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Jan A.P. Hoogervorst

Practicing Enterprise Governance and Enterprise Engineering

Applying the Employee-Centric Theory of Organization

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Applying the Employee-Centric Theory of Organization

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Jan A.P. Hoogervorst
Bennebroek, The Netherlands

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It's all generated, maybe, [a general lack of respect for the people who are trying to solve problems] by the fact that the attitude of the populace is to try to find the answer instead of trying to find a man who has a way of getting at the answer.
—Richard P. Feynman, Physicist and Nobel Prize winner (1918–1988)

Feynman, R.P.: *The Meaning of It All, p. 66. Addison-Wesley, Reading MA (1998)*

A leader [is he] who gives form to the inchoate energy in every man. The person who influences me most is not he who does great deeds, but he who makes me feel that I can do great deeds.
—Mary Parker Follett, Organization Scientist and Philosopher (1868–1933)

Metcalf, H.C., Urwick, L.: *Dynamic Administration: The Collected Papers of Mary Parker Follett,* p. 285. Pitman, London (1941)

Preface

Motivation for the Book

The Premise

Enterprises—our overall label for social entities of human endeavor identified as businesses, companies, organizations, or institutions—significantly affect the prosperity of modern society and the well-being of individuals. As a civilian, patient, student, consumer, or employee, we all experience the positive and negative influences of enterprises on the quality of private and working life. The performance of enterprises thus exerts far-reaching effects. Since we consider contempt for customers, employee alienation, cynical and unmotivated employees, fatigue, burn-outs, inefficiency, low productivity, the squandering of human talent and natural resources, financial crises, and the erosion and compromising of professional craftsmanship as disquieting manifestations of enterprises, the arrangement of enterprises must be based on the same thoroughness generally applied to the arrangement (the design) of technical systems. Nobody would board an unsound aircraft created by people who have not mastered aircraft design. Indeed, system safety, security, availability, reliability, maintainability, or usability must all be based on sound design sciences, such as electrical engineering, mechanical engineering, chemical engineering, or civil engineering. Our premise therefore is that for avoiding unsound enterprises, the arrangement of enterprises should be based on a sound enterprise design science, identified as *enterprise engineering*.

Sound Practices

Creating well-performing enterprises and avoiding the disquieting enterprise manifestations mentioned above do not occur spontaneously but need intentional actions. Service and customer orientation, quality, productivity, flexibility, process excellence, lean production, compliance with rules and regulations, motivated and involved employees, or lower operational costs do not come of their own accord, or because someone at the top has 'declared' it so, or because there is a business case that is 'approved.' Rather, an enterprise must be arranged (*designed*) such that these desirables and areas of concern are successfully operationalized. Activities concerning enterprise design are conducted within the scope of enterprise change: the transition from existing enterprise conditions to preferred ones. Design is at the heart of change since, ultimately, design is the embodiment of intentions. Our motivation for this book lies in attempting to contribute to sound practices for enterprise arrangement, change, and design for enabling excellently performing enterprises. A core aspect of these practices is adopting *the employee-centric theory of organization*.

Purpose of the Book

Closing the Chasms

Despite, or rather because of, an abundance of management 'literature' produced regularly and the plethora of 'business courses' offered, unsound practices with disquieting consequences continue. Ineffective or even fundamentally wrong ways of organizing are prolonged. An unproductive, if not damaging, chasm exists between what foundational sciences, specifically social and organization sciences, know about organizing and what organization and management practices reveal. Prescriptions based on 'best practices' or the 'best managed companies' are often merely anecdotal, faddish, controversial, and based on unsubstantiated pseudotheories. Avoiding the proliferation of questionable viewpoints with no cohesion and an overarching integrating theoretical perspective necessitates that the insights of the foundational sciences are put into practice. Such practicing is seriously hindered by a second chasm: between the social and organization sciences on the one hand and the engineering sciences on the other. Thinking and doing within these latter sciences are about creating things based on scientific knowledge, an attitude desperately needed with the realm of organizing. Closing the second chasm is based on three crucial pillars:

- First, outlining important insights of the foundational sciences.
- Second, applying these insights within the *enterprise engineering* design science for the ability to incorporate them into design and to address the multidisciplinary aspects of enterprises in a coherent and consistent way.
- Third, translating the insights of foundational sciences about change in social systems into sound practices about enterprise change. We identify the competence for these practices as *enterprise governance*.

Since design is at the heart of change, enterprise engineering is a core aspect of enterprise governance. In trying to close the second chasm, conditional for closing the first one, lies the purpose of our contribution, which is the revised and expanded version of our 2009 publication.

Practicing Foundational Insights

Any sound design science is firmly rooted in associated foundational sciences. For enterprises, the foundational sciences are obviously formed by the social and organization sciences, but also other foundational sciences play an important role such as philosophical sciences and information sciences. Our accompanying publication is concerned with the first pillar mentioned above and outlines important foundational insights. This book addresses the second and third pillars by practicing the foundational insights in enterprise governance and enterprise engineering and applies the employee-centric theory of organization in enterprise design. In practicing the foundational insights, the nature and arrangement of the enterprise governance will be clarified, and the theories, methodology, and methods of enterprise engineering are introduced, explained, and illustrated.

Bennebroek, The Netherlands
November 2017

Jan A.P. Hoogervorst

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About the Author

Jan A.P. Hoogervorst studied electrical engineering at the Delft University of Technology and completed his dissertation in Work and Organizational Psychology at the Amsterdam Free University. He fulfilled a number of executive management functions at KLM Royal Dutch Airlines, and was responsible for Aircraft Systems Engineering, Aircraft Components Maintenance and Aircraft Maintenance, Flight Crew Training, Information Services, and Corporate Information Strategy. After retirement from KLM, he worked at Sogeti as an organization and management consultant and as professor in enterprise governance and enterprise engineering at the Antwerp Management School.

Chapter 1
The Importance of Practicing Foundational Insights in Enterprise Governance and Enterprise Engineering

1.1 Introduction

1.1.1 Organizing and Enterprise Design

Different Aspects of Organizing

Our accompanying publication discussed foundational insights for enterprises, our generic term for social entities of purposeful human endeavor, such as businesses, companies, firms, corporations, organizations, and (governmental) institutions. The current publication focuses on practicing these insights within the realm of enterprise governance, dealing with enterprise change, and enterprise engineering, dealing with enterprise design. Both aspects are highly interrelated since change is largely effectuated through design. In practicing the foundational insights, the employee-centric theory of organizing will be specifically applied (Hoogervorst 2017, 2018).

As said, a key point about enterprises is that they aim to be purposeful—directed to accomplishing something. Aside from the (moral) nature of an enterprise endeavor, any purpose necessitates an arrangement of activities. Since the second law of thermodynamics predicts an increasing disorder (entropy) as the natural outcome of doing nothing, the successful arrangement of the purposeful activities does not come spontaneously or incidentally. In the case of enterprises, the sensible opposite to doing nothing, which results in the inevitable development of disorder, is *organizing*—the harmonious ordering and arrangement of activities and means in view of the enterprise purpose(s). Organizing not only concerns coordination and cooperation but also production activities, like organizing a dinner also includes preparing (producing) the meal. Organizing leads to *organization*, a concept that identifies the state of being organized. Note that the term 'organization' is also used to identify the entity being organized. Following common practice, we will use this term occasionally instead of 'enterprise' to follow the terminology of the

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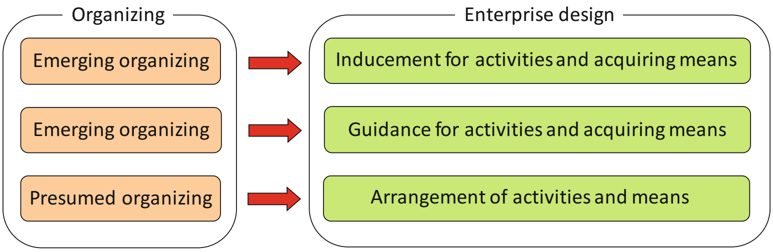


Fig. 1.1 Facets of organizing and enterprise design

organization literature. In these cases, the terms 'enterprise' and 'organization' are thus used interchangeably.

We have shown that organizing cannot be conceived as the onetime arrangement of activities and means representing the definite organized state that covers current and future enterprise operation: a necessary and sufficient outline of organizational roles and tasks, rules and regulations, processes, the associated information supply, means, and so on (Hoogervorst 2018). Rather, organizing must be interpreted in a dynamic sense as continuously evolving activities and states since organizing has largely an emerging nature. Because of the emerging aspect, organizing is not synonymous with enterprise design but critically depends on it. For understanding this criticality, three facets of organizing can be identified which are associated with three facets of enterprise design shown in Fig. 1.1 and further outlined below.

Presumed Organizing

Given the purposeful endeavor of an enterprise, activities and means should be arranged that express the predefined form of organization: the presumed way of working. Such arrangement of activities and means takes the form of the structural functionalist foundation of an enterprise and expresses much of the viewpoints of traditional organization theories that are summarized in the next chapter, including a critical reflection on the exclusive use of the structural functionalist perspective. Nonetheless, the importance of the structural functionalist foundation must be stressed. Indeed, the reliable delivery of enterprise products and services requires some sort of formal, predefined organizational arrangements on which this delivery (also) depends. We fail to see how, for example, the production of material goods or the provisioning of transport, educational, health care, utility, or governmental products and services—on which individuals and society critically depend—can take place reliably if left totally to incidental, emerging processes whose outcome is unpredictable. Recall that the growth of disorder (entropy) is the natural tendency. Hence, enterprises should have a basic level of presumed order provided by predefined organization in view of establishing a baseline reliability in delivering products and services. As indicated previously, it seems highly naïve to expect this basic level of organization to develop spontaneously. But, as the next chapter will clarify, the danger of the structural functionalist perspective lies in the mechanization of enterprises and the instrumentalization of employees. This danger can only be avoided by acknowledging the important notion of emerging organizing. At the same time, this necessary facet of organizing can only be adequately exercised if a proper structural functionalist foundation is in place. It is like driving a car: emerging traffic phenomena must be addressed by emerging 'organizing' (car handling) of the driver which can only be properly done if the driver is supported by an adequate structural functionalist foundation of car and road infrastructure and systems.

Emerging Organizing

The foundational insights presented in our accompanying publication and summarized in the next chapter clarify that the predefined form of organization cannot completely and comprehensively capture the actual momentary, complex, dynamic, and emergent nature of enterprise reality (Hoogervorst 2018). A crucial facet of organizing therefore concerns those emerging organizing activities that are guided by enterprise design, such as through predefined operational rules that prescribe, propose, or direct how to address certain emergent contingencies. Examples are procedures for repairing technical systems, addressing environmental incidents, or remedying certain operational disturbances, such as flight diversions due to weather. All too often, the guidance provides merely an initial orientation for action because new unforeseen phenomena appear that need to be interpreted and addressed. Such developments point to a third facet of organizing. We consider this facet of crucial importance since for a large part, it is impossible to define in advance the precise nature of future enterprise activities and employee (or management) behavior since these activities and behavior have to respond to external and internal operational contingencies emerging out of dynamics, complexity, and the associated uncertainty. Aforementioned impossibility also follows from ambiguity, lack of clarity, and dynamics associated with the predefined organizational roles and activities themselves due to interpretations and expectations concerning what the roles and activities are all about in light of the experienced contingencies. Unpredictable patterns of organizing activities and behavior must develop to address the operational contingencies following from unforeseen, emerging phenomena concerning, for example, customers, suppliers, business partners, stakeholders, employees, machines, equipment, spare parts, material, information systems, work instructions, utilities, offices, buildings, conflicts, or weather, to name but a few sources of variety. So, a large part of the emerging organizing activities have to be defined at the very moment the emerging operational contingencies manifest themselves, simply because the nature of the emerging phenomena *cannot* be foreseen.

Specifically important for understanding previous viewpoints are a number of organization theories that will be briefly summarized in the next chapter. This summary will clarify the necessity to consider employees as the principal source of organizing. This facet of organizing is thus of utmost importance: emerging organizing induced by certain conditions created by enterprise design. These conditions are defined by the employee-centric theory of organization. Precisely, these conditions must be a topic of enterprise design and an integral aspect of the enterprise engineering design theories, methodology, and methods. Only in this way the danger, mentioned above, of creating merely a mechanistic structural functionalist form of organizing can be avoided. Unfortunately, as will become clear, the dominant influence of traditional theories of organization ignores the importance of emerging organizing.

The Engineering Focus: Enterprise Design

Since the required level of organization does not develop spontaneously, creating order through organizing necessitates deliberate, intentional actions. These actions define *how* the organization (the state of being organized) must look like. Enterprises are organized complexities, a concept we will summarize in Sect. 2.3.9. Such complexities rank high on the nine-level scale of complexities defined by Boulding (1956). Creating the organized state is thus no simple matter since enterprises have numerous mutually related facets of which the social aspects are the most difficult ones. Enterprise design should thus cover all the mutually related enterprise facets. Design is not concerned with how things *are* but how things should *become*. Economist, psychologist, sociologist, and Nobel laureate Herbert Simon has stated that "everyone designs who devises courses of action aimed at changing existing conditions into preferred ones" (1969, p. 55). This is the essence of engineering: "The engineer is concerned with how things ought to be—*ought* to be, that is, in order to *attain goals*, and to *function*. Hence, a science of the artificial will be closely akin to a science of engineering" (op. cit., p. 5)[1]. Intentionally creating the conditions for all facets of organizing is identified as *enterprise design*. The theories, methodology, and methods for enterprise design are collectively identified as *enterprise engineering*. On the one hand design concerns understanding the intentions that are to be operationalized (*what*), and on the other hand design concerns figuring out the way to do it (*how*). Design is therefore the creative hinge point between intentions and their realization, as Fig. 1.2 symbolically expresses for the design of a car.

As Winograd and Flores put it, design concerns "the interaction between understanding and creation" (1987, p. 3). Such understanding does not only concern the structural functionalist way of organizing but must, as outlined, include the critical notion of emerging organizing such that the continuously evolving character of organizing is effectively enabled. It is this latter type of organizing that is most

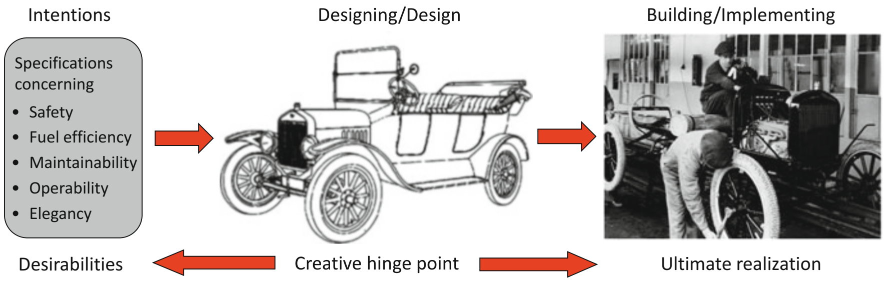


Fig. 1.2 Design as the creative hinge point between intentions and realization

[1]For all quotes in this book, italics are in the original text.

difficult to capture in formal design approaches. Yet, it is precisely here that the foundational social sciences should be practiced. The discipline of enterprise engineering should thus be viewed broadly from this perspective.

Enterprises as Designed Social Entities

Various viewpoints about what an enterprise *is* are presented in the literature (cf. Sect. 1.1.4*)[2]. Four characteristics are commonly mentioned. Enterprises are (1) social entities, (2) purposeful and goal directed, (3) intentionally (re)designed systems of activity, and (4) linked to the external environment. Section 1.3 outlines what the principal categories of activity in an enterprise are. Note that these characteristics concur with the perspectives outlined previously. The fact that enterprises are designed social entities has far-reaching implications for enterprise engineering since the foundational insights of the social and organization sciences must thus be an integral, or even primary, aspect of the enterprise design science. Merely addressing technology-based infrastructural issues is evidently necessary but insufficient.

Design as the Basis for Creating Enterprise Unity and Integration

Intentionally creating the conditions for all facets of organizing was identified above as enterprise design. As we will further discuss below, not any form of organizing suffices. On the contrary, organizing must be such that an enterprise operates as a unified and integrated whole. The notion of 'unity' expresses the condition or state of oneness. For social entities, this notion is commonly used to convey social stability and endurance: different groups within a social 'unity' live harmoniously together. Hence, the social entity does not dissolve and continues to exist. With the notion of 'integration,' the state of oneness is intensified: it expresses mutually coherent and consistent connections or relationships between entities that make up a whole. By 'integration,' we mean the process or instance (hence outcome) of combining aspects or elements of a larger whole such that these aspects or elements exist and cooperate seamlessly. For example, the term 'vertical integration' expresses the process or instance of combining various enterprise aspects pertinent to a product or service, like sales, production, and distribution, into one operational capability. In case of a social entity, integration also means the creation of shared norms, values, and purposes. When summarizing the various theories of society in the next chapter, we will discuss the societal functions and likewise argue the importance of functional integration for the proper functioning of society as a whole. Similarly, for a network, such as an airline network, there must be network unity but also functional integration. So, the term 'unity and integration' expresses the state of oneness whereby the aspects or elements of the oneness are mutually coherent and consistent. Below, we will further argue that creating unity and integration implies *designing*.

Enterprise reality shows that the condition of unity and integration is often violated with unfortunate consequences (cf. Sect. 1.2.4*). Hence, there are conflicts

[2]An asterisk (*) identifies a reference in *Foundations of Enterprise Governance and Enterprise Engineering* (Hoogervorst 2018).

or mismatches between enterprise aspects and between these aspects and the enterprise purpose. Since enterprise performance critically depends on unity and integration, this theme is stressed in the literature under various labels, such as 'organizational alignment' or 'concinnity.' The 'congruence theorem' expresses the fundamental truth supported by much empirical evidence: enterprises will operate more effectively, and perform better, the higher the degree of unity and integration—the coherence and consistency of the various enterprise aspects (op. cit).

Enterprise Engineering: Uncomfortable Connotations?

The importance of enterprise design was emphasized above. For some however, the term 'design' in the context of enterprises has uncomfortable connotations since it is associated with mechanistic approaches to enterprises: arranging them as if they are machines. Sometimes, the label 'social engineering' is used to identify the mechanistic view on organization and management (Tsoukas 1994). This view equates management with control and expresses the conviction that by using certain 'controls,' management can steer the enterprise (top-down) in the desired fashion. The enterprise is thereby assumed to be an objective and designed entity, external to management, that like a machine, merely needs to be controlled. Although design might lead to machine-like forms of organization, that is not inevitable. So, in defense of enterprise design, we submit that the three facets of organizing discussed above will not materialize if left totally to incidental processes of which the outcome is unpredictable. Recall that the growth of disorder (entropy) is the natural tendency. Enterprises are characterized by a certain level of order provided by the three facets of organization which critically depend on design. Hence, creating conditions for proper organizing necessitates deliberate, intentional actions. These actions define *how* organization must proceed. We refer to these actions as *design*.

In summary, we appreciate the mentioned uncomfortable connotations with 'social engineering' and agree that the mechanistic view on enterprises is untenable and have strongly criticized this viewpoint (Hoogervorst 2018). Fundamentally different perspectives were presented that, among other things, acknowledge the nonplanned, nonmechanistic, emerging character of many enterprise developments (op. cit.). Chapter 3 will corroborate this viewpoint in the context of enterprise change. Coping with and addressing emerging phenomena is essential for enterprise strategic and operational success, as well as for the ability to innovate and change. All these capabilities depend on specific enterprise conditions, as we will show when defining these conditions within the realm of enterprise engineering. Again, these conditions must thus be created intentionally: they must be *designed*. Contrary to the uncomfortable mechanistic connotation, such enterprise design enables future, yet unknown, enterprise change and adaptation. Such design is the very basis for an adequate enterprise governance competence.

1.1.2 *The Fundamental Maxim and the Theory of Organization*

The Preferred Way of Organizing and Design

Acknowledging that organizing—the intentional creation of the organized state (organization)—critically depends on design inevitably leads to the question as to how the design must look like. In the course of outlining the discipline of enterprise engineering, we will formally and methodically deal with this question. For now, the following is noteworthy. First, it is impossible to device an algorithmic procedure—a causal set of operations and steps with an inherent, deterministic result—to proceed from a given enterprise purpose to an associated enterprise design, as Sect. 2.2.7 will outline. We will further elaborate on this fundamental insight in Chap. 3. As a consequence of this insight, there are inherent degrees of freedom concerning the concrete nature of enterprise design. A given enterprise purpose can lead to various designs. Figure 1.3 expresses this freedom graphically. The curved lines represent the design process and aim to express its nonalgorithmic nature.

Second, the possible forms of design are not equally effective nor desirable. As further reiterated in the next chapter, not any design is adequate, such as those ignoring emerging organizing. Various practices advanced in business or management literature can be seriously criticized. The next chapter will further summarize in what way the often-used forms of organizing are flagrantly inadequate if not damaging. Lack of understanding and quackery turn out to have severe consequences. Indeed, a crisis in enterprise performance is apparent and "much of this crisis can be traced back to organizational pathologies and ultimately to deficiencies in our thinking about what organizations should be, and how to conceive of them" (Schwaninger 2009, p. 1). Hence, a proper theory of organization is crucial. It is

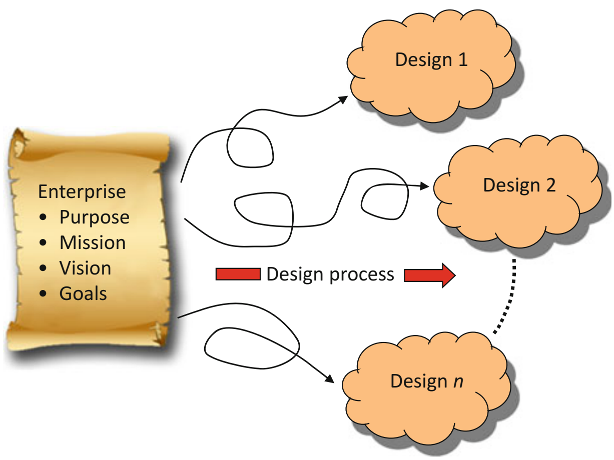


Fig. 1.3 Design freedom

important therefore to recall the fundamental maxim of Burrell and Morgan on which our accompanying publication is based (1992, p. 1):

> All theories of organization are based upon a philosophy of science and a theory of society.

When summarizing philosophical viewpoints and the various social and organization theories in the next chapter, the validity of this maxim will be clearly proven. Together with the philosophy of science and the theories of society, the organization theories form an important part of the foundational insights. Specifically foundational for enterprise design is the *employee-centric theory of organization* that we have strongly emphasized and corroborated (Hoogervorst 2017, 2018). Core reasons for advancing this theory are summarized in the next chapter. For now, it is important to note that it is this theory of organization on which the capacity for emerging organization, as well as the capacity for successful enterprise change and adaptation, is based. Hence, it is this theory that provides the foundational insights for the desired forms of enterprise design.

Closing the Chasm: Applying Foundational Insights

It seems evident that without a proper theory of organization, enterprise design is futile. For effectively addressing the organized complexity of enterprises and their associated performance problems in a practical way, design must therefore be firmly based on an appropriate theory of organization rooted in the foundational sciences. As psychologist Kurt Lewin said, "there's nothing so practical as a good theory" (In: Thomas 2003, p. 74). Conversely, as we have shown in Chap. 4*, "nothing is as dangerous as a bad theory" (Ghoshal 2005, p. 86). Recall that design is the creative hinge point between intentions and realization. Thus, the foundational insights, specifically those of the employee-centric theory of organizing, must be applied to enterprise design. As indicated before, also Herbert Simon had a drive to infuse the social sciences with the same rigor that made the natural sciences so successful. Key to establishing this rigor is the notion of design (Simon 1969). Hence, the theories, methodology, and methods of enterprise engineering must be capable of addressing and operationalizing the foundational insights concerning the employee-centric theory of organization. In doing so, the unproductive chasm between the social and organization sciences on the one hand and the engineering sciences on the other hand can be bridged. The need to bridge this chasm was already identified early in the former century: "and one of the problems of our time is to bridge the widening mental gulf between those educated and trained solely in the humanities and those whose minds are shaped by a life devoted to that machine technology on which all are increasingly dependent for the material basis of existence" (Urwick 1947, p. 10). Bridging the chasm is what this publication aims to accomplish.

1.1.3 Outlining Further Introductory Observations

Given the significance of organizing, the central purpose of this introductory chapter is to argue the importance of understanding and designing enterprises and to introduce the main topics we discuss in subsequent chapters. Our further introductory observations proceed as follows. We will start by sketching the character and trends of the modern enterprise context, as expressed by major developments concerning technology, information, business, and organization. A number of paradigm shifts are identified that typify these developments and point to the need for fundamentally different ways of organizing. Next, two core enterprise competences are introduced of which one is concerned with enterprise change and adaptation. This latter competence, identified as *enterprise governance*, is thus the competence that carries out the process of enterprise design and applies the *enterprise engineering* design science. The nature of this process is further detailed in Chap. 3 and illustrated in the following chapters.

We mentioned that the various facets of organizing become a reality through enterprise design, which is the core activity within enterprise governance. As a further introductory observation, several fundamental reasons will be given for the importance of holistic, enterprise-wide design. The first reason is the apparent widespread inability of enterprises to utilize information technology (IT) successfully. As our discussion will show, a case in point is the persistent problem of 'business and IT alignment.' The inadequacy of the traditional approach to solve this problem, which primarily focuses on IT and IT governance, will be discussed. This forms the basis for an essentially different perspective. Besides IT governance, the theme of corporate governance is briefly summarized. Central in this theme is the notion of 'compliance': the adherence to rules, regulations, and proper internal control for safeguarding the financial interests of shareholders. We will show that effectively addressing compliance requirements needs an enterprise-wide focus, which presents the second reason for holistic, enterprise-wide design. The third reason lies in the fact that design is the basis for enterprise operational and strategic performance. Finally, an enterprise-wide design focus is essential for overcoming theoretical fragmentation in addressing enterprise issues and avoiding the traditional myopia about organizing that reduces attention to merely processes and their machine-like characteristics and thereby virtually excludes the notion of an enterprise as a social entity.

Given the central notion of design, we will introduce the concept of 'design science' and will position enterprise engineering as the design science for enterprises. The close relationship between a sound design science and the associated foundational sciences is outlined, which likewise hold for the enterprise design science. As indicated, enterprise design is the core activity within enterprise governance. Since, as will become clear, solving the issue of 'business and IT alignment' necessitates a focus on the design of the enterprise as a whole, IT governance must therefore not be treated as a separate topic but as an integral part of enterprise governance. Likewise, the issue of 'compliance' can only be addressed properly through enterprise-wide design. Similarly therefore, corporate governance should not be treated in isolation but as an integral aspect of enterprise governance. Next to the close relationship between enterprise governance and enterprise engineering, we will thus also stress the close relationships between the three governance themes, such that attention to enterprise governance suffices: necessary and sufficient for governing enterprise change and adaptation. Finally, the contents of the next chapters will be outlined.

1.2 The Modern Enterprise and Its Context: Trends and Characteristics

1.2.1 The Context

Four characteristics of enterprises were mentioned in Sect. 1.1.1. They are (1) social entities, (2) purposeful and goal directed, (3) intentionally (re)designed systems of activity, and (4) linked to the external environment. This section will illustrate that the trends and characteristics of the modern enterprise context profoundly impact the nature of all four enterprise characteristics. Moreover, the four characteristics are more or less mutually related. For example, other ways of organizing (redesign) might require different types of employees which will change the nature of the social entity. Conversely, a different social nature might entail redesign because of the required different ways of organizing. Likewise, changing relationships with the external environment necessitate other ways of organizing, while other ways of organizing might change the nature of those relationships. Also a changing purpose is likely to affect ways of organizing. In all these cases, (re)design plays a central role. We will further argue this central role by sketching the trends and characteristics of the modern enterprise context pertinent to four perspectives: (1) technology developments, (2) the informatization of enterprises, (3) the business context as the description of the external environment, and (4) organizing, the new ways of getting into the organized state. As the sketch will show, thoroughly understanding enterprises and the ability to properly design them is crucial in order to adequately address the developments outlined.

1.2.2 Technology Developments

Adoption Rate

By 'technology' is understood the totality of knowledge, methods, physical means, and materials for realizing and utilizing technical systems. The influence of technology on human individuals and society is considerable and often of primary significance for the manner in which society is arranged and can be characterized (cf. Sect. 2.4.2*). Technology is one of the three major societal change drivers (cf. Sects.

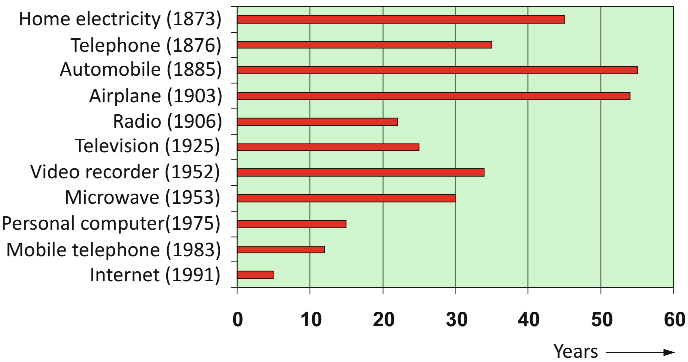


Fig. 1.4 Reduced technology distribution time

3.7.2* and 3.7.5*). An evident example is the revolutionary influence of information technology on the informatization of work. A more recent revolutionary influence is discussed below.

From a historic perspective, the rate of technology adoption in society seems to increase. Put another way, the time it takes for technology to reach broad utilization among people reduces. Based on data from the American Census Bureau, Fig. 1.4 shows the time it took for different technologies to reach at least 25% of the American population (Cox and Alm 1996; DiVanna 1997). The telephone took 35 years, while for the personal computer (PC), only 15 years elapsed to reach that level. For the Internet, the period is 5 years. Within a few years, the Internet has reached a utilization density for which the telephone network needed 100 years. Others have compiled comparable figures (Wooldridge 2011).

IT Dynamics: Computers and Transmission

Information technology (IT) can be understood as the totality of knowledge, methods, physical means, and materials for gathering, handling, processing, storing, and accessing data. One might observe that only then can 'information' be referred to if data has meaning (value) for an individual. In fact, a better term would be 'data technology.' In view of the communication aspect, the ICT label is often used. One might consider communication technology as the technology for transmitting messages electronically. The term 'messages' must be interpreted broadly and denotes anything that can be transported through telegraph, telephone, radio, or television. Due to the digitization of both data and messages, the difference between both technologies becomes virtually nil. This is not only the case for transmission itself—no distinction in the digital manifestation of speech, images, or data—but much communication equipment also has computational capacities. In fact, communication technology can be viewed as a specific facet of information technology. We will therefore refer simply to IT rather than ICT.

Information technology is evidently a prime example of revolutionary developments. Progress in IT has been labeled 'revolutionary,' since this progress has affected the arrangement of society fundamentally and will continue to do so. Rightly, one refers to the 'digital revolution' (Negroponte 1995). From a historic perspective, IT progress shows enormous dynamics stimulated to a considerable extent by the development of computers (Hyman 1982; Bird 1994; Davis 2000). Developments directly prior to, during, and immediately after the Second World War led to the first wave of computers and turned out to be the prelude to the digital revolution and Toffler's third wave: the transformation from the agricultural and the industrial towards the *informational* era (Toffler 1980). Already back in the 1960s, MIT scientist Joseph Licklider foresaw the enormous progress of computer capacity by stating that the capacity would double every 2 years (Licklider 1965). As an illustration of the enormous progress, the following example might suffice. The ENIAC computer became operational in 1946 and contained 18,000 vacuum tubes and 1500 relays, weighed 27 tons, and consumed 160 kW of power. Given the multitude of parts and their reliability, the ENIAC computer was initially only available for about half of the time. In 1971, the total ENIAC computing capacity was realized on a single microchip (Moore 1997). A similar dynamic can be noticed in the area of communication (Kennedy 1977; Keen and Cummings 1994). For decades the transmission capacity has tripled every year.

IT Dynamics: Information Infrastructure and the Internet of Things

During the second half of the former century, various engineers and engineering institutions conducted research into data transmission technology. Together, these mutually stimulating developments led to the possibility for remotely located computers to efficiently and reliably exchange data. Eventually, these developments created the worldwide system of interconnected networks and computers known as the Internet: a massive communication (data transmission) infrastructure. Based on the enormous communication capabilities, other developments in the early 1990s enabled users to search for and retrieve data stored on computers (databases) in the network. This 'worldwide web' of databases—seen as locations with information—changed the Internet from a massive global communication infrastructure into a massive global multimedia database. Growth turned out to be enormous: in less than a decade, at the end of the 1990s, a new www-address was created every few seconds (Downes and Mui 1998).

The digital revolution has led to all sorts of Internet access devices which can often be operated wirelessly and are mobile ('always connected'), with a high level of mutual interoperability, varying from personal computers, laptops, tablets and (mobile) telephones, smart phones, to televisions. In the early stages of Internet development, it was primarily IT equipment (including personal computers) that was connected. Such equipment currently makes up only a fraction of the devices connected to the Internet. Many devices and appliances have microcomputers (embedded 'chips') giving devices intelligence and communication capabilities which are further fuelled by computer capacity progress. Miniaturization of microchips enables the incorporation of 'intelligence' in virtually anything, such as packages identifying their location. All kinds of devices, appliances, or 'things' with internal intelligence, varying from elevators, vending machines, energy meters, to parcels, are connected to the Internet to transmit data about their status, whereby the Internet becomes the 'Internet of things.' It is expected that eventually almost all household equipment will have an Internet connection (Dornan 2001). A washing machine can thus download applicable programs. Hence, miniaturization, combined with the possibility of providing minuscule microchips with energy, means that in the near future, many material objects will have intelligence and can communicate. One refers to 'ubiquitous computing,' or 'pervasive computing,' which turns the environment into 'ambient intelligence' (Aarts and Encarnação 2006). Network communication already consists for more than 90% of communication between 'stuff' that is not specifically computer-related. Ever-increasing mobile communication capacity and the convergence of a variety of (social) media have created an 'always on,' or 'real-time,' society. The Internet is the all-embracing communication medium: between people, between people and devices, and between devices mutually. It is this distributed, partly mobile, intelligence that gives the Internet its enormous potential (Louis 2001). Digitizing information and communication enables extensive integration of previously distinct media. Convergence of data presentation, automation, and telecommunication thus enables convergence on the informational level: information that had to be treated separately can now be presented (through multimedia) in a unified manner. This real-time integration offers inconceivable opportunities for coordination, cooperation, and collaboration between individuals.

The impact of these developments, further discussed below, can hardly be overstated. Note that these developments emerged in unforeseen ways and with no overarching central authority in control.

IT Dynamics: Blockchain Technology

A fairly recent example of IT dynamics is the emergence of the so-called 'blockchain technology,' which was developed for the open-source, distributed digital cryptocurrency called 'bitcoin' (Crosby et al. 2015; Franco 2015; Tapscott and Tapscott 2016). Essentially, the term blockchain refers to an Internet-based distributed database that contains time-ordered data about transactions which took place between participants using the blockchain. Transactions can be seen as atomic changes in the 'state' of an enterprise, for example, changes in financials, documents, contracts, assets, services rendered, or goods produced. Data that enters or is stored in the blockchain can never be erased. Hence, a blockchain contains data about every single transaction ever made by participants. More generally, the blockchain initiative concerns the creation of a peer-to-peer economy where amounts of value are exchanged through transactions without a trusted third party. Multiple amounts of value can be envisioned, such as money, property, energy, etc. This peer-to-peer economy is an Internet-based, distributed digital ledger which contains all the transactions and their associated data. The associated software runs on computers of the participants, called 'nodes.' Underlying is the concept of *distributed consensus*: all participants (nodes) in the network have a full copy of the digital ledger and must agree with the periodic updates and hence must agree that the transactional events happened in accordance with the associated data, thereby sanctioning the storage of irrefutable records in a distributed digital ledger.

Transactions in the blockchain are thus always consistent since the verified transactional updates are logically consistent with the ones already stored. So, it is impossible to spend money twice or resell a product already sold. The process of reaching distributed consensus is carried out without compromising privacy and anonymity. These are core characteristics of the blockchain technology. Without going into the complicated details, the ledger is periodically updated with chunks (blocks) of new transactions that took place and are verified to be trustworthy. The digital ledger is thus a chain of blocks (hence the name) with trustworthy, chronologically ordered transactions.

When anyone, possibly anonymously, can participate in a blockchain network, the blockchain is identified as 'public.' Also the term 'permissionless' is used. The bitcoin network is based on such public blockchain. When some form of access control is effectuated, the blockchain is labeled as 'permissioned': not anyone can join. A specific form of a permissioned blockchain is a private blockchain where only known members or customers of the private organizations are participants in the blockchain.

There are two types of network nodes: (1) passive nodes whereby participants only use the blockchain technology and (2) active nodes whereby participants are contributing efforts to creating new blocks of verified and confirmed transactions (Franco 2015). Participants of the active nodes in a public blockchain are called 'miners.' The process of verifying and creating a new chunk (block) of yet unconfirmed transactions is both innovative and mind-boggling. Verification and conformation of transactions—hence their trustworthiness—is based on (1) mathematical (cryptographical) algorithms, (2) the history of already identified trustworthy transactions, and (3) the condition that a majority of the nodes in the network must concurrently agree. On the average, the blockchain is updated every 10 min. Hence, this is the average time to create and verify a new block of transactions. In case of permissioned blockchains, the process of verifying and creating new trustworthy blocks of transactions can be different (but not necessarily less complicated) because access control enables to establish the nature of the trustworthiness of participants. This is particularly the case for private blockchains.

Technology Dynamics: Uncertainty

Technology-driven dynamics can be appreciated not only based on the shrinking time it takes for widespread utilization but can also be appreciated from the unpredictability of technology developments and their impact. Uncertainty plays a key role. Generally, uncertainty is the consequence of lack of knowledge, or the inevitable effect of the inherent character of the developments themselves (Wilde 2000). We have outlined that the latter aspect plays an all-determining role in technological, societal, and enterprise developments (cf. Chap. 3*). As the story goes, at the start of the last century, the director of the American Patent Office proposed closing the office since everything that could be invented was already invented. The proposal appeared premature: more than half of all American patents were issued after 1960 (Cox and Alm 1996). Predicting or assessing technology advancements with reasonable accuracy is impossible. Indeed, 'predicting' the invention of the wheel or the transistor would mean that one *already* knows what the wheel or the transistor is all about. Using these inventions could thus start directly. Obviously, "we do not know what we will know" (Taleb 2010, p. 173). The following examples illustrate this truth. After the invention of the telegraph, the Boston Post wrote in 1865 that "Well-informed people know it is impossible to transmit voice over wires. Even if it were, it would be of no practical use" (In: Bekkers and Smits 1997, p. 5). In 1943, the president of IBM estimated a worldwide market for about five computers. Not much later (1949), the *Popular Mechanics* magazine stated that future computers probably would not weigh more than 1.5 tons and would contain less than 1000 vacuum tubes, which in itself would be a considerable improvement compared to the ENIAC computer operating at that time, weighing about 27 tons and using 18,000 vacuum tubes. As mentioned above, in 1971 the complete computational power of the ENIAC computer was realized on one integrated circuit (IC) with negligible weight (Moore 1997).

From roughly the 1980s, the digital revolution progressed at such a pace and had such an internal dynamism that the outcome appeared, even more than in the past, hardly predictable. Note that the inability to foresee these and other technology developments, even approximately, also appeared to hold for those involved with these developments. Even at the end of the 1970s, the president of Digital Equipment saw no reason why people would want a computer in their home. Around the same time frame, someone presented the idea to Gordon Moore, one of the founders of the Intel company, for what was basically the personal computer, to sell it in the home market. Other uses than housewives storing recipes on it were not envisaged. As Gordon Moore recalls, "I personally didn't see anything useful in it, so we never gave it another thought" (Moore 1997). Some years later, the president and founder of Microsoft thought that 640 Kb of storage capacity would be enough for people who might after all want a home computer (Aarts 2005). One might appreciate the enormous progress of IT, realizing that these statements were all made in the more recent history. In 1971, Intel developed the first microprocessor which, as mentioned previously, had the same computational power as the massive ENIAC computer developed 25 years earlier. By 1980, the microprocessor had found its way into more than 2000 product designs. At that time, IBM selected the Intel microprocessor for its first personal computer. With hindsight, the same (understandable) inability to foresee the future played its role: "while we knew the IBM product was significant, we had no idea how that single decision would change Intel and the industry" (Moore 1997). The dynamics of IT are thus unpredictable in their effects: certain predicted effects did not occur, or occurred less prominently than expected, while unpredicted effects, such as the enormous growth of text messages, emerged (Seeley Brown and Duguid 2000). Predictions about the impact of technology on society were no better. In 1929, NBC radio's president predicted that radio would be the perfect means for establishing the "ideal democracy" (Wilde 2000, p. 69). Electricity was also viewed as wielding broad influence. According Marshall McLuhan, electricity would "liberate us from city noise, war and violence, and enable us to regain contact with nature" (op. cit., p. 52). As one of the founders of the Intel microprocessor corporation observes, "as has always been the case with new technology, the most important and revolutionary uses are the ones we can't yet foresee" (Moore 1997). Recent history shows such IT dynamics that neither the direction nor the possibilities and opportunities of the IT developments could be comprehended even remotely adequately.

The inability to predict the impact of technological developments with any practical accuracy has to do with the following factors (Wilde 2000, pp.73–75):

- Every technology, alongside its designers' defined intentional use, also has a potential use that is very hard to foresee a priori.
- A successful technology will be followed by barely predictable new functionalities.
- Innovative success depends on complementary innovations that enable the utilization of the initial innovation.
- A technology's success depends on many other conditions, such as economic, social, political, and demographic factors.
- The existing conceptual reference framework implies that the impact of technology innovations and their subsequent systems cannot be understood and fully comprehended.
- It is unclear whether, and to what extent, new technologies and their associated new ways of working will replace existing technologies and ways of working.

The uncertainty sketched above is one of the reasons why the ability of enterprises to change and adapt is crucial. Moreover, when new technology emerges, the issue here is not only technology as such but concerns the meaning and possibilities of new technology for one's own enterprise and the successful integration of technology within the whole enterprise context. As we will argue extensively, successful integration necessitates enterprise-wide design whereby technology is an integral aspect. The inherent nature of technological, societal, and enterprise dynamics and their associated uncertainty necessitate fundamentally different perspectives on strategy development and organizing. Important insights will be summarized in the next chapter.

1.2.3 Informatization

Growth of Data

Progress in information technology has enabled the creation of massive amounts of data associated with, for example, the worldwide web of information, the Internet of things (ubiquitous computing, ambient intelligence), social media, and communication networks, as well as associated with enterprise customer and operational processes. As more and more enterprises experience, these areas become increasingly intertwined, such as the sharing of customer experiences through social media. Not surprisingly, the amount of data grows exponentially. The term 'big data' has been coined to characterize the enormous data volume. It is believed that analysis of this volume would yield valuable information for (1) real-time enterprise operational control; (2) predicting, such as consumer behavior; (3) pattern recognition, for example, between events; and (4) discovery of new phenomena. For some, the exponential growth of digital data is the new industrial revolution which will transform social and working life (Mayer-Schönberger and Cukier 2013). For enterprises, the data revolution is believed to hold many promises: (1) better strategies, decisions, and answers, (2) more innovation and higher productivity, and (3) increased competitiveness would supposedly be the results of exploring and exploiting 'big data' (Bloem et al. 2013). Uncertainty associated with technology developments, as identified above, is likewise associated with the nature and impact of the data revolution. Nonetheless, based on the impact that is already manifest, a considerable impact seems plausible. As Zuboff observes, work is no longer merely automated but 'informated' (1989). Increasingly, work becomes synonymous with 'knowledge work' (Drucker 1992, 1993). The management of physical assets—a typical characteristic of the era of the industrial revolution—shifts towards the management of 'intellectual assets.' As Drucker states: "the function of the organization is to make knowledge productive" (Drucker 1993, p. 49).

Need for Information Integration

Arguably, for making information (data) productive, it must not be fragmented but integrated and shared. This is a nontrivial issue, specifically since most data is generated in events that are distant in space and time. For example, a parts warranty condition negotiated by legal staff must be known to maintenance staff who replace parts. Making information and knowledge productive thus critically depends on unity and integration: the enterprise must be directed to "the integration of knowledge into a common task" (Drucker 1992). Creating and sharing knowledge is viewed as crucial for gaining competitive advantage (Nonaka and Takeuchi 1995).

As we have shown, one can also refer to knowledge at the level of the enterprise itself (cf. Sect. 4.3.5*). According to Argyris and Schön, enterprises can be viewed as cognitive entities which learn and develop knowledge (1978). Shared knowledge defines the enterprise 'mental map' that determines enterprise behavior as a reaction to, and anticipation of, environmental changes. So, enterprise learning concerns the increased capacity to effectively address the dynamics an enterprise is experiencing (Kim 1993). Enterprise learning must be a core competence and is both a manifestation and a prerequisite for change (Prahalad and Hamel 1990). Rightly, enterprises that cannot learn cannot change (Schein 1993). Precisely this insight is the basis for arguing that strategy development must be considered as a learning process. Core arguments are presented in the next two chapters. Obviously, widespread informatization and information integration aid significantly in enterprise learning.

The informatization of enterprises is also manifest in the relationships of enterprises with customers. Traditionally, these relationships were merely transaction-oriented: the exchange of products or services for some monetary reward. Since informatization has resulted in enormous amounts of data about customers, the relationship with customers can be extended beyond that of a singular transaction if data is effectively exploited. Rather than a short-term transaction orientation, attention can shift towards a long-term relational orientation. It is argued that the information-intensive enterprise and society enables a shift from the 'transaction economy' towards the 'support economy,' with its focus on supporting customers, civilians, patients, etc., based on the relationships that support-giving enterprises have built (Zuboff and Maxmin 2003).

1.2.4 Business Context

We will use the term 'business' to denote the enterprise function—delivery of products and services to customers—or, more generally, to denote the relationships of the enterprise with its stakeholders. The term 'business' thus also refers to the overall purpose and goal of an enterprise. We have sketched the social developments that led to the industrial revolution and the development of enterprises as we know them today (cf. Sect. 3.7.2*). The industrial revolution turned out to be an enormous technological and subsequently socioeconomic and cultural transformation. At the outset, the development of machines fuelled the industrial revolution, later further propelled by transport capabilities offered by the railways. In the more recent history, we witnessed another wave of technology revolution mainly due to revolutionary developments in information technology sketched above.

Fundamental Changes

The industrial revolution can be viewed as the transformation that also led to organizational forms that are currently still primarily manifest. Core aspects of enterprises—and their theory development—find their origin here. For a long time, factory-oriented production was directed towards delivering standard products and services. This type of production was associated with mass demand, whereby customers—also because of prevailing economic conditions—appeared to be satisfied with supplier-defined products or services. Markets were relatively static, so mass demand could be answered through mass production and its associated ways of organizing. Attention went first and foremost to economically optimal ways of production, whereby the end-user of the products or services received virtually no attention. Understandably, enterprises therefore tended to be inward-looking.

An increase in wealth led to increased demand for more product variety. As a result, the market became less static since larger product variety implied more demand dynamics. Technological progress, specifically concerning IT, enabled customizing products to individual requirements of customers. Gradually, a shift from standard mass production towards individualized (customized) production and from a static market towards a dynamic market became manifest, as depicted schematically in Fig. 1.5.

With the shift shown in Fig. 1.5, a great number of fundamental changes are associated concerning the manner of business conduct and the way enterprises are organized. More and more, ways of organizing that focus on mass production can be considered as an anachronism. Changes are fundamental since they imply essentially different perspectives on enterprises, their customers, employees, and suppliers. The

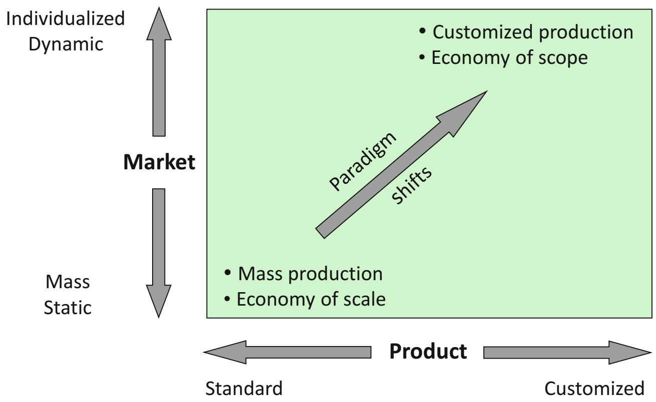


Fig. 1.5 Shifts in market and product character

changes, which we will sum up in a later paragraph, can rightly be identified as paradigm shifts.

Social Media

Section 1.2.2 described the Internet as the massive worldwide communication infrastructure comprising a worldwide web of databases, seen as locations of information. This infrastructure or network has enabled the emergence of so-called *social media*, like Facebook, Twitter, Instagram, YouTube, LinkedIn, etc. Traditional communication media, such as radio, newspapers, television, and magazines predominantly act as one-way communication channels, whereby the receiver consumes content rather than creates it. Social media, however, have enabled individual human beings to create and distribute content through the Internet (Zarella 2010). Social media are thus a collection of Internet-based communication means allowing individuals to create, distribute, and share content of various kinds, and interact pertinent to that content. Depending on the kind of content and its purpose, different types of social media can be identified, such as news sites, media sharing media, content sharing networks, blogs, etc.

Enterprises are using and exploring social media on a large scale for marketing and operational activities. More specifically, social media are used for customer relationship management, public relations, reputation and brand management, organizing customer feedback, advertising, customer support, recruitment, logistics, etc. (Singla and Durga 2015). An important driver for using social media is to gain and maintain competitive advantage. Whether that can be achieved remains a topic for debate (Smith and Vardiabasis 2010). Nonetheless, ignoring social media can be rather dangerous. Negative customer experiences with products or services are easily distributed on a worldwide scale not seldom with dramatic consequences for the producers of the products or services (Powell 2009; Zarella 2010). In this sense, social media enable a transfer of power from producers to customers and have thus changed the relationships of enterprises with customers (Capozzi and Rucci 2013).

Like any other technology, the successful utilization of social media within an enterprise context necessitates that social media are not treated as a separate 'gadget' but as an integral part of the way the enterprise is organized (Chui et al. 2013). Put differently, social media must be treated within the scope of enterprise-wide design as a means of organizing to be fully integrated with other means. Strategic learning about how to effectively use social media is key, contrary to the traditional top-down strategic planning outlook (op. cit.). Chapter 3 will argue this point further. Given the very nature of social media, the notion of emerging organizing discussed in Sect. 1.1.1 plays an essential role since enterprise must address the emerging content of social media in real time.

The Platform Revolution

Information technology developments created dramatic social, business, and organizational influences. More recent developments in this area are likely to create even more dramatic and disruptive influences. Many of these developments can be identified with the label *platform revolution*. The notion of 'platform' is conceived in various ways. For example, a platform is seen as "a new business model that uses technology to connect people, organizations, and resources in an interactive ecosystem in which amazing amounts of value can be created and exchanged" (Parker et al. 2016, p. 3). Also a platform is considered as an infrastructure: "a platform is fundamentally an infrastructure designed to facilitate interactions among producers and consumers of value" (op. cit., p. 134). Yet, as a basic definition, "a platform is a business based on enabling value-creating interactions between external producers and consumers" (op. cit., p. 5). In this case, a platform is conceived as an enterprise. Multiple examples of such enterprises can be given. Well-known are Airbnb facilitating hospitality services and Uber facilitating transportation services.

Based on these reflections, we define a *platform-enterprise* as an enterprise that uses a (information) technology-based platform infrastructure to facilitate value-creating interactions between external producers and consumers. Platform-enterprises thus facilitate matches between consumers with certain needs or purposes on the one hand and producers with resources that can fulfill those needs or purposes on the other hand. Put differently, platforms facilitate the exchange of goods, services, or other forms of 'social currency.' Hence, "the platform concept is fundamentally simple: create a place where producers and consumers can come together in interactions that create value for both parties" (Parker et al. 2016, p. 60). We might observe that such a place has existed for long in traditional forms, such as food markets and stock markets. However, the revolutionary aspect of platform-enterprises lies in the nature of the production they enable, while they do not own the production resources that create the value for consumers: Airbnb does not own the private homes that are offered for hospitality, while Uber does not own the private cars for producing the transportation services. Value is created by the community of platform users and mainly *outside* the boundaries of the platform-enterprise, with little or no control over the resources used. Further, the nature of a platform-enterprise allows it to quickly scale since the bulk of resources are owned by the external producers. As with traditional enterprises, success of a platform-enterprise depends on various factors that are difficult to predict. Frictionless entry of consumers and producers to the community of platform-enterprise users is evidently a key condition for success. Further, speed, reach, convenience, and efficiency are important factors (op. cit.). Again, all these conditions make (strategic) success of a platform-enterprise an uncertain, emerging phenomenon. Moreover, “it is inevitable that participants will use the platform in ways you never anticipated or planned” (op. cit., p. 58).

Note that the platform idea has been practiced earlier, for example, in the form of employment agencies that mediated between employees and employers. Also these historic ‘platform-enterprises’ did not own the production ‘resources.’ So, the revolutionary nature of the idea has more to do with the domain of application than with its novelty. Nonetheless, the fundamentally different character of platform-enterprises challenges traditional concepts about enterprises and organizing, specifically regarding the ownership of production resources. Traditional metrics about the effectiveness of organizing and the performance of enterprises, such as productivity and efficiency, seem inadequate. For platform-enterprises, the number of sustainable, repetitive interactions is of key concern. Hence, the most important ‘asset’ of a platform-enterprise is formed by “the active producers and consumers who are participating in a large volume of successful interactions” (op. cit., p. 188). Likewise, traditional viewpoints about creating strategic success—such as Porter’s model of five strategic forces or the resource-based view on enterprises—lose relevance. These traditional measures are often defensive and protective, for example, by creating barriers to competitive action or securing the relative exclusivity of certain resources. These measures are no longer effective. Ultimately, the relationships with the platform-enterprise users form the lasting source of competitive value: “control of relationships becomes more important than control of resources” (op. cit., p. 228). Information technology also plays an important role in establishing effective control of relationships.

Platform-enterprises are disruptive in many ways, not only in thinking about organizations and organizing but also in upsetting traditional business domains. Notable examples are Airbnb upsetting the traditional hotel or lodging business and Uber upsetting the traditional taxi business. Traditional forms of governmental regulation should thus be reconsidered. Also platform-enterprises must establish effective governance for enabling the development of adequate community relationships and for addressing emerging unwanted negative effects of platform-enterprise utilization, for example, by improper use of the production resources by certain consumers.

Conditional for platform-enterprise success is (1) coherence and consistency for ensuring seamless entry to the platform-enterprise community either as a consumer or producer and for ensuring seamless interactions between consumers and producers, (2) trusted relationships between consumers and producers mutually and with the platform-enterprise, and (3) fairness in creating value or wealth for the community of users (op. cit.).

The Worldwide Digital Ledger

As described above, the blockchain technology and its associated operational protocols become a highly trustworthy peer-to-peer system for digital transactions of some value. Like the Internet is the open platform for exchange of information, the blockchain technology is considered the open platform for exchange of value (Franco 2015). Multiple blockchains can thus be envisioned, depending on the nature of the value that is exchanged. The Internet of things is thereby complemented with the 'ledger of things' (Tapscott and Tapscott 2016). Because a blockchain contains all the historic (verified) transactions, corrupting the system is virtually impossible. Attempts to conduct fraudulent behavior will thus be immediately discovered and exposed since it would require rewriting the blockchain's history. The blockchain thereby becomes the shared single source of truth. Put differently, the Internet of everything becomes "the Ledger of Everything" (op. cit., p. 7). Consensus about the trustworthiness of transactions transforms *distributed consensus* into *distributed trust* (ibid.). An article in The Economist of October 2015 spoke of 'the trust machine' when discussing the blockchain developments. Various forms of intelligence can be embedded in the blockchain technology, such as rules that ensure that the transactional amount can only be used for a predefined purpose. Examples are 'smart contracts' whereby contractual terms are automatically observed and executed (contractual compliance) and 'smart property' whereby ownership and usage of property (money, house, car, phone, etc.) is controlled (Crosby et al. 2015). An important aspect is that "smart contracts are math-based contracts, as opposed to law-based contracts" (Franco 2015, p. 9). These contracts contain the logic to effectuate or execute them under specified conditions, without the need to invoke human interpretation and intervention. Obviously, such approach virtually eliminates the improper use of resources.

Various financial institutions have adopted the blockchain technology for their own private utilization under the name 'distributed ledger technology.' Understandably, the public blockchain networks pose various threats to the traditional institutions since a remarkable aspect of these peer-to-peer transactional networks is that they operate without any central control: "no central authority controls it, everybody knows what's happening, and it remembers forever" (Tapscott and Tapscott 2016, p. 20). Moreover, the traditional institutions are often distrusted, whereas for the network, "trust is intrinsic, not extrinsic" (op. cit., p. 30). So, "rather than trusting big companies and governments to verify people's identities and vouch for their reputations, we can trust the network. *For the first time ever, we have a platform that ensures trust in transactions and much recorded information, no matter how the other party acts*" (op. cit., p. 33). Not only are traditional institutions distrusted, but much of the offerings provided through the Internet are also distrusted because of the misuse of personal data or other malicious conduct. A recent report considers the blockchain technology as a means to restore trust and 'save the future of the Internet of things': it is a "technology breakthrough that has fundamentally changed our notions of centralized authority, the blockchain is a universal digital ledger that functions at the heart of decentralized financial systems such as Bitcoin, and increasingly, many other decentralized systems" (IBM 2015, p. 10). Understandably therefore, the blockchain developments are likely to be disruptive for various businesses, such as finance, legal, insurance, health, notary, or auditing businesses. But also other sectors might be affected. Imagine a peer-to-peer network for energy production and distribution whereby the blockchain technology regulates the transactions between producers and consumers and smart contracts control the mutual gain. This is one example whereby "the blockchain enables us to identify smart devices with relevant core information and program them to act under defined circumstances" (Tapscott and Tapscott 2016, p. 152).

In the case of platform-enterprises discussed above, the traditional notions about enterprises and organizing were questioned, but the blockchain developments question these notions even deeper in the sense that one might wonder whether in this case an enterprise exists in the common understanding of the notion of 'enterprise.' This question is all the more relevant since the blockchain technology can even be disruptive for platform-enterprises since this technology eliminates the need for a platform-enterprise and enables transactional exchange between consumers and producers directly. Some speak of "distributed autonomous enterprises where intelligent software takes over the management and organization of resources and capabilities, perhaps displacing corporations" (op. cit., p. 22). It is stated that "as opposed to traditional organizations, where humans make all the decisions, in the ultimate distributed organization much of the day-to-day decision making can be programmed into clever code" (op. cit., p. 126). A future is portrayed where devices "Are empowered to autonomously execute digital contracts such as agreements, payments and barters with peer devices by searching for their own software updates, verifying trustworthiness with peers, and paying for and exchanging resources and services. This allows them to function as self-maintaining, self-servicing devices. The power to autonomously trade with other devices opens up whole new business model opportunities: each device in the network can function as a self-contained business, sharing capabilities and resources such as compute cycles, bandwidth and power at very low transaction costs with other devices. Besides the creation of new businesses that tap the unused capacity of billions of devices, the blockchain also facilitates new markets for service and consumables associated with those devices" (IBM 2015, p. 12).

For some, this is the future: employees, business partners, and suppliers are working under smart contracts: 'managed' by algorithms and performance metrics embedded in the blockchain technology. All these developments might be interpreted as the dawn of a new era of enterprise mechanization. "Welcome to tomorrow's distributed enterprises (DAE), powered by blockchain technology and cryptocurrencies, where autonomous agents can self-aggregate into radically new models of the enterprise" (Tapscott and Tapscott 2016, p. 127). As a prominent business magazine observes, "the technology could turn a company into a seamless network of coordinated freelancers" (Coy and Kharif 2016, p. 1). Whether these developments are to be welcomed might be debated. Indeed, "a no-excuses, stiff-consequences contract that's permanently embedded in software is appealing to some people and appalling to others" (op. cit., p. 2).

New Ways of Business Conduct

Globalization, deregulation, and the removal of trade barriers have changed the character of doing business dramatically. Successful entrepreneurs can come from anywhere in the world and compete globally. Open markets and increased competition on a worldwide scale (in principle) have increased business dynamics significantly. Technological developments play a dominant role in business domain changes. Information technology is an evident example. Informatization, discussed above, as well as the Internet have changed the business domain considerably within a few decades (Wooldridge 2011). Telecommunications capabilities are turning virtually every market into an electronic market where information is exchanged instantaneously and whereby transactions are initiated and completed with a minimum of human intervention. Due to the blockchain technology and the digital ledger, these transactions have become reliable and trustworthy, whereby smart contracts enable the precise execution of intentions. Integration of technologies can be witnessed, enabling content, storage, networks, business applications, and consumer devices to operate in an integrated manner. Media convergence, such as between consumer electronics, television, publishing, (mobile) telecommunications, and computers, will create novel forms of value. New types of business conduct and ways of organizing have been introduced under the ‘e-label,’ such as ‘e-business’ or ‘e-government.’ Networks of interacting and collaborating customers, employees, business partners, and suppliers—with new communication, interaction, and distribution channels—are manifestations of this new enterprise context. The ‘business ecosystem’ label has been coined to identify “an economic community supported by a foundation of interacting organizations and individuals—the organisms of the business world” (Moore 1996, p. 26). Examples abound: ordering and purchasing through ‘the web’ have revolutionized business fundamentally and have shifted activities that were traditionally handled by enterprises to private persons, ranging from home-printing of tickets, organizing transportation, to arranging ‘bed and breakfast.’ Platform-enterprises have taken these developments to the next level: arranging transactions between consumers and producers without owning the means of production.

Diffusion of Traditional Boundaries

In this new enterprise context, the traditional intermediaries such as brokers and dealers can be easily disintermediated by direct contact between consumers and producers, as the platform-enterprises exemplify. But new intermediators are created, such as websites for comparing products or services. Also the distinction between customer and producer or between product and service becomes less prominent. Through interactive dialog with the producer, a customer can determine the type of product and service. Other than mass production for anonymous customers, the product or service is delivered for a specific customer. As such, the logic of production is reversed: the customer does not come into play at the end of the production process but determines the execution of the production process right from the start (Negroponte 1995). Hence, as depicted earlier in Fig. 1.5, the situation typical of the industrial revolution is reversed: mass production, based on mass demand, will shift increasingly towards individual production based on individual demand. Rightly, “the information revolution is blowing established business models to pieces” (Wooldridge 2011, p. 172). In a similar vein, the distinction between physical products and services vanishes. Technology enables complementing physical products with associated services. Well-known are various services that are offered in conjunction with using a car. The enterprise might thereby shift its focus from producing cars towards delivering mobility services.

Technological developments will lead increasingly to the diffusion of business boundaries. A freight carrier might, for example, grow into a producer of logistic services who controls the total end-to-end chain. Within any business domain, the use of loyalty cards for customers can lead to offering financial services associated with the loyalty card. Diffusion of business boundaries is fuelled further since information technology, as mentioned previously, makes it relatively easy to add complementary services to the primary product. So the sales of airline tickets can be combined (possibly through business partnerships) with services pertinent to finance, insurance, car rental, or hotel reservations. One might even consider home security or animal care while owners are absent. As Moore observes: “a business ecosystem does not respect traditional industry boundaries” (1996, p. 28). Finally, the Internet and multiple (mobile) access media have obliterated geographic and time limits. Businesses operate globally and continuously. Access—independent of time and place—is gained through various media and functionalities. Customers expect good quality products and service, and bad experiences are easily shared through social media and almost instantly globally known.

Increased Dynamics and Extendedness

The foregoing sketch shows significantly increased business dynamics. Additional developments increase dynamics further: globalization, deregulation, and the removal of trade barriers have stimulated enterprises to develop new products and services. The number of new products has tripled since 1980 (Cox and Alm 1996). The shorter lifecycle of products and services can also be mentioned. Renewal thus occurs more frequently. For example, at the end of the 1970s the life-cycle of electronic consumer products lay between 3 and 6 years. Ten years later this had already been reduced to 1 year (Haaf et al. 2002). More variations of the same product also reached the market. Roughly over the same period, it was not only the product life-cycle which reduced significantly, but the number of electronic product variations increased tenfold (op. cit.). Enormous product variations of essentially the same product resulted from more enterprises offering similar types of product but also arose from enterprises offering more product variations. Such enormous variation can be noticed in virtually all areas: from electronic equipment and cars to toothpaste (Cox and Alm 1996). Not surprisingly, research among 500 top executives showed that they identified the dynamics in their business domain as high to very high (Prahalad and Krishnan 2002). The speed of change also seems to increase. Longer periods of stability are becoming an illusion. As Zuboff and Maxmin state, “flexibility and agility have replaced long-term planning” (2003, p. 119).

Next to increased dynamics, the increased 'extendedness' is also a typical characteristic of the modern business context. Globalization, the networks of business partners and suppliers, and the offering of complementary services (with the associated diffusion of business boundaries), all these aspects point to a significantly increased extendedness of end-to-end customer and operational processes. Evidently, this 'whole' must operate in a unified and integrated manner since local disturbances are not contained locally but affect the whole chain and network.

The somewhat intuitively used term 'globalization' might be interpreted as one of the vague buzz words of modern management used to defend drastic measures in view of 'global competition.' Some products and services indeed compete on a global scale, but if the term 'globalization' is to mean the gradual progression towards global products and services produced in identical ways by globally operating enterprises irrespective of local differences, then such globalization rarely took take place (Wooldridge 2011). Actual practices of multinational enterprises show that they generally are forced to acknowledge local market conditions, culture, workforce characteristics, customer preferences, and governmental regulations (op. cit.). But globalization does mean that the developments mentioned earlier enable enterprises to operate globally. Given the necessity to recognize local or regional conditions, the key challenge is to exploit global presence while simultaneously acting locally. Hence, the key challenge is integrating the global and local enterprise aspects.

Transcending Economics: Purpose and Social Responsibility

For some, the goal of conducting a business is 'to make money.' Enterprises are thus only considered in economic terms. In fact, an influential viewpoint summarized in Sect. 2.4.1 holds that the reason an enterprise exists at all is that it can carry out activities at less costs than 'the market' can. Outsourcing activities is thus warranted when this condition is no longer satisfied. Also the very existence of an enterprise is thus defined in purely economic terms, a viewpoint we have outlined and criticized when discussing the ideological foundation for enterprise governance and enterprise engineering (Hoogervorst 2018). Writings about corporate governance manifest these economic opinions in all their negative ramifications, as our brief resume in Sect. 1.4.2 will show. Two developments can be mentioned that aim to counteract the mere economic focus of enterprises and are identified under the labels (1) the purpose economy and (2) corporate social responsibility.

The label 'purpose economy' denotes a perspective about enterprise conduct whereby products and services are provided that positively impact individuals and society by serving real needs. Hence, "the purpose economy is about more than just profits; it's about creating meaningful impact in the service of people and the planet" (Hurst 2014, p. 205). The notion of 'people' refers to customers, employees, and stakeholders affected by enterprise conduct. Purpose thus translates to "personal purpose, social purpose, and societal purpose" (op. cit., p. 23). Our resume about the ideological foundation outlines that the notion of 'purpose' is strongly associated with meaningful work, employee-centric organizing, and management as leadership.

Closely related to the previous perspective is the perspective of ‘corporate social responsibility’ (CSR). The term ‘responsibility’ refers to a moral obligation or duty and being accountable for actions undertaken. Commonly, the label ‘corporate social responsibility’ intends to mean an attitude about business conduct and can be defined as “a commitment to improve community well-being through discretionary business practices and contributions of corporate resources” (Kotler and Lee 2005, p. 3). The term ‘community well-being’ includes human aspects (employees, customers, stakeholders), as well as societal issues. Further, the ‘discretionary business practices’ identify voluntary actions, not ones enforced by law or other means. Comparably, the European Commission defines CSR as follows: “CSR is a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with stakeholders on a voluntary basis” (EC 2002, p. 5).

CSR—also expressed by the labels ‘people, profit, planet’ or ‘inclusive economy’—aims to balance economic considerations with social and societal considerations. A wide range of topics can be classified under the CSR label. Typical topics are sustainability, reusability of material, reusing waste, energy conservation, pollution reduction, honesty in business conduct, socially responsible investing, adequate working conditions, etc.

Various reasons are mentioned for adopting CSR, either based on genuine interests in improving personal, social, or societal conditions or based on defensive reasons, such as concerning the enterprise reputation or to divert attention away from less favorable business practices (D’Amato et al. 2009). In case of genuine interests, it is important to understand that CSR must not be an ‘add-on’ to the common business practices but must be an integral part of how enterprises are arranged and operate (EC 2002). Hence, CSR must be one of the concerns in enterprise-wide design.

Juridicalization

As stated above, the purpose of an enterprise is often considered only in economic terms. Such perspective on conducting business and the existence of enterprises is associated with a focus on legal contracts that specify the relationships between relevant parties in view of economic terms. Relationships within the enterprises are thereby also of a contractual nature, specifically concerning the employer-employee relationship. Employee contracts must be such that they make employee behavior consistent with their assumed economic self-interest and thereby reduce the cost of employee performance monitoring and evaluation (Rosen 1991). Overall, the enterprise must be “properly viewed as a ‘nexus’ of contracts” (Demsetz 1991, p. 169). Contracts are considered the vehicle to provide certainty about required behavior and the availability of resources. We have seriously questioned this assumption and argued that it is precisely the contractual perspective that supports a mechanistic and deterministic mindset that blocks and ignores valuable insights about the inability to ‘specify’ the future contractually (cf. Chap. 4*). This inability fuels disagreements and disputes that must be settled. Hence, a focus on contracts is the manifestation of juridicalization and is inevitably associated with legal action. The language of contracts is thus associated with conflicts and litigation and is essentially based on distrust (Pfeffer 1994). Building trust, loyalty, motivation, and dedication in view of a socially and morally justifiable purpose are alien ideas, as is the conviction about loyal, motivated, and dedicated employees as a source of competitive advantage (op. cit.). Increased juridicalization of business conduct is thus a lamentable trend. Not competence, trust, joint effort, and common purpose but formal contracts define activities. Juridicalization took momentum during the 1980s when the theme of corporate governance became popular.

Arguably, juridicalization of (business) relationships is inversely related to trust and feelings of confidence and will ultimately corrupt and destroy the spirit of genuine cooperation. Minimalistic behavior, as a self-fulfilling prophecy, is often evoked, merely asserting to satisfy contractual requirements. Obviously, such behavior fuels the drive towards more juridicalization. But, as mentioned above, most times contractual requirements can never be complete and comprehensive. Grounds for increased litigation are thus built-in. In the chapter about the ideological foundation, we have discussed that increased juridicalization is not conducive to business and societal prosperity (cf. Chap. 4*). Trust is the vital fabric of healthy business and society (Fukuyama 1996).

1.2.5 Organizing

New Collaborative Relationships

As indicated before, enterprises are social entities with human actors engaging in purposeful activities. Certain action relationships, expressed by coordination and cooperation, exist between human actors that manifest organizing. As can be readily understood, the developments outlined previously have a major impact on the nature of activities within and between enterprises, as well as between enterprises and their customers, business partners, suppliers, and stakeholders. The impact is enormous because the action relationships between human actors are increasingly (also) *informational* ones. As we have mentioned, work becomes ‘informated’ (Zuboff 1989). More and more, work becomes ‘knowledge work,’ whereby an essential aspect of organizing is “to make knowledge productive” (Drucker 1993, p. 49). Changes are fundamental and enable coordination and cooperation independent of time and place, not only between actors within an enterprise but likewise between actors of different enterprises. Networks of collaborating enterprises (‘extended enterprise’) have emerged, such as the airline networks. Enterprise service centers (like call centers) can operate from another part of the world than the location of the enterprise itself or the recipients of the service. Comparable observations can be made pertinent to the coordination and cooperation between enterprises and customers, or between customers mutually, such as within consumer and user groups. Thus, technological networks with all their informational capabilities make networks of relationships possible on an almost unimaginable scale. It is precisely these networks of relationships which enable fast and seamless interaction and stimulate collaboration and creativity (Moss Kanter 2001). The enormous scale of coordination and cooperation enabled by IT has led to new research disciplines, such as 'computer-supported cooperative working,' that develop possibilities of IT in this area further (Bannon 1998). It is this impact on coordinative, cooperative, and collaborative relationships that gives IT its revolutionary character.

New Ways of Organizing

Understandably, new ways of business conduct are likely to impact the different facets of organizing: new ways of working. Hence, these new ways of business conduct also imply that a new enterprise design must be established. E-business services and customization of products and services are a case in point. Offering (customizable) products and services to customers through a web portal requires that the internal (back-office) processes have been adjusted (redesigned) such that integrated process execution is safeguarded. Further, collaboration with business partners and suppliers likewise requires extensive processual and informational integration, which entail significant implications for the different facets of organizing. Various computer-supported information systems will aid the processual and informational integration. Numerous collaborative and distributed tasks must be integrated, whereby coordination, distributed decision-making, and knowledge sharing are facilitated (Bannon 1998).

Cooperative work patterns with local autonomy, supported by information systems, can help considerably in avoiding rigidity and inertia associated with traditional, formal, and hierarchical structures. Centralized data and knowledge can be used within decentralized authorities and responsibilities. Centralization and decentralization are thus not necessarily mutually exclusive: local operational units have the freedom to act within the boundaries of centrally defined directions, norms, and values. New ways of organizing are likely to reduce the importance of the traditional organizational structures: hierarchies and conventional central management become less relevant for networks of teams and individuals connected virtually and directed towards the cooperative execution of an end-to-end process. These new ways of organizing require a fundamentally different view on employment (Hoogervorst et al. 2002). Such view critically depends on ideas and beliefs about what an enterprise is. We have discussed these issues in the chapter about ideological viewpoints on organizing and argued the necessity to adopt the employee-centric theory of organization, as will be summarized in the next chapter.

The Danger of Losing Social Cohesion and Organizational Competences

Our previous reflections show that, enabled by the revolutionary developments of information technology, the nature of work has dramatically changed. Whereas physical collaboration to accomplish an organizational task necessitated also joint physical presence of the people collaborating, an increasing volume of work that requires only informational collaboration also increasingly eliminates the need for physical presence. Such type of collaboration enables synchronous and asynchronous tasks to be conducted from various locations. One might observe that the (partial) shift from physical organizations to virtual organizations also initiated a shift from large scale organizational employment towards individualized, flexible employment relationships between individuals and an enterprise. Arguably, the virtualization of work leads to a fundamentally different relationship between employees and their employer. Closely related to the previous point is the fact that globalization has enabled enterprises to obtain, through outside market transactions, products and services that were originally produced internally or would have been produced internally. Under the assumption of economic advantage, enterprises outsourced erstwhile internal activities to outside parties or do not consider these activities as internal activities in the first place. Such outside parties might be other enterprises but also individuals having flexible contracts with enterprises but not formally employed by them. Both these trends, the virtualization and (out)sourcing of organizational tasks have serious consequences. Two of these consequences are sketched.

Section 1.1.1 identified an enterprise as a social entity. Characteristic for such entity is that members, in our case enterprise members, socially interact through communication. As we have thoroughly discussed and briefly summarize in the next chapter, such intersubjective social interaction is the basis for social order, consensus, cohesion, and solidarity. Social order is based on intersubjective consensus among human beings about their social reality, which result from rational communication. Within enterprises, social order, consensus, cohesion, and solidarity is created by cooperating human beings. This forms the basis for team spirit and creates a sense of belonging, which might be considered the essence of the social nature of human beings. When human beings cooperate only virtually, social cohesion is lost and it becomes difficult to create such sense of belonging (Wooldridge 2011). Hence, it becomes difficult to create employee loyalty and commitment. Further, through social interaction, social reality is defined. Put differently, through social interaction, the shared meaning of the organizational world is socially defined. However, the virtualization of enterprises has dramatically changed the nature of social interaction. As our summary of organization theories in Sect. 2.3.14 clarifies, this change implies the disappearance of the ability to create the shared 'intersubjective objectivity' because face-to-face communication is lost due to information technology utilization, since employees 'behind screens' are not likely to develop intersubjective objectivity through shared sensemaking.

Comparable with the previous trend is the trend to use external parties for carrying out certain organizational tasks. This trend entails the danger of losing essential organizational competences. In the next section, we will formally introduce an organizational competence as a capacity formed by the unified and integrated whole of skills, knowledge, culture, and means for adequately performing an organizational activity. Various competences can be identified, such as the competence to carry out aircraft maintenance, grow tomatoes, perform railway transportation, or conduct a financial administration. By using external sources for carrying out organizational tasks, an internal competence is not created or an existing one is lost. An internal competence and commitment to a common purpose is replaced by a collection of contracts. This connects nicely with the increased juridicalization of business conduct mentioned before. Rather than relationships based on the focus on a common purpose, the contractual relationships tend to induce a focus on the contractual specifics only. All too often, such focus leads to goal replacement whereby contractual goals are pursued at the expense of the overall purpose.

An important part of the unified and integrated nature of an organizational competence is the social cohesion of the employees who have the knowledge and skills. The loss of social cohesion mentioned above thus additionally contributes to the loss of a competence. Serious forms of inadequate enterprise performance are associated with the loss of essential competences. An example is an airline that contracted all major functions through outside supply and could not create or maintain the necessary competence to run an airline, in the end leading to dramatic consequences (Phillips and McKenna 1996).

1.2.6 The Need for Understanding and Designing Enterprises Summarized

Thoroughly understanding and adequately designing enterprises was argued based on the previously sketched technology, information, business, and organizational developments. The sketch can be summarized as:

- Revolutionary technology developments create enormous business and organizational dynamics that necessitate (1) new ways of business conduct in a 'business ecology' over a far greater extendedness and (2) new ways of organizing with collaborative relationships characterized by increased informatization. These new ways of organizing critically depend on enterprise design.
- Increased extendedness of business conduct with multiple actors, such as customers, employees, business partners, suppliers, and government agencies—all with multiple access channels and interfaces. Together with the increased informatization associated with these actors and their collaborative processes, massive interdependencies are created and thereby also the daunting task to seamlessly integrate all these aspects for ensuring adequate enterprise performance.
- Diffusion of boundaries between (1) products and services and between (2) organizational events created by social actors and events created by technology-based intelligence (Internet of things, smart devices, ambient intelligence, autonomous transactions, smart contracts, etc.). This diffusion necessitates effective integration of product and service delivery, as well as integration of the multifaceted technology functionalities into business, organizational, and informational processes. Such integration is conditional for making information productive and is the key to adequate enterprise performance.
- In a disruptive way, information technology-based platforms facilitate large-scale transactions between individual consumers and individual producers. The Internet as the open platform for information exchange is transformed into an open platform for value exchange, whereby the trust-based nature of the blockchain technology complements the 'Internet of things' (smart devices) with the 'Ledger

of things' (trusted transactions, smart contracts, etc.). Distributed autonomous enterprises are envisioned whereby intelligent software arranges all or a considerable part of organizing. Based on the digital ledger technology, all kinds of operational decisions are expected to be taken by autonomous (software-based) agents. Avoiding the possible new dawn of enterprise mechanization necessitates specific forms of enterprise design based on ideological convictions.

In view of the enterprise purpose and mission, the developments briefly summarized above need to be addressed effectively for successful enterprise performance and enterprise continuation over time. In addition to the previous points, we observe the following developments:

- Legislation is passed that requires transparency, coherence, and consistency concerning (financial) data, such that responsibilities concerning the enterprise's financial state of affairs can be effectuated (compliance). These requirements are based on corporate governance considerations which are summarized in Sect. 1.4.2. All these aspects must be an integral part of enterprise-wide design.
- Virtualization of activities and the use of outside parties to carry out certain organizational tasks might threaten enterprise social cohesion and the build-up of essential organizational competences. Fully understanding enterprises is conditional for designing enterprises such that loss of essential organizational competences is avoided.
- Under the labels 'purpose economy' and 'corporate social responsibility,' enterprise conduct is promoted that—in their genuine form—aims to counteract the detrimental effects of economism and aims to realize positive personal, social, and societal impact. These goals can only be successfully pursued if they are operationalized as an integral part of enterprise design.

For successfully addressing the topics briefly summarized above, successful enterprise change is an evident necessity. As stressed before, such change does not occur spontaneously but needs to be intentionally created, that is, needs to be intentionally *designed*. Clearly, successful design can only be accomplished if that what is to be designed is fully understood. Quackery is not beneficial, also not for enterprises. Practicing the foundational insights is thus vital for enterprise operational and strategic success.

1.2.7 Paradigm Shifts

In his analysis about scientific progress, Thomas Kuhn introduced the notion of 'paradigm shift' (1962). A paradigm is viewed as a conceptual model: a way of observing, investigating, and explaining phenomena. The inability to address phenomena adequately within an existing paradigm might lead eventually to a paradigm shift: the adoption of a new model of thinking with essentially different concepts that are able to address the subject of investigation better. In case of enterprises, this

Table 1.1 Important paradigm shifts faced by enterprises

	Traditional		Modern
Customers	Anonymous	→	Individually known
	Mass marketing	→	One-to-one marketing
	Product focus	→	Relationship focus
	End of production	→	Begin of production
	Not involved in production	→	Involved in production
	Little power	→	Increased power
Competitors	Same domain	→	Different domains
Business relationships	Transaction-based	→	Relationship-based, support
Business	Singular	→	Ecology, network
	Internal integration	→	End-to-end integration
Partners	Same domain	→	Different domains
Business boundaries	Clear and fixed	→	Diffuse and dynamic
Enterprise boundaries	Fixed, local	→	Dynamic, extended
Products and services	Mass, standard	→	Individual, customized
	Distinct	→	Integrated
Work	Place-, time-depended	→	Anywhere, anytime
	Automated	→	Informated
Assets	Financial, physical	→	Intellectual
Market	Mass, static, regulated	→	Individual, dynamic, open
Way of organizing	Rigid	→	Adaptive
	Modest integration	→	Massive integration
Enterprise context	Stable, orderly	→	Dynamic, uncertain
Enterprise development	Planned	→	Emerging
Employees	Costs	→	Asset
	Labor	→	Knowledge
	Management dependent	→	Empowered
Employee employment	Transaction focus	→	Commitment focus
Management	Control	→	Support

means a "radical reconceptualization about the nature of business and the nature of the organization" (Laudon and Laudon 1998, p. 393). Others speak of "creative destruction," seen as "the process of adopting new ideas and abandoning the corresponding older ones" (Nolan and Croson 1995, p. 17). The developments briefly sketched above necessitate various paradigm shifts in the way enterprises must be conceptualized. Important paradigm shifts are shown in Table 1.1.

The paradigm shifts present characteristics of, in our terms, 'traditional' and 'modern' perspectives on enterprises and organizing. The nature and full magnitude of the paradigm shifts will become fully clear through summarizing the foundational insights in the next chapter. This summary will reveal whether current mainstream organization theories and practices indeed reflect the modern perspectives on enterprises. With respect to the last three paradigm shifts mentioned in Table 1.1, we admit that they involve ideological convictions not shared by all enterprises.

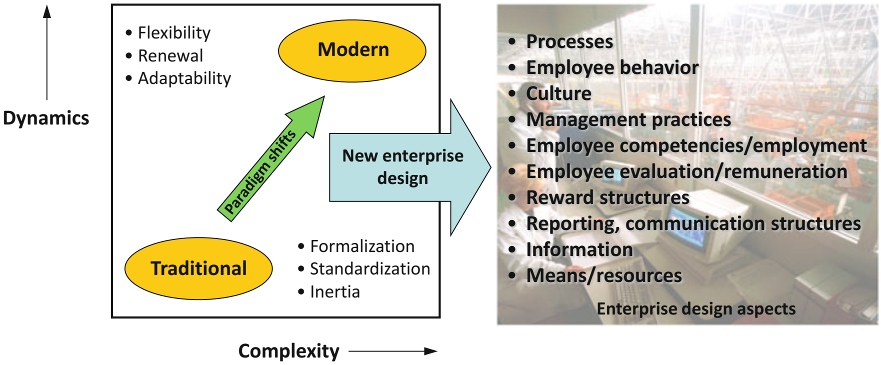


Fig. 1.6 Paradigm shifts and the necessary shift to new ways of organizing

We have defended these convictions when presenting the ideological foundation for enterprise development (Hoogervorst 2018). The next chapter will summarize these convictions.

Based on the sketch of the developments in the areas of technology, business, information, and organization, considerable changes have been portrayed with respect to the relationships of the enterprise with its environment, as well as concerning the internal ways of organizing. It seems safe to say that the modern internal and external enterprise context manifest increasing dynamics and complexity. New organizational forms are thus associated with the paradigm shifts mentioned. As indicated and will be further discussed below, these new ways of organizing will not develop spontaneously but must be intentionally created. Put differently, the new ways of organizing must be intentionally *designed*. A fundamentally new enterprise design, involving many areas, is thus associated with the paradigm shifts. Figure 1.6 symbolically indicates this shift and identifies a few enterprise aspects that must be addressed through enterprise design. Chapter 4 will present the theories, methodology, and methods for enterprise design, further illustrated in Chap. 5.

1.3 Two Core Enterprise Competences

1.3.1 The Notion of Enterprise Competence

A competence can generally be seen as the capability or the ability to adequately perform an activity, such as the competence to play a musical instrument or to drive a car. In case of enterprises, Prahalad and Hamel consider an organizational competence as a unified and integrated whole of knowledge, skills, and technology (1990). Technology comes in various forms, ranging from information systems, machines, and equipment to utilities and infrastructure. Since next to technology also various rules and regulations will play an important role for carrying out activities, such as concerning safety or treating customers, we substitute ‘technology’ for ‘means’ in conceptualizing an enterprise competence. Moreover, as we have shown, the norms, values, and convictions in an enterprise—collectively identified as the enterprise culture—have a significant influence on enterprise performance and hence affect the competence to perform enterprise activities (Hoogervorst 2018). Key aspects of culture are summarized in Sect. 2.3.4. So, we define an enterprise competence as:

- *Enterprise competence* The organizing capability formed by the unified and integrated whole of skills, knowledge, culture, and means for adequately performing an enterprise activity.

Key words in the previous definition are ‘unified’ and ‘integrated,’ which were introduced in Sect. 1.1.1. Unity and integration point to a coherent and consistent level of organizing, whereby all facets of organizing discussed in Sect. 1.1.1 play a role. An enterprise competence thus rests on adequate enterprise design. Recall that organizing involves coordination and cooperation but also production activities, such as serving a customer, preparing a report, taking a decision, or assembling a device.

As mentioned enterprises aim to fulfill or address certain (perceived) wants and needs of societal members or society at large by delivering products and/or services. Numerous enterprise activities have to be executed for adequately delivering products and services as well as for defining the nature of these activities in the future. All these activities can be categorized into two fundamental types which refer to two fundamental enterprise competences: the operational and governance competence.

1.3.2 Operational Competence

The activities that, at a certain moment in time, directly or indirectly concern, or are associated with, the delivery of products and services are identified as *operational* activities (‘*running* the mill’). More generally stated, operational activities have to do with maintaining the current relationships of the enterprise with its environment and the internal primary and support activities for doing that. Delivering products and services to customers is evidently a main part of these relationships, but maintaining operational relationships with business partners, suppliers, and various operational stakeholders are also part of the operational activities because these relationships become a reality in actual operation. With reference to the definition of an enterprise competence given above, the operational competence is defined as:

- *Operational competence* Enterprise competence for adequately maintaining operational relationships with stakeholders, specifically with customers in view of the adequate delivery of products and services.

1.3.3 Governance Competence

It is highly likely that the nature of operational activities will change over time for external or internal strategic reasons, for example, driven by the developments sketched in the previous section. Also changing customer behavior, new products and service offerings, or market and regulatory developments will affect operational activities. Hence, enterprise are forced to adapt, that is, change the current operational ways of working. Stated otherwise, enterprises need to change the ways of organizing. Changing the nature of operational activities involves the second category of activities, which we will identify as *governance* activities (‘*changing* the mill’). Governance activities thus concern changing the current nature of operational activities (ways of organizing) into the future nature of operational activities (the future ways of organizing). So, we define:

- *Governance competence* Enterprise competence for adequately inciting and accomplishing enterprise change.

Chapter 3 will further elaborate on enterprise governance and the nature of enterprise change.

1.3.4 Competence Process and Outcome

Both core enterprise competences have two characterizing aspects: (1) the result or outcome and (2) the process that produces the outcome. We will identify the processual aspect of the operational competence as *operational organizing*: the momentary operational activities for establishing the organized state and carrying out operational tasks. As said, the operational competence concerns the daily operation of delivering products and services (‘running the mill’). Products and services are thus the principal outcome of the operational competence. But, as mentioned above, the operational competence generally concerns the operational relationships with stakeholders. Adequate stakeholder relationships are thus an outcome of operational organizing and hence of the operational competence. Understandably, the operational competence must be sustained: it must be prolonged, kept going, and maintained. This is the domain of operational management (‘keep the mill running’).

As said, enterprise governance concerns enterprise change (‘changing the mill’). We identify the processual aspect of the governance competence as *governance behavior*: the manifestation of activities from the incipient and inchoate nature of an idea for change until its ultimate realization. Section 1.1.1 outlined that design is the creative hinge point between ideas or intentions and their realization. Hence, the outcome of the governance competence is twofold: a (re)design reflecting the future way of organizing and the implementation of the (re)design. Examples of the design

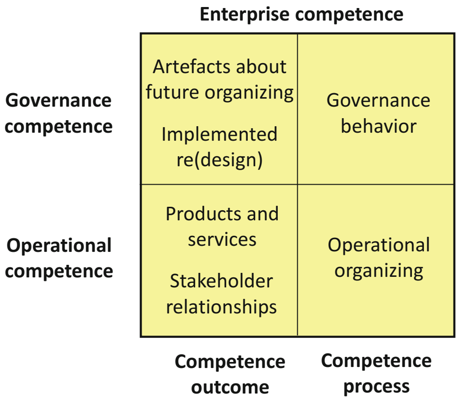


Fig. 1.7 Fundamental enterprise competences

outcome are artifacts like description about desired norms and values, employee and management behavior characteristics, process models, information object descriptions, work instructions, operational rules and regulations, production means, job profiles, reporting structures, remuneration and assessment criteria, (IT) system designs, infrastructural designs (offices, utilities, etc.), and so on. Collectively, the artifacts express the conceptual realization of the new way of organizing. Enterprise design is thus a core facet of enterprise governance. Put differently, the competence to practice the enterprise engineering design science is a core facet of the enterprise governance competence. As will become clear in Chaps. 4 and 5, through enterprise design, important aspects of enterprise governance are effectuated. Understandably, also the governance competence must be sustained since enterprise change and adaptation is a continuous process.

Contrary to the common perspective, Chap. 3 will clarify that the two core competences are highly interrelated. This will further clarify the inadequacy of the dysfunctional approach to strategy development and subsequent operationalization. Our previous reflections are summarized in Fig. 1.7. The overall enterprise competence can thus be conceived as the combination and integration of the operational competence and the governance competence.

1.3.5 Governance Versus Management

Our summary of the foundational insights in the next chapter reveals the highly management-biased perspective of many traditional organization theories. Supposedly, operational performance and successful change all depend on (executive) management involvement. Not surprisingly therefore, both competences introduced above are closely associated with enterprise (executive) management. Unlike our definition of a competence, (executive) management is considered instrumental in effectuating both competences. This view on management is the basic tenet of mainstream organization practices. Moreover, both competences are virtually

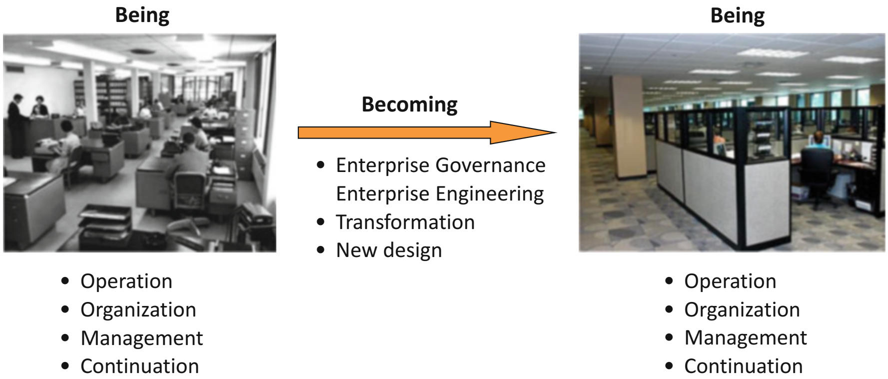


Fig. 1.8 Governance versus management

always considered separately, whereby enterprise governance is viewed as an executive management prerogative. We will submit a fundamentally different perspective in Chap. 3 by arguing that both competences are highly interrelated and that the adequacy of both competences primarily depends on employee involvement in view of the inherent nature of change.

It is important to reiterate some of our observations to emphasize once more the distinction between governance and management. The term ‘governance’ stems from the Latin word *gubernáre* (in turn borrowed from the Greek language), meaning to control or steer, in the original meaning, the steering of a ship. Governance can thus be associated with guiding and giving direction. It is important to distinguish governance from management. The latter term has its origin in the Latin word *manus* (hand). Both terms are relevant within the enterprise context. To distinguish management from governance activities, we will view the notion of ‘management’ in an operational, executing sense and use the term ‘governance’ in the context of enterprise change. Put another way, governance concerns developments that lead to a new (or partly new) enterprise. Figure 1.8 schematically illustrates the distinction.

On the left-hand side of Fig. 1.8, an administrative office is depicted, which is managed in an operational sense, focused on the continuation of the office in all its aspects. Hence, this concerns the office its ‘being.’ The office on the right-hand side carries out the same basic tasks but in a different manner using other means. Put differently, the new office expresses a different form of organizing and hence has a different *design*. Again, in the new situation there is operational organizing and management focused on office continuation. Governance has to do with the transformation of the original office into the new office. In other words, governance has to do with ‘becoming.’ Chapter 3 will further clarify how the notion of governance within an enterprise context must be conceived and operationalized. An important aspect of such operationalization concerns enterprise engineering: the theories, methodology, and methods that create the new office design. In short, enterprise governance is the competence concerning initiating and successfully realizing enterprise change. More formally, we define enterprise governance as:

- *Enterprise governance* The enterprise competence (unified and integrated whole of skills, knowledge, culture, and means) for continuously inciting enterprise adaptive and reshaping initiatives and their unified and integrated operationalization through enterprise (re)design and subsequent implementation.

1.4 The Need for Holistic, Enterprise-wide Design

1.4.1 Curing the Lingering Problem of Business and IT Alignment

Inadequacy of IT Governance

The enormous and revolutionary influence of information technology (IT) on society, enterprises, and human individuals has been briefly outlined before. In an attempt to productively utilize these revolutionary developments, the notion of IT governance emerged in the 1980s. Numerous publications about IT governance emerged. Typical in these publications is their common focus on management and structural aspects of IT governance (cf. Sect. 1.4.1*). Controlling the developments of IT is strongly associated with (executive) management responsibilities and their assumed decision-making prerogative. Decision-making centers around enterprise (IT) objectives and their implications for IT investments, their prioritization and budgets (cf. Sect. 1.4.3*). Cost reduction often appears a primary concern. Associated with this perspective is an accountability structure of performance and compliance monitoring pertinent to the direction and objectives that were agreed. The focus on decision-making also led to much debate about the proper organizational structure for optimum control of IT investments, such as a central, decentral, or hybrid structure. Within the management- and structure-oriented perspectives on IT governance, failing IT initiatives are considered the consequence of inadequate structural arrangements, management involvement, and direction.

Management and structural measures are relatively simple to take. Rather remarkable therefore is the tenacity with which the IT governance theme is addressed in the literature and at conferences. This should warn that the approach to governing IT, briefly summarized above, is apparently problematic. Not much improvement in using IT productively and innovatively appears to have been made since many IT strategic initiatives fail (cf. Sect. 1.2.4*). Therefore, the call for proper IT governance continues to be high, driven by advocates of IT governance who argue its importance by pointing to the significant challenges for successful IT deployment caused by the problematic relationship between IT investments and enterprise performance, the low success rate of IT initiatives, high IT costs, and long delivery time on IT developments. Despite the obvious questionable results, proper IT governance is still often defined in structural and managerial terms. We will criticize this mechanistic approach as rather ineffective in Sect. 3.2.10 after discussing the characteristics of enterprise change.

A fundamentally different perspective on governance is introduced in Chap. 3. Given the theme of this section and anticipating our discussions in Chap. 4, we will argue below that effectively utilizing the possibilities offered by IT is first and foremost an aspect of enterprise-wide design and not an issue that primarily concerns the structure and decision-making processes of IT governance. Moreover, the analysis will make clear that IT governance is of limited value without embodiment within enterprise governance.

Trying to Solve the Business and IT Alignment Issue

An important theme within the IT governance discourse is 'business and IT alignment.' Within this discourse, the term 'business' denotes that part of the enterprise which uses the IT services. The term 'alignment' refers to a state of perfect fit between the possibilities of IT and the enterprise context where these possibilities are to be made productive. As mentioned, the perspectives on IT governance summarized previously fail in bringing about business and IT alignment since the problem of misalignment lingers on, as is the discourse about IT governance.

In trying to solve the business and IT alignment issue, many proponents of IT governance emphasize that the performance of IT (or specifically IT systems) must be judged by how well IT adds 'value' to the enterprise. It is about ensuring optimum return—defined mostly in financial terms—on the portfolio of IT investments and ensuring that IT investments 'perform' according to the strategic (IT) plan, thus judging IT performance by enterprise (financial) performance. Evaluating IT performance in terms of enterprise results is curious for several reasons (cf. Sect. 1.4.2*), curious because a clear linkage between IT investments and enterprise performance is inherently problematic. Many, often diffuse, interdependencies and influencing factors determine enterprise performance and blur the linkage. Further, there is considerable evidence showing that much of the alleged IT underperformance results from inadequate use of IT. Inefficient and ineffective business processes were merely automated, which did not enhance enterprise performance and often only increased costs. Enterprise departmental silos and lack of business and IT collaboration continued the IT mess. Finally, evaluating the performance of an IT system in terms of enterprise performance criteria is fundamentally wrong. A system can only be evaluated based on criteria that are inherent to the system. For IT systems, such criteria are, for example, mean time between failures, mean time to repair, availability of specified system functions, and so on. Customer satisfaction is not an inherent IT system performance criterion since it is not germane to an IT system. Of course, the question as to how IT can enhance customer satisfaction is evidently relevant. But that question cannot be addressed within the IT domain; it can only be addressed from the (design) perspective of the enterprise as a whole. As we will show below, the fundamental reason for inadequate benefits of IT systems lies in a lack of unified and integrated enterprise and IT design.

Business and IT Alignment Models and Processes: Not Much Help

The dictionary notes that 'to align' means 'to be or to come into precise adjustment or correct relative position,' whereby the 'alignment' term denotes 'the act or state of being aligned.' Alignment can thus refer to a *process* or a *state*. The notion of IT alignment as mentioned in the literature has to do with unity between the enterprise and IT strategy such that IT supports the business strategic intentions adequately. Also the term 'harmony' between business and IT is sometimes used (Weil and Broadbent 1998). The core goal of IT governance is seen as obtaining strategic alignment of business and IT such that IT adds value to the business (IT Governance Institute 2003). Understandably, the *state* of alignment is not incidental but requires intentional activities: the *process* of bringing about alignment. We will return to these activities later.

As we have seen, the business and IT alignment problem emerged out of frustration with the results of IT deployment in enterprises. Within the perspective of alignment as 'state,' the question is, through which concepts and methods the notion of alignment can be utilized in a practical way? Put another way, how can the state of alignment be established and ascertained? Although the state of alignment may be understandable intuitively, the aforementioned questions can hardly be answered satisfactorily, unless the alignment process is the enterprise-wide design process with information supply and IT as integral aspects. This process will then yield alignment as state. In fact, we submit that alignment appears to be a concept that is difficult to operationalize outside the realm of design. Nonetheless a number of alignment models are mentioned in the literature that supposedly would lead to alignment. A number of frequently mentioned models will be discussed below in order to portray the essentials of this type of 'alignment thinking,' as well as to depict why and where our approach differs.

Strategic Alignment Model

A well-known model is the one developed by Henderson and Venkatraman which is shown in Fig. 1.9 (1993). The model distinguishes between business and IT (columns) and the external versus internal focus (rows). Four cells or areas of attention are defined that are considered important for obtaining alignment. The unity between business and IT strategy is called 'functional integration,' and that between the external and internal perspective the 'strategic integration.' For overall integration, multiple alignment perspectives concurrently play a role, as indicated by the arrows between the four areas of attention. Within these four areas, some subdomains are indicated for which mutual alignment is considered important. The multiple facets are an indication of the difficulty of operationalizing the alignment concept in a practical way, at least by means of these concepts.

Alignment Processes

Within the strategic alignment model, the *process* of alignment is understood as a certain pattern to bring into unity (alignment as *state*) the relationships between (remarkably only) three of the four areas of attention (Macdonald 1991). Four patterns are distinguished, depending on the chosen starting point. That starting point is called the 'dominant alignment perspective.' The four alignment patterns are shown in Fig. 1.10. With the first pattern, the dominant alignment perspective is

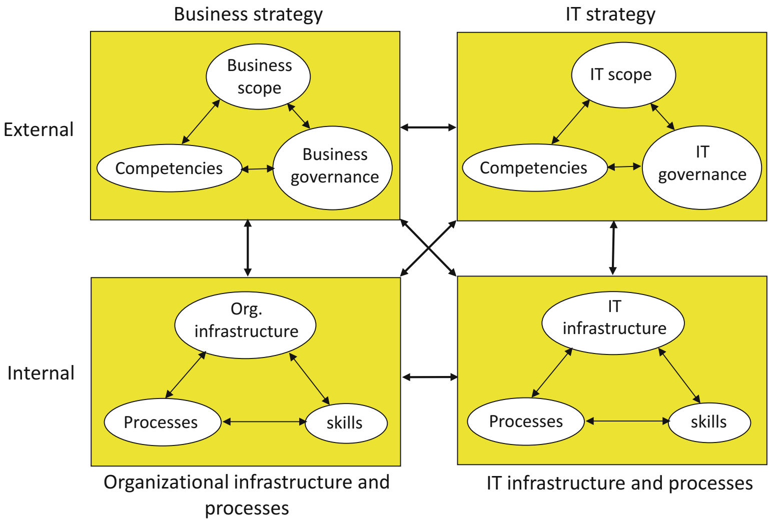


Fig. 1.9 Strategic alignment model

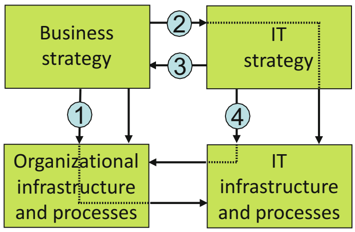


Fig. 1.10 Alignment processes

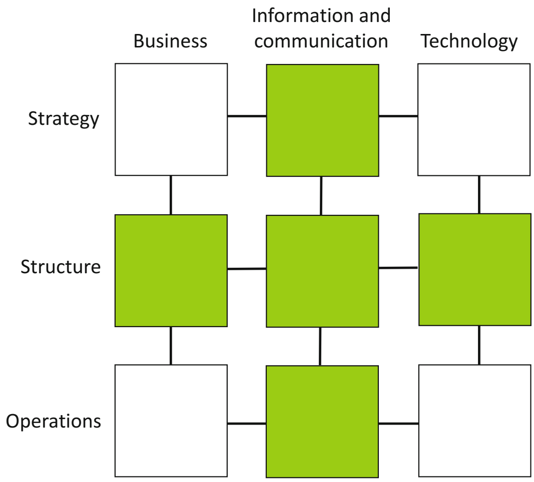
called *strategic execution*. The starting point is the business strategy which subsequently defines the organizational infrastructure and processes that must be supported by the IT infrastructure and processes. Notably, an explicit IT strategy is not addressed within this dominant alignment perspective. The organizational IT function is seen merely as a service and cost center. Possibilities and opportunities offered by IT for arranging the organizational infrastructure and processes differently are not a primary focus within this perspective. Note that the concept of organizing is limited to infrastructure and processes. The second dominant alignment perspective and associated pattern is labeled *technology potential*. Here too, the business strategy is the starting point but is used to formulate the IT strategy that subsequently defines the IT infrastructure and processes. Within this perspective, the central issue concerns how to use technology for supporting the business optimally. The *competitive potential* is the third dominant perspective. In this case, the IT strategy is the starting point, where the renewing possibilities and opportunities that IT can offer are utilized for defining an innovative and competitive business strategy. Subsequently, the business strategy defines the organizational structures and processes. Finally, the fourth dominant alignment perspective is labeled *service level*. Again, the IT strategy is the starting point, but unlike the third perspective, the focus lies with arranging the IT infrastructure and processes such that IT services can be delivered effectively and efficiently. One can also label this the IT supplier perspective since the business strategy does not play a primary role. It is emphasized that the four perspectives (and associated alignment patterns) are dominant but not necessarily exclusive (op. cit.). Given a certain dominant perspective, the other perspectives might also play a role.

The strategic alignment model contains relevant areas of attention, with recognizable dominant perspectives and associated patterns. However, the following remarks can be made. First, within the notion of alignment as a process, merely 'perspectives' are offered with no indication as to *how* alignment is accomplished, and how, given a certain dominant perspective, the aspects falling outside the dominant perspective are brought within the alignment process. Put another way, there is no attention for organizational competences, processes, and methods that bring about alignment. Second, according to the model (Fig. 1.9), governance is part of strategy, while one might argue that rather conversely, the governance competence is the source for defining strategy. Third, governance is limited to the external perspective. However as we will outline later, governance clearly has an internal aspect and must encompass the total spectrum from strategy development, the subsequent enterprise design (including IT), the definition of projects to implement design, to the implementation of projects. The model does not address these aspects. Fourth, the precise meaning of the subdomains within the cells remains unclear, while further, one might question whether the four cells and their subdomains are sufficient. Additional areas of attention can be identified that are relevant for enterprise and IT design and hence relevant for alignment. One might consider customer interaction channels, informational aspects, human resources engagement, employee behavior, the behavioral context, and so on, aspects that are all part of enterprise-wide design.

In view of our fourth comment, some publications argue for extra rows and columns. An example is the 'nine-cell model' shown in Fig. 1.11 (Maes et al. 2000). An extra row is created by dividing the internal perspective into a structural and operational perspective. In essence, the structural perspective concerns the organizational blueprint: essential (functional) units and their duty. These units perform by means of processes and skills, which are contained in the operational perspective. Further, the extra column follows from considering 'information and communication' as an area of attention between the business and IT perspective, which is the bridge between information and communication needs of the business on the one hand and IT (the technology) answering these needs on the other. The extra row and column create five additional cells. The creators of the nine-cell model pay little attention to elucidating the precise meaning and alignment activities of these additional cells (and the other cells for that matter). Nonetheless, the extra cells are considered essential in view of establishing alignment.

A variant of this model is created by dividing the 'technology' column into two columns, pertaining to information systems and technology infrastructure, respectively, thereby creating a 12-cell model (Maes et al. 2000). Yet others have added

Fig. 1.11 The nine-cell model



even more extra cells and have defined—in a comparable sense as before—alignment patterns based on dominant alignment perspectives (Avison et al. 2004).

Recalling our earlier comments, one might question the practical value of categorizing different alignment perspectives, in light of an alignment model chosen. As indicated, certain alignment patterns are associated with chosen alignment perspectives. These patterns are expected to bring about alignment, but *how* that is supposed to happen remains unclear. Put another way, there is no attention for organizational competences, processes and enterprise design theories, methodology, and methods that bring about the state of alignment. Our fundamental difficulty with these models and the alignment patterns provided is that they appear to be introduced without formal underlying theories and associated methodology and methods for establishing alignment: the theories, methodology, and methods for *designing* enterprises whereby the utilization of IT is an integral part. The models are merely graphical representations of some alignment aspects, but these models do not in and of themselves produce alignment; only enterprise design does. Anticipating our later discussion, we contend that alignment as 'state' has to do with the design of the enterprise as a whole, in which information supply and with that information systems are designed concurrently in a unified and integrated manner. Within this vision, alignment as a 'process' has to do with the realization (the process) of design and its ultimate implementation. The creators of the nine-cell model have also acknowledged the importance of design for realizing alignment, but no formal theories, methodology, and methods are presented.

Enterprise-wide Design Focus Is Essential for Alignment

For decades, the 'business and IT alignment' theme has taken a prominent place in the literature about ensuring enterprise success with IT deployment. This theme is a specific example illustrating the importance of enterprise unity and integration, in this case between 'business' and 'IT.' Despite decades of attention, alignment continues to be problematic (PWC 2006; Haes and Grembergen 2009). Unfortunately, as indicated, much of the literature about business and IT alignment advocates IT governance as the preferred means to establish alignment (IT Governance Institute 2003). We submit that the focus on IT governance is not conducive to bringing about alignment. In fact, this focus might be the very reason why this theme is still discussed. We will argue this assertion by presenting a comparable example as the one given earlier (Hoogervorst 2018).

Consider a 'provisioning system' or 'supplying system' S that delivers a certain function to a 'using system' U. For example, a generator (S) that delivers electrical energy to a car (U) under specified conditions. It is *impossible* to determine the function of the generator (S) from, or based on, the function of the car (U). Indeed, knowledge that the car is used for driving does not give any clue as to the required function of the generator. Understandably, the only source for the generator *function* is the *construction* of the car. Generally stated, the only source for the function of a supplying system S is the construction of the using system U. Indeed, it is the car's construction—its arrangement and operation—where the function of the generator is used. Hence, the functional design of the generator proceeds from the constructional perspective of the car. Figure 1.12 illustrates these considerations.

Since the function of the generator is based on insight in the construction of the car, the car/generator alignment is first and foremost an issue of the car's construction: its design. There is no need for knowledge about the internal construction of the generator; the only relevant knowledge concerns the generator's mechanical and electrical interface. And that knowledge is determined by the *construction* of the car. Speaking of governance and design, it is primarily 'car governance and design' and not 'generator governance and design' that determines car/generator alignment. This evident insight is practiced by all design disciplines, except so it seems, in case of IT systems delivering services to the enterprise 'construction.'

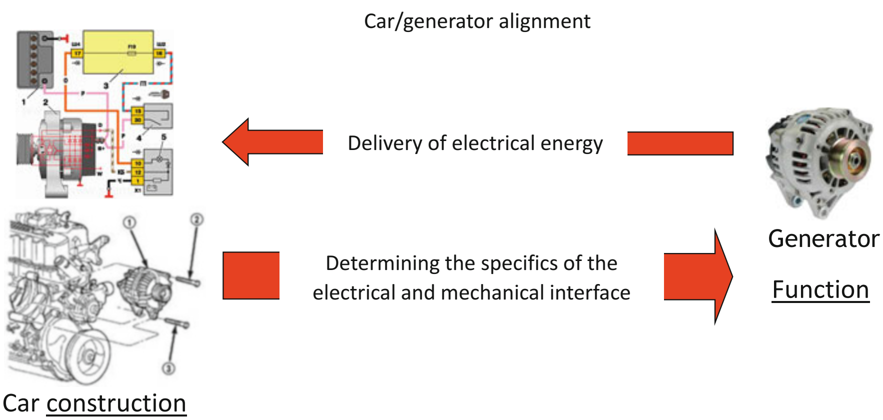


Fig. 1.12 Focus for car and generator alignment

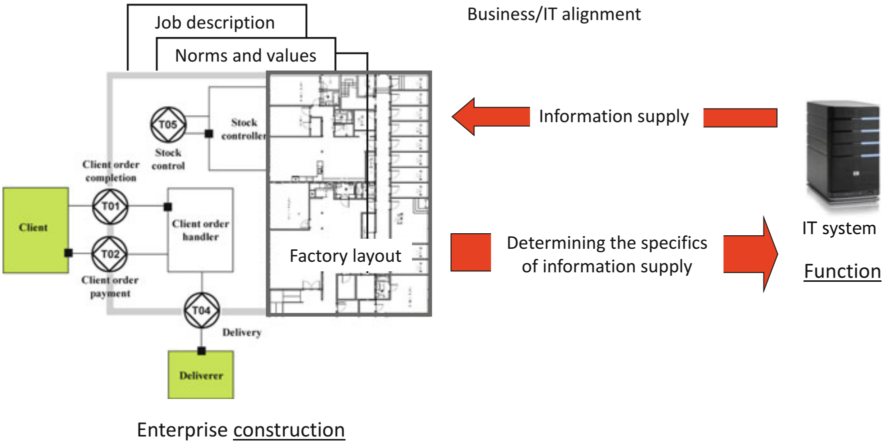


Fig. 1.13 Focus for business and IT alignment

Figure 1.13 shows the analogy whereby the car is replaced by an enterprise and the generator by an IT system. In this case, the IT system (S) delivers a certain function to the enterprise as the using system (U). Similarly as before, it is *impossible* to determine the function of an IT system based on the function of an enterprise. Knowledge about the function of a supermarket, police department, legal institution, or university gives no clue as to the required IT function. The *function* of the IT system can only be determined from the *construction* of the enterprise, as defined by the collaborative patterns, employee and management competences, operational rules, work instructions, job profiles, decision-making prerogatives, level of employee self-organizing, norms and values, compliance requirements, and so on. Likewise, functional design of the IT system proceeds from the constructional design of the enterprise. Both designs are the ultimate basis for any adequate and *subsequent* financial analysis. Further, these designs are also the very, and only, basis for business and IT alignment. Designing concerns the *process* towards alignment, and the design manifests the *state* of alignment. Within this perspective, there is no need for knowledge about how the IT system is developed. As for governance and design, business and IT alignment is thus first and foremost an aspect of enterprise governance and enterprise design. Focusing only on IT governance for realizing business and IT alignment must be considered as essentially ineffective. Moreover, the management- and structure-oriented perspectives on IT governance seem to suggest that once the framework for decision-making is defined, business and IT alignment will progress in the desired manner. How that is supposed to happen remains unclear however.

Despite the relative unimportance of IT governance, experiences show that attention is virtually only paid to IT design and IT governance. Maybe said attention is driven by sheer necessity because of an apparent lack of attention to enterprise governance and enterprise design. However, this situation will prolong the problematic issue of business and IT alignment. Insight in the nature of this issue clarifies that the often-introduced function of 'information management' will not solve the core problem of business and IT alignment because of the continued lack of focus on the design of the enterprise. Similar remarks can be made about the effectiveness of CIO functions in this respect. Ideological considerations about enterprise governance and enterprise engineering clarify the various manifestations of institutionalized ineffectiveness that frustrate business and IT alignment (Hoogervorst 2018). Some of these considerations are presented in Sect. 3.2.10. Ultimately, alignment concerns the central theme of enterprise unity and integration and hence concerns enterprise engineering whereby information supply and IT design are integral aspects. We stress that Figs. 1.12 and 1.13 merely aim to illustrate the constructional perspective with a few constructional aspects. For constructional design of both the car and enterprise, a comprehensive set of construction documents are needed to clarify how the car as a system and the enterprise as a system are to be arranged.

1.4.2 Effectively Addressing the Compliance Theme

Short History of Corporate Governance

When enterprises issue shares to acquire capital, the shareholders are considered, at least from their perspective, as owners of the enterprise. This viewpoint might be seriously contested. Nonetheless, the whole idea of shareholder 'ownership' inevitably leads to ideas about protecting the interests of shareholders, which led to the emergence of the corporate governance theme (cf. Sect. 1.5*). Already at the beginning of the former century, the core issue concerning corporate governance was identified: the problem resulting from the split between the 'owners' of an enterprise (the shareholders) and the people who manage it. According to the proponents of 'shareholder value,' management should act in the interest of shareholders. However, there is a high likelihood that the goals of owners and management are diverging and conflicting because management is directed towards their own agenda (or even their own interests) and not focused on what matters to shareholders. This problem easily develops since ownership is dispersed among many shareholders. Various financial scandals emerging around the 1980s due to questionable or even megalomaniac management behavior manifested the full magnitude of aforementioned problem.

Not surprisingly, the financial scandals led to the wake-up call to return to the basis of the corporate governance doctrine: focus on creating financial value for shareholders. However, this very focus was the prelude to new and even more serious scandals (op. cit.). An important force fuelling these new scandals can be traced back to the education given by mainstream business schools. Graduates of this type of education were instilled with the idea that the only purpose of enterprises lies in creating economic wealth for shareholders. Financial incentives for management were created in order to align their activities with the interests of shareholders. The whole approach created a dramatic 'institutional shift' in beliefs about the purpose of enterprises and in the type of executive management. The fixation on shareholders inevitably leads to a short-term financial focus of executive management in order to boost short-term economic performance. Also, here business school education has been charged to inflict serious damage because of their espoused theories (cf. Sect. 1.7.2*).

So much is meanwhile clear: the strong focus on the value of shares led a number of enterprises to present their financial figures in a highly favorable way to stimulate and secure the growth in share price. Remarkably enough, these attempts to polish up reality were partly in accordance with accounting rules but were nonetheless dubious, while some attempts were outright fraudulent. Sometimes questionable or even nonexistent income was reported. The enormously short-term-focused mindset and activities of enterprises were amplified by institutional investors who were more interested in short-term gain than in enterprise survival in the long-term. However, much of the apparently wonderful short-term performance turned out to be bogus, based on nothing. Large-scale fraud and malversation was covered up. Discovery turned out to be disastrous. Various authors argue that management remuneration based on shares or share options has caused the aforementioned shortsighted and, in many cases, also unjustified top management behavior (op. cit.).

Ironically, the financial focus (e.g., share value) was an attempt to address the first financial scandals but led to the arguably more serious subsequent financial scandals. One would expect that corporate governance in general and the pursuance of shareholder value in particular were seen as the root cause of these problems. Questions might be raised regarding the narrow focus on the value of shares and the income per share as the ultimate unit of measure for enterprise performance, without any regard for ethical and social considerations. It is argued that the narrow financial/economic focus is detrimental to enterprise performance, also in view of shareholders. Hence, we have criticized the basic tenets of the corporate governance focus (cf. Sect. 4.8.4*). Contrary to expectations one might have, the theme of corporate governance gained even more attention. Important reforms were initiated that secured such attention, among which are the reforms dictated by the American Sarbanes-Oxley legislation (cf. Sect. 1.5*). Rather remarkably, analysis showed that this legislation could not have prevented the scandals that led to drafting the legislation (op. cit.). Moreover, the suggested reforms are structural in nature and are virtually not concerned with moral issues. Hence, the renewed attention to corporate governance primarily concerns the structure of governance mechanisms and their associated management responsibilities, such that the financial benefits of shareholders are safeguarded.

The Compliance Theme

Satisfying the requirements of corporate governance is commonly identified with the term ‘compliance.’ These requirements can be distinguished in an *internal* and *external* perspective. The internal perspective concerns attention for enterprise systems and structures for control and risk management aimed at ensuring that enterprises exercise their responsibilities towards shareholders adequately and responsibly, thereby avoiding undesired financial/economic developments (avoiding risks) within enterprises. Underlying this approach is the assumption that internal control is the ultimate method to safeguard prudent financial/economic enterprise developments and avoid risks in this sense. The chapter about the ideological foundation has questioned that assumption (cf. Sects. 4.2.2* and 4.8.4*).

The manner by which internal control is effectuated is also determined by rules (such as those issued by stock exchanges) and legislation, specifically the American Sarbanes-Oxley legislation (cf. Sect. 1.5.6*). Legislation concerns topics like the structure of the executive board, the form of internal control and financial reporting, the auditing of compliance, and the type of lawful sanctions in case of serious misconduct. Accounting and its rules are likewise considered important for safeguarding prudent behavior for protecting the interests of shareholders. All these rules and legislation can be seen as *external* corporate governance aspects. In summary, corporate governance, as the basis for compliance requirements, is the totality of internal structures and systems, as well as external rules and legislation, for internal control and risk management that ensures that enterprises exercise their responsibilities towards shareholders effectively and adequately.

Compliance: Enterprise-wide Design Inevitable

As mentioned, compliance has to do with satisfying rules and legislation about corporate governance. Internal corporate governance arrangements must thus satisfy external corporate governance directives. An important aspect of compliance is the form and trustworthiness of financial reporting. Various regulating bodies have defined accounting rules or principles, such as the US Federal Accounting Standards Advisory Board that defined the set of 'Generally Accepted Accounting Principles/ Practice' (GAAP) or the International Accounting Standards Board that issued the 'International Financial Reporting Standards' (IFRS). The latter set of standards is used by many countries and is mandatory within the European Community. The two sets of standards differ in various areas, whereby from an overall perspective, the IFRS is considered principles based with little application guidance and the GAAP is considered rules based with specific application guidance. The IFRS covers a wide range of topics concerning the financial treatment of assets, acquisitions, joint ventures, mergers, inventory, loans, debtors, creditors, profit, taxes, costs, amortization, etc. Further, the IFRS indicates how the various financial statements must be interpreted and presented. Examples of IFRS principles might be (in our own wording) that (1) financial assets must be based on the 'fair' (actual) value, (2) negative goodwill must be recognized immediately in the profit and loss statement, or (3) the effect of events (e.g., transactions) must be recorded financially when they occur, not when cash is received or paid (IASB 2007). Accounting principles should evidently be applied when designing the administrative organization and the supply of financial information. Put another way, accounting principles must be *designed* formally into the respective IT systems. Further, since events that have a financial impact occur in operational processes, these processes must be linked to financial informational systems. This points to a broad perspective on enterprise design.

The broad focus on enterprise design also follows from a fundamental IFRS requirement, which holds that enterprises must adopt the 'management approach' to financial reporting, implying that enterprises must use the same underlying data for financial reporting as is used for managing the enterprise and enterprise performance. In doing so, financial (performance) reporting can be linked transparently to operational performance and reporting. The approach is also efficient: data is used that is already available from enterprise operations. Clearly, in this sense, financial reporting is not something separate but an integrated aspect of enterprise performance reporting. Again, proper financial reporting thus requires a broad perspective on enterprise design.

As we have seen, another important aspect within corporate governance is internal (financial/economic) control. A typical facet concerns the systematic gathering, recording, and processing of financial/economic data for internal control and effectuating accountability. Evidently, this requires such measures that financial data and reporting are trustworthy. Understandably, the trustworthiness of financial reporting depends on the trustworthiness of the financial data itself, which might degrade due to:

- Flawed informational or documental process design, creating diverging or incompatible data.
- Inadequate data management.
- Inadequate data or system security.
- Faults or disruptions in IT systems.
- Deliberate manipulation.

This summary of possible causes for degrading data quality also brings the design, utilization, operation, and maintenance of IT systems formally within the scope of compliance. The requirement thereby is that the utilization of IT systems and the activities within IT operations management—among them change, problem, and release management of IT systems—should not negatively affect the trustworthiness, completeness, and availability of (financial) data. This also points to the operation and design of the enterprise and IT systems within, such as processes and their informational aspects, data management, and security, for example. Various operational policies—applicable to different organizational domains—should thus be defined to safeguard the integrity of the informational system. We return to this topic in the chapter about enterprise design.

For effectuating corporate governance, the notion of internal control extends beyond merely safeguarding the trustworthiness of financial data but also tends to focus on operational integrity, such as through assessing and avoiding risks. Within this broader view on internal control, the following aspects play a role for example:

- Tasks, authorizations, and responsibilities.
- Tasks execution, policies, and rules (including those for avoiding unwarranted risks).
- Process control, execution, and improvement.
- Resources and their planning.
- Performance criteria.

This view on internal control necessitates attention for a wide range of operational, support, informational, and documental processes. As argued previously, the utilization of information technology must also be included in the perspective for arranging internal control, since operational systems, decision support systems, management information systems, knowledge systems, and office automation are all dealing with aspects relevant to internal control. Hence, we submit that properly effectuating internal financial/economic control inevitably leads to attention for the arrangement of the enterprise as a whole. Put another way, the proper arrangement of corporate governance should take place within the overall enterprise governance context.

Although compliance requirements do not consider ethical aspects, one might nonetheless argue that alongside formal arrangements for internal control, corporate governance has an, probably the most important, ethical dimension: norms and values, as well as certain desired management and employee behavior, in the interests of avoiding unjustified or fraudulent behavior. As Sect. 2.3.9 will summarize, norms, values, and behavior are determined strongly by the internal enterprise context. For example, certain behavior might be stimulated or invoked by structures and systems for employee review and reward, as well as by the associated reporting structures about unit, process, and employee performance. Desired forms of behavior should thus be enabled and supported by the enterprise behavioral context. This ethical aspect also points to a unified and integrated design of the enterprise as a whole.

Previous considerations show that the focus on compliance (financial reporting and internal control) inevitably leads to an enterprise-wide scope. Compliance is thus an integral part of enterprise-wide design. So, for example, design activities for IT systems providing secure network access and the management of the associated authentications and authorizations are relevant to enabling customers, business partners, employees, and suppliers to have secure access to the enterprise network. Evidently, this is essential in view of the primary enterprise purpose and objectives, such as pertinent to e-business, or end-to-end process integration. However, the IT systems to be designed from the primary enterprise purpose and objectives are likewise relevant from compliance considerations. This illustrates that compliance is connected implicitly to the design of the total enterprise.

Anticipating our discussion in the chapter about enterprise design, ‘compliance’ can be seen as a strategic area of concern. For this concern, design principles should thus be defined such that the concern for ‘compliance’ can be effectively addressed. Likewise, the IFRS directives for accounting should be translated into principles for design. For example, the accounting principle that ‘the effect of events (e.g., transactions) must be recorded financially when they occur, not when cash is received or paid’ can be translated into a design principle reading ‘financial operational events must update financial informational systems in real time.’ In the chapter about enterprise design, we will present design principles that are relevant from the compliance perspective.

As our discussion clarifies, satisfying compliance requirements generally follows from the design of the enterprise and the design of IT systems within, based on considerations such as process excellence, quality, efficiency, security, and so on. Put another way, enterprise design, wherein information system and IT system design are integral parts, is relevant for enterprise strategic and operational performance and at the same time also relevant in view of corporate governance (compliance) requirements. We underline thus yet again the importance of enterprise-wide design.

1.4.3 Enterprise-wide Design: The Basis for Enterprise Performance

The Creative Hinge Point Between 'What' and 'How'

Section 1.3 identified two core competences, one concerning enterprise operations ('running the mill'), the other concerning enterprise change and adaptation ('changing the mill'). Roughly speaking, operational performance regards the effective, efficient, quality-oriented, and service-oriented production and delivery of products and services. Performance regarding enterprise change is determined by the degree of realizing the intended changes, as well as by timely recognizing the need to achieve them. Changes might have a direct relationship with operational activities, such as concerning the process of continuous improvement. Change and adaptation are often of a strategic nature, that is, certain desirables are formulated that enterprise change should accomplish. Strategic desirables come in two principal categories concerning (1) the type of, and market for, products and services and (2) the ways of organizing for bringing about the products and services (cf. Sect. 4.4.4*). Most likely, the first category of strategic desirables will impact operational organizing. Based on foundational insights, enterprise design must (1) establish the relationships between the strategic desirables and the new ways of organizing and (2) effectuate the new ways of organizing through design. These observations constitute the first reason why enterprise design is the basis for enterprise performance: design effectuates the strategic desirables. It is, as stressed earlier, the creative hinge point between *what* is desired and *how* that is realized. Two other reasons are discussed next.

Addressing Common Causes of Poor Enterprise Performance

Causes of poor operational performance can be dived into two categories: (1) systemic causes that are the inevitable result or consequence of the way of organizing and (2) nonsystemic causes that are incidental and random (cf. Sect. 1.2.5*). Deming labeled these causes, respectively, as *common* and *special* causes (1986). According to Deming's analysis, 94% of the causes of poor enterprise performance are common causes. Put differently, virtually all instances of poor performance—ranging from bad service and employee cynicism to operational inefficiency, as further discussed in the next chapter—are the consequences of inadequate ways of organizing. Avoiding or rectifying common causes of poor enterprise performance thus necessitates a focus on enterprise design.

As we have stressed in Sect. 1.1.1, enterprise performance critically depends on enterprise unity and integration. Not satisfying this condition creates poor performance and is thus a major contributor to common causes.

Creating Performance Possibilities for Employees

Closely associated with the previous point is the following. Enterprise mechanization summarized in Sect. 2.4.2 entails the traditional focus on employee control, such as through performance targets and periodic assessments. We argued that this practice is fundamentally flawed since the implicit message to employees is that their performance willingness is distrusted. This practice becomes a self-fulfilling prophecy and destroys employee motivation and breeds employee cynicism (cf. Sect. 4.6.3*). A far better approach is to focus on the *performance possibilities* of employees, which are determined by the characteristics of the working environment and are aspects of enterprise-wide design.

Addressing a Core Reason for Strategic Failures

Next to operational performance, also enterprise strategic performance is an issue of great concern. Numerous studies showed that the majority of strategic initiatives fail, in the sense that the intended goals are not realized (cf. Sect. 1.2.3*). These studies cover a broad spectrum of topics, such as total quality management, business process reengineering, business process management, six sigma, e-business, customer relationship management, and mergers and acquisitions. The high failure rates are likewise manifest when applying technology in enterprises. Failing initiatives are thus also associated frequently with failing technology introductions. Much has been reported about failing introductions of information technology (IT). Rather remarkably, research into a large sample of enterprises over a lengthy period of time did not prove any positive relationship between IT investments and measurable improvements in enterprise performance. In view of these problems, the topic of 'business and IT alignment,' discussed previously, is a case in point and has been a topic of interest for decades without any noticeable improvement in 'alignment.' To appreciate the enormity of these observations, we reiterate the following. In 1996, the seminal book *Leading Change* by John Kotter was published, indicating that 70% of change initiatives failed. After studying numerous publications, Keller and Price published their investigation about strategic failures and wrote: "Fifteen years later, we can choose from more than 25,000 books on organizational change, and hundreds of courses of how to lead and manage it. In spite of this abundance of advice, all available evidence suggests that—you guessed it—still only one in three programs succeeds" (2011, p. xix).

While strategic failure might be the result of an inherently poor strategy, substantial evidence indicates that failure is the avoidable consequence of (1) inadequate concepts about how to successfully realize strategic desirables and hence how to accomplish successful enterprise change and (2) lack of enterprise coherence and consistency (unity and integration) which precludes the enterprise to operate as a unified and integrated whole (cf. Sect. 1.2.4*).

The first core reason for strategic failures refers to the concepts about governance that are in our view fundamentally inadequate, as outlined in Chap. 3. A fundamentally different perspective will thus be argued. The second core reason for strategic failures concerns enterprise design since only through enterprise-wide design can the coherence and consistency among the ways of organizing be established. Numerous publications have stressed the importance of enterprise unity and integration (op. cit.). We reiterate that an enterprise design focus is therefore crucial for successfully operationalizing strategic choices. A McKinsey publication confirmed this observation: rather than the traditional management focus on structural changes for strategic success, "they would be better of focusing on organizational design" (Bryan and Joyce 2007, p. 22). The report emphasizes that "most corporate leaders overlook a golden opportunity to create durable competitive advantage and generate high returns for less money and less risks: making organizational design the heart of strategy" (op. cit., p. 21). We therefore fully support the view that "the field of organization design can and should play a much larger role in management theory and practice than it presently does" (Burton et al. 2006, p. xi).

In summary, the focus on enterprise design is essential for:

- Effectuating enterprise strategic desirables.
- Ensuring the proper way of organizing.
- Addressing common causes of poor enterprise performance.
- Ensuring enterprise unity and integration.

1.4.4 Overcoming Theoretical Fragmentation and Avoiding the Traditional Myopia About Organizing

Coherence and Consistency

Previous paragraphs stressed that enterprise design, and hence enterprise engineering, plays a crucial role within the enterprise change process and is thus a crucial aspect of enterprise governance. Additionally, enterprise design is the basis for enterprise performance, as argued in the preceding paragraph. Various performance topics play a role such as customer satisfaction, employee satisfaction, motivation, quality, efficiency, productivity, security, and compliance. Obviously, in view of the importance of enterprise unity and integration (coherence and consistency), the set of strategic desirables and requirements must be coherent and consistent. Indeed, it seems highly unlikely that incoherent and inconsistent strategic desirables and requirements would be conducive to enterprise success and performance, while such incoherence and inconsistency would nonetheless lead to a coherent and consistent enterprise design. Ascertaining aforementioned coherence and consistency already involves the foundational insights for enterprise design. For example, a strategic desirable about performance-related pay is inconsistent with the strategic desirable to increase employee motivation (cf. Sect. 4.6.4*). Likewise, the intention to use classic accounting measures conflicts with the intention to increase customer loyalty (cf. Sect. 4.7.10*).

The Multidimensional Enterprise Aspects

Actually turning strategic desirables into reality implies realizing new forms of organizing based on a new enterprise design. Since enterprise unity and integration is a crucial condition for operational performance and strategic success, as argued in the preceding paragraph, enterprise design must ensure this crucial condition. Violating the crucial condition will imply full or partial failure in realizing strategic desirables. We argued that enterprises are organized complexities with many different aspects like employee behavior, management behavior, culture, communication, accounting, security, safety, employee assessment and rewards, motivation, and so on (Hoogervorst 2018). Hence, a multitude of different aspects and areas of concern must be effectively addressed and integrated for obtaining enterprise unity and integration. That is no easy task. For this task, the foundational insights are indispensable (op. cit.). In view of the high rate of strategic failures mentioned before, the question of *how* strategic desirables and concerns can be successfully addressed thus requires a well-grounded answer. It is not to be expected that strategic desirables and concerns can be adequately operationalized without adequate theories, methodology, and methods that can address the desirables and concerns. This evident truth is acknowledged in many areas. Indeed, one would probably not board an aircraft manufactured by a company with a concern for safety but without adequate theories and methods to address that concern. Further, recall from the preceding paragraph that poor enterprise performance is virtually always attributable to inadequate enterprise design (common causes). The ability to address all enterprise facets, given the strategic desirables, areas of concern, and manifestations of poor performance, requires theoretical and methodological completeness (cf. Sect. 1.7*). For example, we consider theories, concepts, and methods as incomplete, and thus inadequate, if the concern for motivated employees or a customer-oriented culture cannot be effectively addressed. Again, a comprehensive basis of foundational insights for enterprise design is crucial.

Theoretical Fragmentation

As Sect. 1.3.4 outlined, the outcome of enterprise design is artifacts that detail the future organized state. Examples of such artifacts were mentioned earlier: description of desired norms and values, employee and management behavior characteristics, process models, information object descriptions, work instructions, operational rules and regulations, production means, job profiles, reporting structures, remuneration and assessment criteria, (IT) system designs, infrastructural designs (offices, utilities, etc.), and so on. Collectively, these artifacts form the new enterprise design: the conceptual realization of the future ways of organizing.

Unfortunately, the ability to address the enterprise in a unified and integrated manner is hampered by the fact that relevant enterprise topics are treated by different academic disciplines. When employed by enterprises, specialists educated within these academic domains almost 'naturally' continue the conceptual and practical fragmentation due to the lack of any overarching integrating theory and methodology. Hence, there is considerable fragmentation in the study of enterprises, which in and of itself also forms the key obstacle to practicing the foundational insights. Not only is there a lack of integration concerning the various topics of the foundational insights but consequently a lack of fit between the problems addressed by these various disciplines and the problems enterprises are facing. Partial solutions are thus provided for problems that require an integral approach (cf. Sect. 1.7.3*).

The Traditional Organizing Myopia

One might observe that the theoretical fragmentation has led to traditional organizing myopia, whereby the incompleteness of the enterprise design scope is even more profound. Often, attention for design is limited to the usual four traditional structural functionalist (mechanistic) design aspects: processes, information relevant for these processes, the IT applications that supply the information, and finally the infrastructure supporting the applications. We fail to see how, by paying attention to these four design aspects, one could effectively address the concern for motivated employees, a customer-oriented culture, or meaningful work. Clearly, the notion of an enterprise as a social entity is virtually excluded within this traditional design scope. Although the mentioned design aspects are evidently relevant, the approach is theoretically and methodologically incomplete. As a consequence of incompleteness, enterprise unity and integration cannot be realized. Indeed, unity and integration is not to be expected if relevant enterprise aspects are not brought within the design perspective. Many approaches concerning enterprise design can be noticed with a focus on models and representations, whereby adequate attention to all relevant enterprise aspects can be questioned (Dietz and Hoogervorst 2011). Note that the business and IT alignment models discussed in Sect. 1.4.1 manifest the traditional organizing myopia: only organizational and IT processes and infrastructure are considered. Avoiding the traditional organizing myopia by enabling an integrated approach is what enterprise-wide design based on the enterprise engineering theories, methodology, and methods aims to offer.

1.5 Enterprise Design Science

1.5.1 The Importance of Sound Theories

A First Fundamental Truth: The Danger of a Bad Theory

When speaking about the preferred theory of organization in Sect. 1.1.2, we introduced the first fundamental truth: “nothing is as dangerous as a bad theory” (Ghoshal 2005, p. 86). Despite the warning that is implicit in this truth, enterprise reality is rife with examples of bad theories in use. Ways of thinking and acting that are total nonsense or dangerous half-truths continue to be widely applied (cf. Sect. 1.7.1*). Organizing beliefs and practices are continued with complete disregard for the facts about their validity. This points to the unproductive, if not damaging, chasm between what organization science knows and what management practices reveal. For a considerable part, the continuation of nonsensical management practices is caused by the so-called ‘management industry’ that has produced enormous amounts of misleading and also conflicting advice (op. cit.). Prescriptions based on the 'best managed companies' or 'best practices' are anecdotal, folkloric, or based on hypes, fads, and unsubstantiated pseudotheories.

Sadly enough, the propagation of bad theories has been greatly facilitated by business or management schools. Postwar business school education focused on a conception of management that was separated from the nature of the enterprise itself (cf. Sect. 1.7.2*). No specifics of the enterprise needed to be understood since, as the prevalent thoughts would have it, concepts like forecasting, planning, and controlling within the context of enterprise financial performance can be applied anywhere. A zone of detachment was thereby created between managerial work and the particular organization of any one enterprise. Not inventors and engineers that understood the inherent activities of the enterprise and had a sincere interest in the quality of products but managers only interested in profit were 'managing' enterprises. Since enterprises were basically seen as 'black boxes' run by management in pursuit of primarily financial goals, not much progress has been made in developing theories for effectively addressing the organized complexity of enterprises.

Many scholars have questioned the notion of 'management' as an autonomous profession and hence have questioned the very possibility of this notion as an adequate foundational topic for an autonomous academic discipline. However, the 'theory' that would give business schools their own respectable turf was believed to be the collection of viewpoints summarized previously in the paragraph about corporate governance. Everything that enterprises, and hence management, should do must be in the economic interest of shareholders. Next to profit maximizing, concepts for doing so are 'restructuring,' 'leveraged recapitalizations,' 'leveraged buyouts,' 'takeovers,' 'downsizing,' or 'outsourcing.' Clearly, this way of thinking and the concepts used frame the perspective on enterprises as merely 'money-making machines.' This perspective is further associated with a strong legal and contractual focus: the enterprise as a legal fiction, as summarized in Sect. 2.4.1. Contracts define enterprise relationships. An amoral position is thereby advocated since the only responsibility of management lies in creating economic wealth for shareholders within the accepted legal boundaries. The focus on financial gain inevitably induces a short-term management focus, which has been labeled as 'short-termism,' leading to detrimental consequences and is considered 'the management to economic decline' (Hayes and Abernathy 2007).

The point has been made that, unfortunately, business school education developed into a proliferation of different viewpoints without any cohesion and an overarching integrating theoretical perspective (cf. Sect. 1.7.2*). Business schools did not provide an antidote to the 'witch doctor approaches' but, in fact, largely contributed to its widespread proliferation. Many serious failures were and are the inevitable consequences. Even more seriously, certain forms of business school education have been charged with inflicting severe social damage because of improper enterprise (management) conduct as a result of this education (Khurana 2007). As Ghoshal observes, "many of the worst excesses of recent management practices have their roots in a set of ideas that have emerged from business school academics over the last 30 years" (2005, p. 75).

A Second Fundamental Truth: The Practical Value of a Good Theory
A proper theory of organization matters for the simple reason that ways of thinking and acting concerning enterprises not only affect enterprise performance but, equally important, affect employee and society well-being (cf. Sect. 1.1.1*). Such well-being is in the hands of managers applying a management 'theory.' And the number of managers is increasing rapidly (cf. Sect. 1.7.1*). Unfortunately, both employee and society well-being is seriously jeopardized if not inflicted with severe harm: the bleak nature of enterprise reality (cf. Sect. 4.8*). Various organization theorists have stressed the need for a proper theory of organization already decades ago. Barnard spoke about the need for developing a "science of organization" (1938, p. 200). Roughly a decade later, Urwick voiced his plea for an effective theory of organization, whereby "the development of a technique of administration, a body of professional knowledge without which those who attempt to manage other people appear increasingly amateurish, is likely to have a profound effect on our institutions" (1947, p. 7). Inflicting severe harm as a consequence of 'bad theories' was also pointed out by Urwick because no attention is paid to design: "lack of design is illogical, cruel, wasteful and inefficient" (op. cit., p. 38). It is cruel "because the main sufferers from lack of design in organization are the individuals who work in the undertaking" (ibid.). Along similar lines, Nobel laureate Herbert Simon states that "the theory of administration is concerned with how an organization should be constructed and operated in order to accomplish its work efficiently" (1997, p. 45).

As illustrated, most business school education did not provide the proper theory of organization. So, almost a century after the plea of the organization theorists mentioned above, an alternative for the management theory and business school education criticized above is strongly voiced (Adler 2002; Ghoshal 2005; Khurana 2007; Wooldridge 2011). We have mentioned the need to adopt the employee-centric theory of organization in Sect. 1.1.2 and will summarize core reasons in the next chapter. This theory has to be put into practice by crossing the chasm between the social and organizations sciences and the engineering sciences. Hence, the employee-centric theory of organization is the input for the enterprise engineering design science. In doing so, our aim is to provide a sound theoretical base for business or management schools. According to social scientist and Nobel laureate in economics Herbert Simon, such a design focus is essential for the professional school concerned with organization and management theory. "The professional schools will resume their professional responsibilities just to the degree that they can discover a science of design, a body of intellectually tough, analytic, partly empirical, teachable doctrine about the design process" (1969, p. 58). Simon was convinced that through such design theory, business schools could distinguish themselves from economics or psychology. Lack of such theory will continue the detrimental demand from the 'management industry.' Moreover, like the other engineering sciences or medical sciences demonstrate, a sound enterprise engineering design science will likewise prove Kurt Lewin's dictum: "there's nothing so practical as a good theory" (In: Thomas 2003, p. 74). As will be outlined below, a good design theory is firmly rooted in foundational sciences. This is no different for enterprise design. Indeed, “before we can establish any immutable ‘principles’ of administration, we must be able to describe, in words, exactly how an administrative organization looks and how it works” (Simon 1969, p. xi). Insight into how ‘it works’ comes from the foundational sciences on which the science of organization, and hence enterprise design, must be based.

1.5.2 Design Sciences and Foundational Sciences

About What Is and What Can Be

Under the label ‘foundational science,’ we identify science and research that seek to understand natural (physical or biological) or social phenomena, obtain theoretical knowledge, and discover law-like relationships between these phenomena. Unlike the ‘ideographic’ perspective on science whereby phenomena are described that are considered unique and not guided by underlying general regularities, foundational sciences are ‘nomothetic’; they are ‘law giving’ (Nagel 1961). Others have used the term ‘factual science’ to identify a science concerned with exploring, explaining, and describing how the world *is* (Dresch et al. 2015). Thus, foundational sciences are concerned with understanding and explaining why phenomena manifest themselves as they do: it is about how and why things *are*. Foundational sciences are physical, biological, social, and behavioral sciences. Specifically regarding enterprises, social and behavioral sciences seek to understand, explain, and predict organizational and human phenomena (Hevner et al. 2004).

Next to foundational sciences that focus on how the world *is*, another important scientific domain is concerned with how the world *can be*. Hence, this scientific domain concerns the creation of artifacts: artificial, human-made entities. In his book *The Sciences of the Artificial*, Herbert Simon argues the importance of establishing a science of ‘the artificial’ and hence argues the importance of a science for creating artifacts (1969). This importance seems evident since there are numerous cases where human beings are not concerned with how the world *is* but how it *can be* or *should be*. The creation of artifacts is identified as *design*. Section 1.1.1 identified design (designing) as courses of action aimed at changing existing conditions into preferred ones. Comparably, others have identified design as the activities for addressing practical problems, whereby a practical problem is characterized by the difference between the actual and the desired state of affairs (Johannesson and Perjons 2014). The scientific approach to design is identified as *design science*. Although this term is not used uniformly in the literature, we will define it as:

- *Design science* The coherent and consistent scientifically valid body of knowledge (theories, methodology, methods) based on foundational sciences, which is used for the creation of artifacts as they are developed with the goal of solving practical problems of general interest.

It should be stressed that the application of insights from a foundational theory—such as creating an employee reward system based on some insight about human behavior—is not the same as applying a design science (Dresch et al. 2015). An enterprise design science encompasses all relevant enterprise design aspects and can address the influence of the reward system on these other aspects. In order to qualify as a design science, three conditions must be satisfied concerning the body of knowledge, which must be (1) based on the associated foundational sciences, (2) based on rigorous research, and (3) generally applicable for the design of a class of artifacts. In view of the second point, closely related to the notion of design science is the notion of *design science research*. For understanding this latter notion, it must be stressed that design within the scope of design science research is not concerned with merely designing an artifact for some practical use based on the existing design science body of knowledge, but the process of design aims to contribute to the scientific body of knowledge itself. So, the design science research within aircraft engineering aims to contribute to the scientific body of knowledge about the design of aircraft, for example, in view of safety or energy efficiency. In order to scientifically demonstrate that design is indeed improved, the design within a particular design science research scope is thus inextricably linked to the particular design science. Hence, design science and design science research are closely intertwined, since it is design science research that makes a particular design science a 'science.' To bring the message home: "The purpose of design is to create an artefact that fulfills the needs and requirements of some stakeholders, possibly only for local practice. Design science research, in contrast, aims at producing and communicating new knowledge that is relevant for a global practice" (Johannesson and Perjons 2014, p. 161). That's why the definition of design science speaks about practical problems of general interest. Hence, the artifacts produced through design science research are evaluated in view of improving design theories, methodology, and methods that are valid for a certain class of artifacts, such as the class of aircrafts, houses, electrical generators, IT systems, or enterprises. In view of the somewhat ambiguous term 'design science research,' one might speak about *design research*, which aims to improve the associated design science (Winter 2008). In addition to the qualifying conditions for design science, the following conditions are relevant for design science research (op. cit.):

1. Rigorous research methods must be applied in order to make the creation of new design knowledge scientifically valid.
2. New knowledge must relate to an existing body of well-founded knowledge of the design science.
3. New knowledge must be made known to the applicable community of researchers and practitioners.

Since there are various types of artifacts, there are likewise also various design sciences and associated research methodologies (Johannesson and Perjons 2014; Dresch et al. 2015).

Close Relationship Between Foundational Sciences and Design Science

The definition of design science stresses the importance of being grounded in the foundational sciences. This importance can be understood as follows. In view of our previous reflections, we might say that foundational sciences are concerned with what is *true*, hence describing how things are, whereas design sciences are about how things have to be created (March and Smith 1995). Put differently, design sciences are concerned with finding out what is *effective* (Hevner et al. 2004). A design science is thus necessarily *prescriptive*: a body of knowledge that indicates *how* a certain class of artifacts needs to be designed. Nonetheless, prescription must be based on valid scientific knowledge, which is the very reason why both types of sciences are closely related. For example, the design science about aircraft design rests on theories and concepts from aerodynamics, metallurgy, chemistry, and so on. Within electrical engineering sciences, for example, the foundational theory of electromagnetic fields is highly intertwined with the design theory for antennas. Hence, the relationship between a design science and the associated foundational sciences is rather close since explaining why a design is (in)effective rests for a large part on foundational sciences. Otherwise stated, the foundational sciences provide the theory and its justification, whereby the theory is the basis for design. Conversely, the evaluation about the design is input for (further) theory development, justification, and possible adaptation. Any design science must thus have an adequate theory base (Hevner et al. 2004).

As indicated, for the engineering sciences, the relationship with the design science aspect and the foundational science aspect is rather close, such that the distinction is just about absent. For the social sciences, the situation is rather different, as outlined below.

Closing the Social Sciences Versus Design Sciences Gap

Several important social, behavior, and organization foundational theories for easy reference identified as social and organization sciences will be summarized in the next chapter. These theories explore, explain, and describe social, human behavioral, and organizational phenomena. The next chapter summarizes a few topics. Unfortunately, within the realm of these phenomena, the focus is on how the social world *is*, while less formal attention, in the form of design, is paid to how the social world *can be*. One might thus observe a detrimental gap between the valid body of knowledge about social and organizational phenomena, and the practical application of that knowledge in solving social and organizational problems (Dresch et al. 2015), and hence a gap in applying knowledge for changing existing social and organizational conditions into preferred ones. A 'social and organization design science' is thus urgently needed. In view of our focus on enterprise design, we thus submit that an enterprise design science, which we have identified as enterprise engineering, is needed to close the gap between the foundational social sciences and their practical application.

From the perspective of design science research, important aspects that are relevant for the respective sciences have been identified along the axes of the, slightly adapted, grid devised by March and Smith, shown in Fig. 1.14 (1995). As indicated previously, design science research aims to improve the associated design

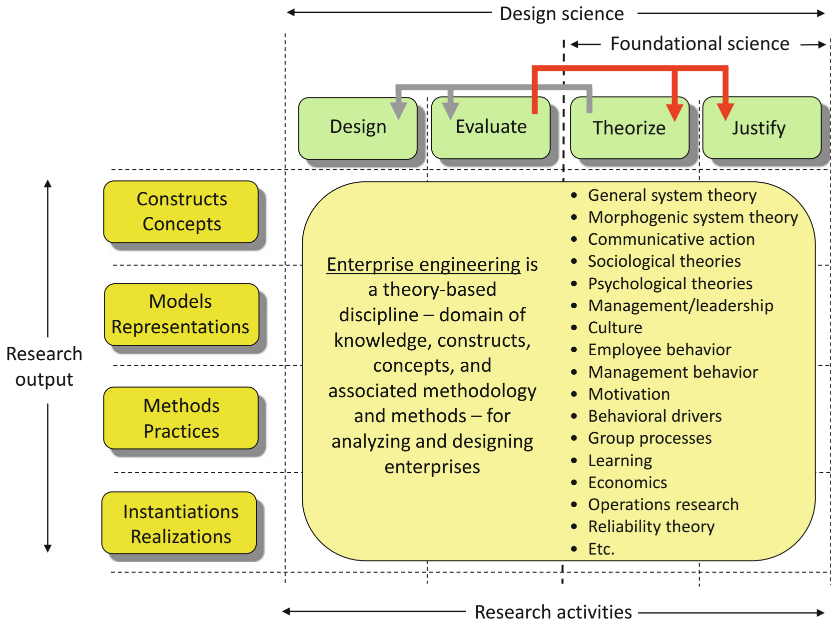


Fig. 1.14 Aspects of design and foundational sciences

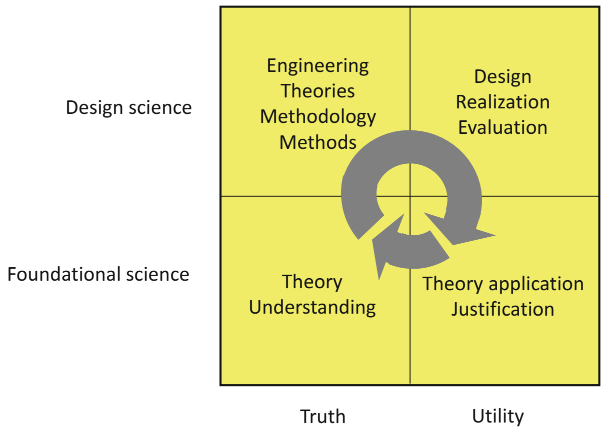
science. Two important research aspects are identified: research activities and research output. We will illustrate this grid in case the design science is enterprise engineering.

Research activities concern the foundational theories and their justification, as well as the design and its evaluation. Various topics of the foundational sciences that are relevant for enterprise engineering are identified in Fig. 1.14. As indicated, theorizing is obviously a central aspect of a foundational science, whereby adequate empirical data justify a theory. The understanding provided by the theories of the foundational sciences is the basis for the enterprise engineering design science which is subsequently used for the design and realization of an artifact within the realm of enterprises. The evaluation of the design result takes place pertinent to the theoretical foundation. In turn, evaluation of the design result is then used for considerations about the foundational theories, their justification, and application. These considerations might then be used for further foundational theory development and understanding. The research activities are conceptually divided in various phases that can be broadly identified as (Johannesson and Perjons 2014; Dresch et al. 2015) (1) problem description, (2) formulation of possible solutions for addressing the problem and final selection of preferred solution, (3) design, (4) demonstration of solution feasibility, (5) evaluation of design in view of the initial problem and applicable theories, and (6) communication about results to the relevant research community. Depending on the type of artifact, various research methods might additionally be used, such as surveys, action research, simulation, pilots, and so on (op. cit.).

As for the research output, Fig. 1.14 mentions a number of typical aspects relevant for both sciences (Johannesson and Perjons 2014). For example, theoretical constructs or concepts are ‘system,’ ‘function,’ ‘construction,’ ‘culture,’ or ‘behavior context.’ Design constructs or concepts are, for example, ‘requirement,’ ‘architecture,’ ‘area of concern,’ or ‘design domain.’ All these and other constructs or concepts will be discussed in subsequent chapters. Models and representations are the artifacts created through design. Different models will be introduced when discussing the various social and organization theories, as well as when discussing enterprise engineering. In the case of enterprises, the term ‘representations’ refers to various other artifacts that outline the future enterprise arrangements (ways of organizing), such as documents detailing the implications of the meaning and purpose(s) of the enterprise and the enterprise units, performance criteria, job profiles, information systems and their purposes and functions, or culture and behavior characteristics, etc. Methods and practices express prescriptive knowledge about conducting foundational and design science, respectively. For enterprise engineering, the frameworks that will be introduced are typical examples. Finally, the instantiations manifest the realized artifact: an (partial) enterprise (re)design.

As stressed, an effective design science, based on design science research, has its fundaments in the foundational sciences. Design science research contributes to design science development and further theoretical development of the associated foundational theories. Figure 1.15 graphically shows this iterative cycle. Again, the close reciprocal relationship between the application of theory in actual design on the one hand and the use of evaluation data for theory development on the other hand stresses the convolution of a design science and its associated foundational sciences. Without such close interrelatedness, design activities can never develop into a mature design science. Likewise, the design of enterprises, and hence enterprise engineering, must be rooted in the foundational sciences. These sciences provide insight into the nature of enterprises. Such insight is crucial prior to any design.

Fig. 1.15 Foundational theory–design theory iterative cycle



Recall the words of Nobel laureate Herbert Simon: "before we can establish any immutable 'principles' of administration, we must be able to describe, in words, exactly how an administrative organization looks and exactly how it works" (1997, p. xi). In view of the multitude of aspects relevant for enterprises, the theoretical basis for understanding 'how enterprises work' is considerable. Hence, also the foundational basis for enterprise design is inherently broad and, as indicated before, must not be treated fragmentally. Various foundational sciences thus play a role. One might think of theories like organizational behavior (micro level and macro level), work and organizational psychology (employee behavior, learning, culture, motivation, leadership, etc.), sociology (views on human groups, social order, social change), theory of communicative action, system theories, or operations research. Some of these theories are shown in Fig. 1.14. All these foundational theories contribute to the theoretical and methodological completeness of the enterprise design approach. Important theories of the foundational sciences have been discussed in Hoogervorst (2018). It will become clear that the foundational sciences provide, as the name suggests, the content for design guidance in view of enterprise strategic intentions and areas of concern.

Arguably, a design science without a firm rooting in the foundational sciences poses a threat. When using, for example, aircraft, trains, automobiles, bridges, or buildings, one trusts that the design has been adequate. Also within the enterprise context, the danger of not developing and maintaining an adequate 'theory base' has been stressed (Hevner et al. 2004). Unfortunately, many approaches concerning enterprise design can be noticed with a focus on models and representations, whereby adequate attention to the theory base can be questioned (Dietz and Hoogervorst 2011). As indicated earlier, witch doctor approaches and certain types of business school or management school education developed into a proliferation of different viewpoints without any cohesion and failed miserably in producing an overarching integrating theoretical perspective on enterprises. From the perspective of enterprise design, the relevance of these different viewpoints is questionable. Under the label enterprise engineering, an approach will be discussed that aims to avoid aforementioned danger of an inadequate theory base. Noticeably, the concept of engineering an enterprise has been emphasized in earlier publications. For example, as far back as several decades ago, James Martin stated that "Enterprise Engineering is an integrated set of disciplines for building or changing an enterprise, its processes, and systems" (1995, p. 58). With deep insight, he foresaw that "a new type of professional is emerging—the enterprise engineer" (op. cit., p. xii). Underlying the approach advocated by James Martin was the notion that enterprise success necessitates unity and integration of various enterprise aspects, a notion we have likewise emphasized before. Despite the similar use of the term 'enterprise engineering,' our approach nonetheless differs in various aspects. The difference lies primarily in our emphasis on the formal theories and associated methodology and methods for enterprise design, as well as in our focus on the characteristics of effective governance for enabling the enterprise engineering approach to be successful.

1.6 The Close Relationship Between Enterprise Governance and Enterprise Engineering

1.6.1 Core Topics in Perspective

As amply stressed before, enterprise unity and integration is a crucial condition for enterprise success. That is not to say when that condition is satisfied, enterprise success is secured. Indeed, a chosen strategy might turn out to be flawed. However, violating the crucial condition will imply full or partial failure in realizing strategic intentions (cf. Sect. 1.2.4*). Recall that enterprises are organized complexities with many different aspects like employee behavior, management behavior, culture, communication, accounting, security, safety, employee assessment and rewards, motivation, and so on. Various performance areas play a role, such as customer satisfaction, employee satisfaction, quality, efficiency, productivity, security, and compliance. These topics can be identified as enterprise *areas of concern*. Hence, a multitude of different aspects and areas of concern must be effectively addressed and integrated for obtaining enterprise unity and integration. That is no easy task. For successfully performing this task, our core concepts of enterprise governance and enterprise engineering are essential. We will put these concepts in an overall perspective with the aid of Fig. 1.16.

Central in Fig. 1.16, the notion of enterprise unity and integration is depicted. This notion is about coherent and consistent (conceptual) relationships between all enterprise aspects that collectively express, define, and realize intended enterprise behavior and performance. In Chap. 4, we will return more formally to the various

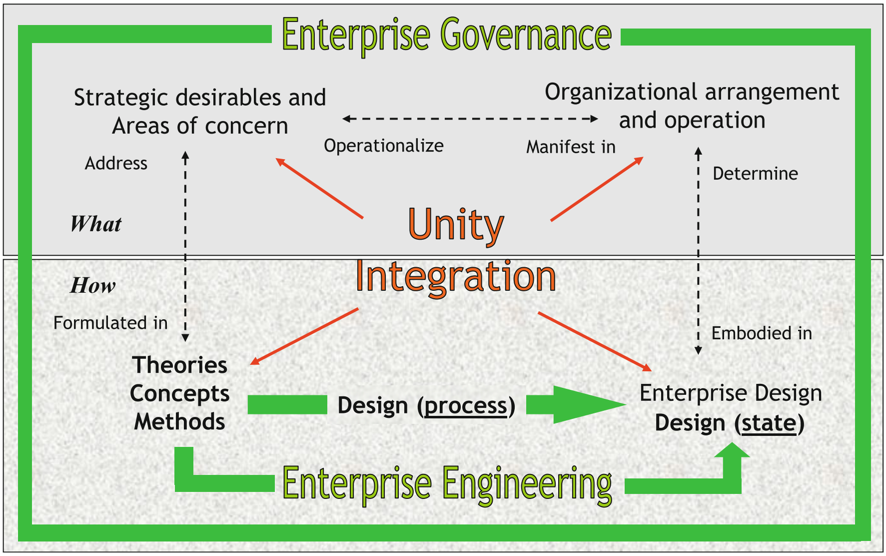


Fig. 1.16 Enterprise governance and enterprise engineering in perspective

enterprise aspects and address how they can be methodically brought into a unified and integrated perspective, such that a unified an integrated enterprise design is realized.

Understandably, the first area where unity and integration is required is that of strategic desirables and areas of concern. Indeed, it seems highly unlikely that incoherent and inconsistent strategic desirables and concerns would be conducive to enterprise success and performance, while such incoherence and inconsistency would nonetheless lead to a coherent and consistent enterprise design. Next, the actual enterprise arrangement and operation should operationalize—hence make real—the strategic desirables and areas of concern in a unified and integrated manner, while conversely, strategic desirables and concerns must be manifest in the enterprise arrangement and operation. Unfortunately, that is all too often not the case: *what* is being desired is not realized. For example, the actually experienced enterprise might not reflect the espoused strategic desirable about, and concern for, customer satisfaction.

In view of the high rate of strategic failures mentioned before, the question of *how* strategic desirables and concerns can be successfully addressed requires a well-grounded answer. It is not to be expected that strategic desirables and concerns can be adequately operationalized without adequate theories, concepts, and methods that can address the desirables and concerns. This requires theoretical and methodological completeness, as stressed before. This evident truth is acknowledged in many areas. As mentioned before, one would probably not board an aircraft manufactured by a company with a concern for safety but without adequate theories and methods to address that concern. Hence, as Fig. 1.16 depicts, the theories, concepts, and methods must be able to address the strategic desirables and areas of concern. Conversely, formulation of these desirables and concerns must be possible within the theories and concepts. For example, we consider theories, concepts, and methods as incomplete, and thus inadequate, if the concern for motivated employees or a customer-oriented culture cannot be effectively addressed.

Ultimately, the organizational arrangement and operation of the enterprise is determined by its design: the very way the enterprise ‘is put together,’ that is, the way the intentional design actions—also those concerning emerging organizing—are manifest. Conversely, enterprise arrangement and operation are embodied in enterprise design. These observations must be emphasized: except for the special causes of poor performance discussed in Sect. 1.4.3, enterprise design is the primary source, or origin, of the way the enterprise manifests itself. Poor performance is thus virtually always attributable to enterprise design (common causes). Enterprise engineering is, as mentioned before, the overall label for the theories, concepts, and methods for enterprise design. In view of the multifaceted aspects of enterprises, the theories and concepts of enterprise engineering are likewise multifaceted. Finally, enterprise governance concerns all activities from the initial development of strategic desirables and areas of concern, until their ultimate operationalization. Enterprise governance and enterprise engineering are thus closely related as will be further elucidated in later chapters.

1.6.2 Three Governance Themes: Summary

Corporate Governance

We have seen that this governance theme has a long history and concerns protecting the interests of shareholders (cf. Sect. 1.4.2). Given the purpose of corporate governance, the type of discussion about this theme and the character of the proposed reform manifest strong dominance of the financial/accounting and auditing profession. The perspective is heavily structurally oriented, focused on internal risk management and control in financial/economic developments. Formal reporting and auditing play an important role, including compliance: satisfying rules and legislation on corporate governance. Such rules and legislation are directed for a considerable part to the responsibilities of (executive) management towards shareholders. As indicated earlier, the notion of corporate governance is therefore associated strongly with (executive) management. The rules-and-regulations-based approach to corporate governance manifests structural, legal, and contractual characteristics which are assumed to establish compliance and prudent financial behavior. We have argued that financial reporting and internal control, as the two crucial pillars of compliance, can only be properly addressed through enterprise-wide design (op. cit.).

IT Governance

Section 1.4.1 sketched that the IT governance theme surfaced as an area of interest at the end of the 1980s in an attempt to address the revolutionary IT developments and solve the business and IT alignment problem. Various other problematic issues concerning IT would be cured through IT governance, such as unclear value of IT investments, IT systems limiting enterprise flexibility, mere technology-driven IT developments, or high costs of IT developments and operation. Supposedly, IT governance would lead to such innovative use of IT that competitive advantage is gained.

As clarified, many IT governance approaches provide a management- and structure-oriented answer to the issue of business and IT alignment, whereby IT governance is viewed as the process of decision-making and associated accountabilities around IT investments. Such perspectives seem to suggest that once the structure for decision-making is defined, IT developments will progress in the desired manner. What those IT developments should be remains unclear, however, within the focus on management and structures.

Obviously, these perspectives inevitably associate IT governance strongly with management responsibilities and their assumed decision-making prerogative. Similarly as with corporate governance, the visions regarding IT governance are thus almost exclusively associated with (executive) management of enterprises and are apparently only concerned with accountabilities and structures for decision-making. However, we have illustrated that the problem of business and IT alignment can only be solved through enterprise-wide design in which the definition of information supply and the design of the IT system are integral parts.

Enterprise Governance

Recall that we have defined enterprise governance as the enterprise competence (unified and integrated whole of skills, knowledge, culture, and means) for continuously inciting enterprise adaptive and reshaping initiatives and their unified and integrated operationalization through enterprise (re)design and subsequent implementation.

Enterprise adaptive and reshaping initiatives include all activities that aim to change existing enterprise conditions into preferred ones. Hence, these activities range from initiatives in the realm of strategy development to initiatives associated with continuous operational improvements. It is within this overarching scope of enterprise governance that all activities must be addressed that are traditionally addressed from the perspectives of IT governance and corporate governance. We have discussed the two other perspectives on governance because of their frequent mentioning in the literature, not because we think these themes are inevitable as topics of autonomous bodies of knowledge. Rather, the unrelated emergence of corporate governance and IT governance is the unfortunate consequence of the theoretical fragmentation discussed before. To be effective pertinent to the goals that corporate and IT governance promote, they must be addressed from an enterprise-wide design perspective within the overarching scope of enterprise governance. The strong relationships, to be discussed next, between corporate and IT governance mutually and with enterprise governance further elucidate the importance of the overarching enterprise governance perspective.

1.6.3 Enterprise Governance: The Overarching, Integrative Scope

The previous paragraph summarized three different perspectives on governance briefly. In addition to earlier remarks, this paragraph will further outline their mutual relationships and thereby provide arguments for the overarching, integrative scope of enterprise governance to address the various governance perspectives in a unifying treatment. The mutual relationships are depicted schematically in Fig. 1.17 and will be discussed below. As will become clear, enterprise governance as the overarching governance competence is necessary and sufficient for addressing all change initiatives and covers, in an integrative fashion, all the topics that IT governance and corporate governance might identify.

IT Governance and Enterprise Governance Relationship

When discussing the background of the attention for IT governance, the questionable results of IT investments were mentioned in Sect. 1.4.1. A clear positive relationship between enterprise performance and IT investments is absent. We have argued that successful utilization of IT systems can only be based on enterprise-wide design. Lack of such design implies lack of aforementioned positive relationship with as the inevitable consequence the suboptimal use of IT. That means applying IT whereby a

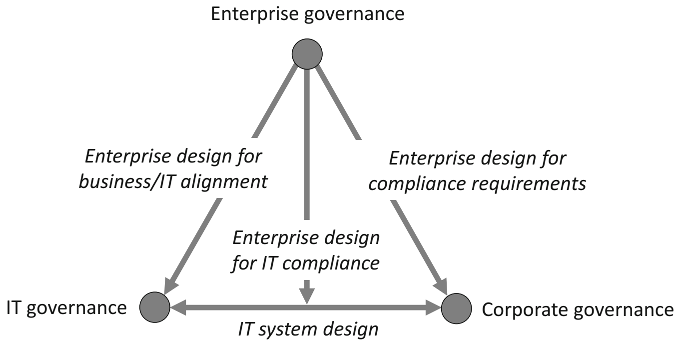


Fig. 1.17 Relationships between various governance perspectives

mismatch exists between the possibilities and capabilities of IT and the enterprise context in which IT—more specifically the function of an IT system—is utilized. So, introducing an IT system for local, distributed decision-making by employees hardly seems effective in a context where decision-making is seen primarily as a (central) management prerogative. Likewise, the introduction of a system for customer relationship management appears less meaningful in an enterprise context devoting little attention to customer satisfaction. A call center where employees are rated by the number of customers 'served' per hour is an example. These examples illustrate, as amply stressed before, the importance of unity and integration between IT functions and the organizational context where these functions are to be made productive. That importance can only be addressed from an enterprise-wide perspective, as expressed by the fact that business and IT alignment is first and foremost an aspect of enterprise design that defines the necessary informational requirements and functions, as Fig. 1.17 expresses. These observations show that IT systems and their functionality must be designed concurrently and in unity with the enterprise context. This constitutes the fundamental grounds for the strong mutual relationship between IT and enterprise governance. Stated otherwise, IT governance must be an integral part of enterprise governance.

Corporate Governance and IT Governance Relationship

An important aspect of corporate governance indicated previously concerns the arrangement of internal control: the totality of (financial) arrangements and associated activities for ensuring financial prudence and the adherence to rules and legislation for safeguarding the interests of shareholders. The Sarbanes-Oxley legislation formulates stringent requirements for financial reporting and the formal top management testimonial that said reporting reflects the actual state of affairs.

Understandably, many IT systems are for a considerable part, if not exclusively, involved with initiating, authorizing, handling, storing, and reporting on financial transactions. Put another way, important aspects for adequately arranging corporate governance rest on the adequate arrangement of IT systems, such that corporate governance requirements can be satisfied. One might consider obvious attention areas like (IT Governance Institute 2004):

- Security management and data classification.
- Identity management (authentication and role-based authorization).
- Data management and data warehousing (data integrity).

Another reason for the strong relationship between corporate and IT governance lies in the fact that IT systems are generally not developed primarily from a corporate governance perspective. Rather, those systems are developed for supporting enterprise operational processes, yet at the same time provide essential data which is relevant to corporate governance considerations. Consequently, the quality of the development, implementation, and operation of IT systems must be such that corporate governance requirements can be fulfilled concurrently. Moreover, changes in IT systems might have considerable implications for the integrity and completeness of (financial) data. Aspects of the design, implementation, and operation of IT systems thus have a bearing on the ability to satisfy corporate governance requirements (compliance). Hence, corporate governance entails important implications for the total spectrum of IT governance, while conversely, measures within the realm of IT governance might impact compliance with corporate governance requirements. The overall enterprise responsibility in this respect is not alleviated if parts of IT services delivery are outsourced to third parties.

Our considerations indicate, as we have stressed before, that enterprise design requirements regarding compliance—satisfying corporate governance rules and regulations—are not unique in the sense that they are only defined from the corporate governance perspective. On the contrary, fulfilling compliance follows likewise (and primarily) from design requirements that are already defined on other grounds, such as areas pertinent to information security and data management mentioned earlier. This implicit relationship between design requirements based on compliance considerations and those based on the design of IT systems constitutes another reason for the strong mutual relationship between corporate and IT governance. As Fig. 1.17 aims to illustrate, IT systems design takes place within the scope of enterprise governance and enterprise-wide design, as argued previously, wherein satisfying compliance requirements for IT systems is an integral part.

Corporate Governance and Enterprise Governance Relationship

In addition to the preceding observations, the necessity to address corporate governance requirements within the scope of enterprise governance is based on the following. The internal aspects of corporate governance reform concern the manner of control in view of shareholders' interests. This begs the question as to how these interests are best served. Fraud and the publication of misleading (financial) information are evidently not conducive to shareholders' interests. However as indicated earlier, failing strategic developments and implementations are likewise—and probably even more so—damaging to shareholder interests and do not enhance the enterprise economic value. As said, some authors on corporate governance therefore bring enterprise strategy development and execution within the scope of corporate governance.

Roughly, two approaches can thus be identified: (1) a narrow perspective on corporate governance that is focused primarily on executive management supervision and compliance in view of financial/economic aspects and associated reporting and (2) a broad perspective on corporate governance that also includes the enterprise strategy and execution. In the latter case, corporate governance reform is also argued based on examples of failing enterprise strategies, since internal control is viewed to have failed in adjusting the enterprise strategy timeously (cf. Sect. 1.5.2*).

Evidently, corporate governance in the broad perspective concerns enterprise strategy development, the subsequent design of the enterprise, the definition of relevant programs and projects for realizing the design, and the execution of programs and projects for implementing the design. Hence, within this perspective, corporate governance concerns not merely internal structures and systems for (financial) control, reporting, and risk management, but the broad perspective concerns the strategic development of the enterprise itself. Aspects that concern enterprise (strategic) development—with business, organizational, informational, and technological aspects—require a perspective that encompasses the enterprise in all its facets, from design and implementation to actual operation. This points to the themes of enterprise governance and enterprise engineering. We submit that the broad view transcends the corporate governance theme and the financial/economic perspective of its proponents considerably: adequate enterprise performance and the control of risks in the financial/economic domain require an approach that surpasses this domain fundamentally and conceptually, which thus inherently *cannot* be developed within the financial/economic domain and its associated concepts and thinking. Ideological considerations clarify the fundamental limitations of the financial/economic perspective in this respect (cf. Sect. 4.7.2*).

Comparably as with IT governance, the strong mutual relationship between corporate governance and enterprise governance follows also from the fact that design requirements for the enterprise as a whole must also concurrently address requirements following from compliance considerations. Indeed, it seems rather problematic to arrange the enterprise, with enterprise governance as the guiding competence, and then afterwards to separately incorporate requirements and conditions following from corporate governance. On the contrary, requirements and conditions following from corporate governance must form an integrated part of enterprise design and are thus addressed concurrently. One might consider requirements on process design to safeguard coherent and consistent process execution and control. For example, through minimizing reconciliation, the avoidance of process reversals, or the assurance of nonrepudiation, coherent and consistent process operation is ensured, which at the same time improves the coherence and consistency of financial/economic data. Corporate governance must thus be an integral part of enterprise governance.

1.7 Outlining the Next Chapters

1.7.1 Summing Up the Previous Discussion

Our previous discussion can be summarized as follows:

- Enterprises are purposeful social entities. In view of their purposeful nature, organizing is necessary: the harmonious ordering and arrangement of activities. A considerable part of organizing has an emerging character because organizing must address emerging, here-and-now phenomena. Since organizing is the process of continuously evolving activities, organizing is not synonymous with enterprise design but critically depends on it. Enterprise design must enable the different facets of organizing.
- Enterprise design—changing existing enterprise conditions into preferred ones—is the creative hinge point between desirables and intentions on the one hand and their conceptual realization (the design) on the other hand. The design is the basis for final realization (implementation).
- A given enterprise purpose can lead to various ways of organizing and hence various designs. Not every enterprise design is equally effective nor desirable. Some forms of organizing are flagrantly inadequate if not damaging. Based on foundational insights, the employee-centric theory of organization is adopted which is the basis for enterprise design. Adopting this theory is crucial for adequately performing emerging organizing.
- Modern enterprises are characterized by (1) highly dynamic internal and external context, for a considerable part driven by technology developments, (2) new ways of business conduct, (3) new ways of organizing requiring extended integration, and (4) extensive informatization. Adequately coping and exploiting these developments and their associated paradigm shifts ultimately implies adapting the enterprise through enterprise (re)design.
- The success rate of enterprise strategic initiatives is alarmingly poor. Core reasons are (1) the lack of enterprise unity and integration and (2) inadequate governance. The condition of unity and integration must be intentionally created through enterprise design, which is a core aspect of enterprise governance.
- Almost all causes of poor enterprise performance are the consequences—the common causes—of the arrangement and operation (the design) of the enterprise. The only solution to rectify common causes of poor performance is enterprise (re)design.
- Enterprises must have two essential competences: (1) the enterprise operational competence for adequately maintaining operational relationships with the environment, specifically concerning the delivery of products and services, and (2) the enterprise governance competence concerning enterprise change and adaptation. Both competences will be shown to be highly intertwined and are determined through enterprise design.
- The function of an IT system can only be determined based on knowledge and insight into the organizational context ('construction') where the function is to be

utilized. Additionally, the performance of IT cannot be expressed in terms of enterprise performance or value. The contribution of IT in this respect can only be determined and expressed with reference to the design of the enterprise context where enterprise performance or value is to be realized. Both these fundamental insights imply that 'business and IT alignment' follows from enterprise-wide design, whereby information supply and IT systems are integral aspects. Enterprise-wide design must thus take place within the overarching scope of enterprise governance, rather than focusing merely on IT governance.

- Corporate governance concerns financial/economic internal control and the trustworthiness of associated data. These data are largely, if not exclusively, contained in information systems and generated in operational processes. Further, norms and values (culture) about prudent financial/economic behavior are likewise relevant. The broad spectrum of aspects concerning compliance with rules and regulations about internal control and financial/economic reporting can thus only be effectively arranged through enterprise-wide design that holistically addresses all relevant aspects. Similarly, the strong relationship between corporate and IT governance can only be effectively addressed within the overarching scope of enterprise governance.
- Much management and organizational practices are 'witch doctor practices' that lack any sound theoretical foundation and justification. Mainstream business school education did not address this issue but rather contributed to it and prolonged it. A design focus is considered essential for professional schools concerned with organization and management theory. Enterprise design theories enable such focus.
- There is unfortunate theoretical fragmentation since enterprise issues are addressed from within different disciplines. Fragmented solutions are offered for problems requiring an integrated approach. Moreover, due to the traditional organizing myopia, only the usual structural functionalist enterprise aspects are considered as design aspects: processes, information relevant for these processes, the IT applications that supply the information, and finally the infrastructure supporting the applications. Numerous other enterprise design aspects are not addressed due to the lack of professionals that are able to effectively utilize an overarching and integrating theoretical approach. The theories, methodology, and methods of enterprise engineering aim to provide the needed overarching and integrating theoretical design perspective and enable to integrate the insights of the various foundational disciplines.
- Enterprise engineering as the enterprise design science must be firmly rooted in the foundational sciences. Since enterprises are social entities, the social and organization sciences are of specific importance. The employee-centric theory of organization is the principal foundational theory for enterprise design.

Our previous reflections make plausible the importance of understanding and designing enterprises. Additionally, we observe that society has become a society of enterprises: the nature and prosperity of society are largely defined and determined by enterprises. Successes and failures of enterprises spill over to society at large, while the nature of work has a considerable impact on the physical and mental health of enterprise and hence societal members. In view of the significant influence of enterprises, there is clearly a definite need for academically educated people—organization or enterprise specialists—who thoroughly understand enterprises in all their multidimensional aspects, also in view of certain ethical and ideological perspectives following from responsibilities of enterprises towards employees and society at large. Next to the foundational insights briefly summarized in the next chapter, subsequent chapters will outline the enterprise engineering design science for practicing the foundational insights.

1.7.2 Chapter 2. Foundational Insights for Enterprise Change and Enterprise Design Summarized

The foundational insights are presented with reference to the fundamental maxim of Burrell and Morgan mentioned in Sect. 1.1.2 that all theories of organization are based upon a philosophy of science and a theory of society. Philosophical considerations are thus the starting point for the foundational insights. The philosophical foundation is followed by the ontological foundation that outlines the nature of society and the different theories of society. Subsequently, various organization theories are briefly summarized. Since the argued employee-centric theory of organization also involves ethical viewpoints, the final part of the foundational insights is formed by summarizing ideological foundation.

Philosophical Foundation[3]

Questions about what is true, good, or right are evidently very relevant in the case of society and enterprises. These questions refer to beliefs about society and enterprises and the justifications whereupon the beliefs are based. This refers to scientific viewpoints about the justification for beliefs. Further questions might be raised about whether scientific investigations are morally neutral or whether certain forms of scientific inquiry already, perhaps inadvertently, involve normative choices. Hence, questions about what is good or right already creep in when conducting science, especially social science. The manner of inquiry determines how society and enterprises are arranged. Moreover, the philosophical foundation outlines the origin of the concepts used to study society and enterprises. Specifically relevant in this respect is the 'mechanization of the worldview' and the subsequent dominant influence on the perspective on society and enterprises. All these topics have a bearing on the content of enterprise design science, which is thus the very reason for presenting the philosophical foundation. We are convinced that without

[3]From the Greek word *philos* = loving, beloved and *sophia* = knowledge, wisdom or *sophis* = wise, learned.

presenting such foundation, the approach to understanding and designing enterprises becomes bereft of its essential meaning.

Ontological Foundation[4]

The term 'ontology' refers to the study about the nature of 'being' or reality, in our case the reality of society and enterprises. Hence, the ontological foundation probes into the nature of society and, subsequently, into the nature of enterprises. Understanding the nature of society and enterprise is thus a prerequisite for properly designing enterprises.

Our starting point for discussing the ontological foundation is by showing how the different philosophical viewpoints, outlined in the chapter about the philosophical foundation, lead to viewpoints about society and viewpoints about the way society should be studied. A number of research paradigms and archetypical sociological theories will be discussed. These are (1) structural functionalism, which includes the theory about bureaucratic institutions; (2) symbolic interactionism; (3) social system theory; and (4) social conflict theory. As it turns out, some of these sociological theories have a dominant influence on the way enterprises are perceived and hence have a dominant influence on theories about enterprises and subsequently on the concepts used for enterprise design.

The philosophical foundation spoke about the 'mechanization of the worldview' and its influence on how society and enterprises are perceived. The ontological foundation seriously questions that worldview and presents a fundamentally different viewpoint that acknowledges the crucial notion of emergence: the occurrence of unpredictable and novel phenomena. Acknowledging the dominance of emergent phenomena has profound implications for conceptualizing and modeling society and enterprises. A conceptual model of society will be presented that acknowledges emergent phenomena and is the basis for the conceptual enterprise model. Based on the theories of society, four categories of organization theories are presented: classical, neoclassical, modern, and postmodern organization theories. The enterprise conceptual model will be the basis for the enterprise design theory. Much of the content of this theory, however, is of ideological nature. It concerns answers to the philosophical questions about what is good and right, specifically for enterprises. Answering these questions is the purpose of the ideological foundation.

Ideological Foundation[5]

Having explicated the nature of enterprises, various ideological viewpoints are presented. Much of the traditional ideas are severely criticized as seriously flawed or even damaging. Alternative viewpoints are presented and corroborated in support of the employee-centric theory of organization. The ideological foundation is of particular importance since the insights illustrate how ideological convictions determine the design of enterprises.

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[4]From the Greek word *óntos* = being and *logos* = word, speech, reason, doctrine.

[5]From the Greek word *idea* = thing in the mind, archetype of the ideal world. The notion of *ideal* refers to the world of ideas.

In view of the 'mechanization of the worldview' discussed in the philosophical chapter, the 'mechanization of enterprises' will be subsequently sketched. Said mechanization is shown to be a direct consequence of dominant social theories. More generally, the different social theories will be recalled and discussed in light of enterprise strategy development and will be placed against the perspective of emergence. In view of a fundamental law about regulating systems, the traditional viewpoints on strategy development will be severely criticized. A fundamentally different perspective is advocated which allows to embrace the concept of enterprise governance and enables the utilization of the enterprise design theory. It will become clear that within the traditional perspective on strategy development and operationalization, enterprise design theory has virtually no place.

A core aspect of the ideological foundation is arguing the importance of employee involvement in enterprise operational and strategic activities. Empirical considerations are provided based on the positive effects of employee involvement on enterprise performance in areas such as productivity, quality, service, enterprise learning, and innovation. Additionally, theoretical considerations are offered based on the very nature of enterprises and the crucial notion of emergence that characterizes enterprises. It will become clear that only through employee involvement can emerging phenomena in enterprises be effectively addressed. These theoretical considerations consequently lead to viewpoints about the enterprise operational and governance competence that differ fundamentally from traditional viewpoints. All these empirical and theoretical considerations about employee involvement will be shown to have a bearing on enterprise design.

Having outlined the empirical and theoretical considerations for employee involvement, the employee-centric way of organizing will be summarized. Typical traditional viewpoints concerning this topic will be rejected and others supported. Among the latter is the unitarist viewpoint on employee and enterprise interests, arguing that no necessary conflict exists between these two interests. The practical consequences of the employee-centric way of organizing will be given. Finally, we will reflect on what most of enterprise reality shows. Particularly, we focus on the difference between the ideological viewpoints and the often-experienced enterprise reality.

1.7.3 Chapter 3. Enterprise Governance and the Process of Enterprise Design

The foundational insights showed how the mechanization of the worldview has ultimately led to the mechanization of enterprises. Plainly visible is the mechanization of enterprises in the disproportionate burden of planning and control mechanisms in the form of rules, protocols, record keeping, targets, performance contracts, evaluation reports, management reporting, and yearly plans, combined with frequent meetings to discuss and sustain all that material. Strategy development and the activities to realize strategic desirables have likewise become mechanized as the management-initiated top-down causal chain of planned activities that would supposedly yield strategic success. Chapter 3 criticizes this perspective and probes into the nature of enterprise change. Two different phases of change will be discussed as well as the incommensurability of these phases because of their fundamentally different nature. Failing strategic initiatives are all too often the inevitable consequence of mixing up these two different phases of enterprise change.

Enterprise change essentially boils down to creating a new form of social organization. Based on the foundational insights, the nature of social organization will be discussed which subsequently identifies the nature of enterprise change. This nature is further clarified in view of emerging phenomena that must be adequately addressed. As likewise becomes clear, emerging phenomena make social determinism—a viewpoint tightly associated with the mechanization of the worldview—an elusive notion. Said elusiveness has consequences for the perspective on enterprise governance. For properly addressing emerging phenomena, the fundamental regulating law—the Law of Requisite Variety—must be satisfied.

Two core enterprise competences were discussed in Sect. 1.3: the operational competence ('running the mill') and the governance competence ('changing the mill'). Unlike the management-biased view, Chap. 3 will outline that for both competences, the involvement of employees is crucial. For governance, this involvement is expressed by the notion of *distributed governance*. This notion will clarify the close relationship between the operational and the governance competence. Specifically important for enterprise governance is the central enterprise governance function which is instrumental for leading enterprise change and practicing the enterprise engineering design discipline. Two core areas of activity will be outlined which are associated with the two different phases of enterprise change mentioned above.

1.7.4 Chapter 4. Poietical Foundation[6]: Theories, Methodology, and Methods of Enterprise Engineering

Having summarized the foundational insights and provided the understanding about the nature of enterprise change, this chapter provides the foundation for enterprise design—the poietical foundation—by outlining the enterprise engineering approach for practically effectuating enterprise change. Since enterprise engineering covers a wide range of different aspects, we limit ourselves to those aspects of enterprise engineering that (1) are closely related to the notion of enterprises as social entities, (2) are concerned with organizing, (3) can link strategic enterprise desirables and areas of concern with enterprise design methods, and (4) can link concepts and theories of the foundational sciences with enterprise design. Specific topics that have

[6]From the Greek word *poiesis* = making, creating.

to do with the design of technical systems, such as production systems and IT systems, are out of scope. For these systems we refer to the relevant literature.

Regarding the different system views, the chapter about the poetical foundation starts by outlining the precise notion of the functional and constructional system perspectives. Next, the conceptual language for design is introduced, which includes the notions of system requirements, architecture, and essential implementation-independent modeling. By taking a technical system as an example, these concepts for design are illustrated and the concept of system design domain is introduced and illustrated through functional and constructional decomposition in functional and constructional design domains. Also the publication structure for requirements and architecture is sketched. As will become clear, these design domains are essential for effectively defining requirements and architecture, as well as for effectively addressing system areas of concern. All concepts for design are expressed and further illustrated by the generic requirements and architecture framework and the generic system development framework. Using the technical system as an example, the importance of essential, implementation-independent modeling will be argued as the starting point for system, and hence enterprise, design.

The design concepts that are introduced and illustrated, using a technical system as an example, are subsequently applied in case the system is an enterprise. We will start by discussing enterprise functional and constructional decomposition into functional and constructional design domains. As in the general system case, these design domains are essential for effectively defining requirements and architecture, as well as for effectively addressing enterprise strategic desirables and areas of concern. Next, enterprise requirements and architecture are discussed and expressed by the enterprise requirements and architecture framework. Special attention will be paid to the publication of enterprise requirements and architecture as an important aspect of enterprise governance since the publication provides the initial linkage between the expression of strategic desirables and design activities.

The totality of enterprise development and the associated concepts will be expressed by the generic enterprise development framework. Likewise, as in the case of the technical system, enterprise development starts with essential, implementation-independent modeling, followed by further design wherein the wide spectrum of design aspects is addressed.

The enterprise design process and content will be positioned within the conceptual overview of the enterprise engineering framework and within the context of the viewpoints developed in the chapter about the ideological foundation. This will further corroborate the core reasons for strategic failures mentioned before. Finally, by discussing the case of a considerable enterprise transformation in Chap. 5, the concepts of enterprise governance and enterprise engineering are further explained and illustrated.

1.7.5 *Chapter 5. Case Illustration: Creating EnerServe*

The development of Europe's open energy market necessitates traditional energy companies to change fundamentally in numerous areas, such as concerning the relationships with customers and business partners, employee and management behavior, culture, organizational roles and processes, information supply, as well as concerning economic and market perspectives. This energy market development and the associated fundamental changes are taken as the basis for the case illustration, whereby the theories and viewpoints developed and discussed in the previous chapters are applied for transforming a traditional energy company into a new fictitious energy company called EnerServe. For this transformation, the enterprise governance competence—within which the enterprise engineering theories, methodology and methods are applied—is essential. Therefore, in addition to illustrating how enterprise engineering is applied, special attention is given to the arrangement of enterprise governance, the core processes of enterprise governance, and the personal competences of the enterprise engineers within the central enterprise governance function. Maturity levels of enterprise governance will be discussed. The case will further illustrate the approach for addressing the existing information technology systems in view of the needed transformation. Finally, a crucial facet of the transformation is ensuring cultural and behavior change. Critical aspects of such change will be outlined.

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Chapter 2
Foundational Insights for Enterprise Change and Enterprise Design Summarized

2.1 Introduction

Enterprise change has two principal aspects: the process of change and the outcome, that is, what the change process must produce. The latter aspect concerns design: the expression of the desired result. Designing is thus a core aspect of the change process. Successful enterprise change and enterprise design depends on the poietical foundation which is formed by (1) theories and insights about *enterprise governance*, the enterprise competence concerned with enterprise change, and (2) the theories, methodology, and methods of *enterprise engineering*, the enterprise design science that is used within the enterprise governance competence. Recall from Chap. 1 that these two enterprise aspects are highly interrelated since enterprise change is largely effectuated through enterprise design.

As Fig. 2.1 shows, the poietical foundation for enterprise change and design, hence enterprise governance and enterprise engineering, is itself based on three other foundations: the philosophical, ontological, and ideological foundations. Our accompanying publication discusses these foundations extensively (Hoogervorst 2018). The following paragraphs aim to summarize some important insights. For the underlying literature, we refer to the accompanying publication.

2.2 Philosophical Foundation

Discussing the philosophical foundation is a direct consequence of the important maxim introduced in Sect. 1.1.2 stating that that all theories of organization are based upon a philosophy of science and a theory of society. Philosophical considerations concern, for example, the grounds for beliefs, truth, and knowledge,

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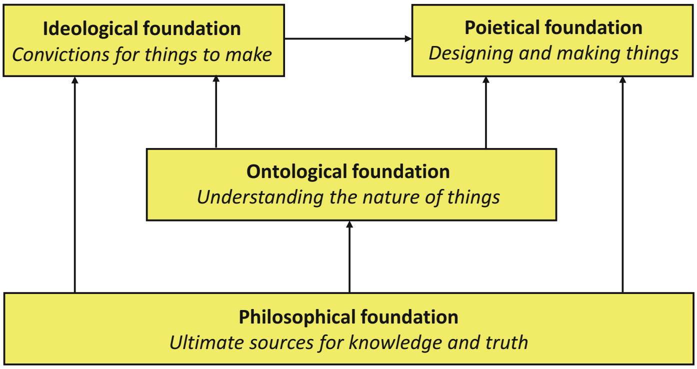

Fig. 2.1 Foundations for enterprise governance and enterprise engineering

as well as concern the essential aspects of human existence. Conducting science, and thus science about enterprises, their evolvement, change, and design, confronts the scientists with those philosophical issues. As Dennett observes, "there is no such thing as philosophy-free science; there is only science where philosophical baggage is taken on board without examination" (1995, p. 21). The philosophical reflections in our accompanying publication aim to avoid ignoring the implicit 'philosophical baggage' that underlies the viewpoints on society and enterprises and the ways to study and arrange them (Hoogervorst 2018). Important points are summarized below.

2.2.1 About the Origin of Scientific Concepts

Our 'Mental Glasses'

As said, philosophical considerations concern the grounds for beliefs, truth, and knowledge. We have presented the commonly accepted viewpoint about knowledge as a justified true belief (cf. Sect. 2.2.1*).[1] A key issue is of course on what justifications the beliefs are based. Influential within Western scientific thinking is *empiricism*, a viewpoint holding that knowledge and its justification follows from observation and experience (cf. Sect. 2.2.2*). No knowledge precedes experience. All our ideas and concepts thus come from the world that fills our mind through experiences. The mind has no innate ideas but is merely a passive receptor of external stimuli which are the ultimate source for knowledge and truth. We discussed that the empiricist viewpoint turns out to be very problematic: investigating sensory experiences with no mental concepts is impossible (op. cit.). To give experiences

[1]The asterisk (*) identifies paragraphs, sections, or chapters in *Foundations of Enterprise Governance and Enterprise Engineering* (Hoogervorst 2018).

meaning and phenomena significance, concepts are needed, but the world or nature 'has' no concepts.

Opposing the viewpoint of empiricism, the viewpoint of *idealism* holds that objective knowledge about how the world *really* is cannot be obtained (cf. Sect. 2.2.3*). Observing phenomena without concepts to interpret and give meaning to phenomena is literally meaningless. Understanding the (natural) world is thus pointless unless addressed through a conceptual system defined by the human mind, contrary to what empiricists want us to believe. Imaginatively, humans have conjured up concepts and theories far beyond what is immediately observable. Physics is a notable example.

Rather remarkably, and in line with the viewpoint of idealism, philosophical arguments can be presented showing that it is not the world that provides the concepts for investigation (as empiricism would have it), but it is the investigator that 'dictates' them to the world. As a striking observation, the world as we know it does not exist independently of human consciousness but are 'constructions' thereof. Rather than investigating the reality of the world, human beings discovered how the mind *constructed* the world (cf. Sect. 2.2.4*). This insight dramatically changed the traditional perspective on investigating worldly phenomena. The issue is not trying to understand the world as it is, since that cannot be known, but the issue is in what way the world becomes understood through the concepts human beings themselves have conjured up. The natural and social world does not reveal itself through categories and concepts inherent in the world but only through categories and concepts that we impose on the world. Put differently, the natural world answers to our quest for knowledge and truth in a language *we* have defined. Nature (the world) 'itself' is not observed but nature as it appears through our method of investigation. Hence, there cannot be theory-neutral observation and theories cannot be derived from data. Figure 2.2 aims to illustrate this crucial insight: depending on the concepts used, an observer sees the central object either as a figure or a letter.

As indicated, experience gets meaning through the concepts human beings have conjured up. The concepts are also often expressed in law-like relationships, such as Boyle's law about the relationship between gas pressure (P), volume (V), and

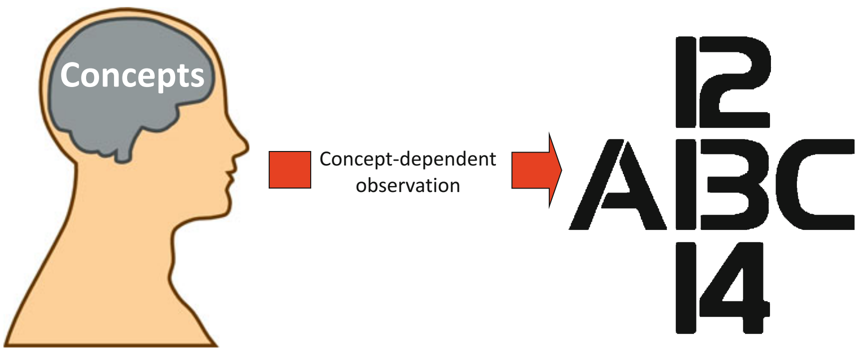

Fig. 2.2 Observations depend on the theory and concepts used

absolute temperature (T). Our philosophical reflections indicated that progress in science is only possible if such relationships not only express current conditions but also *predict* future conditions (cf. Sect. 2.2.5*).

Concepts: Just Names or Denoting Something Real?
Closely related to the viewpoint of idealism, stressing that concepts used to form an understanding about the world are of our own making, is the viewpoint of *nominalism* that takes the idealistic viewpoint to its ultimate consequences by stating that the concepts are just names but do not correspond to or express an objective reality defined by the things themselves (cf. Sect. 2.2.6*). But if concepts are just names given to experienced phenomena, how can there be law-like relationships between the human-defined concepts, such as expressed by Boyle's gas law? Opposite the idea that concepts are just names and do not express an objectively knowable reality is the viewpoint of *realism* or *naturalism* that holds that nature itself will reveal the inherent concepts that the human mind necessarily must use to understand nature (cf. Sect. 2.2.7*). According to realism, these concepts refer to real, objectively existing aspects of nature. Note that the perspective of realism/naturalism closely compares with that of empiricism mentioned above.

Accepting Both Viewpoints
A sensible approach is to take the middle position between idealism/nominalism and realism/naturalism by acknowledging the following. First, concepts and theories are of our own making. They are our own 'instruments of thought,' whereby the question whether these concepts and theories reveal the ultimate objective reality cannot be answered, as idealism/nominalism argues. Second, a reality 'out there' exists which puts the concepts and theories to test, and if this test fails, concepts and theories must be revised in order to avoid conflict with the characteristics of reality, as realism/naturalism stresses. Reality does not 'have' concepts and theories that are to be discovered, but reality can 'veto' the concepts and theories of our own making that are used to understand reality (cf. Sect. 2.4.3*). Both viewpoints about investigating reality must make us critically aware about the concepts used.

2.2.2 The Dominant Mechanistic and Deterministic Worldview

Deeply engrained as a common viewpoint is that science should reveal how our world really is. Ideas expressed by naturalism/realism underlie this common viewpoint: science is in the business of discovering truths about, and lawful relationships between, worldly phenomena. We have discussed that a typical characteristic of scientific endeavor is to search for the essential, primordial building blocks of nature seen as the ultimate reality and totality of things (cf. Sects. 2.2.3* and 2.2.7*). Note that the search for primordial building blocks manifests the *reductionistic* approach to acquire knowledge. Understanding complex wholes only follows from knowledge about the constituent elementary building blocks. Since according to the naturalistic viewpoint, nature reveals itself through terms or concepts of nature itself, the knowledge obtained refers to things ‘as they are.’

Ultimately, as history shows, the search for elementary building blocks—the explanatory entities of nature—eventually became virtually exclusively a search for material building blocks (cf. Sect. 2.2.8*). Therefore, the naturalistic viewpoint became a materialistic viewpoint. Since the material world is synonymous with physics, *materialism* is therefore also identified as *physicalism*: everything—including the human mind—must be understood in purely physical terms. Human individuals with their consciousness and the ability to understand and change the world are considered the ultimate products of material development. Materialism clearly manifests the reductionistic perspective: everything in the world can be reduced to a set of elementary physical building blocks. Conversely, everything in nature can (consequently) be understood in terms of these building blocks. Understanding natural phenomena is thus a reductionistic process: reducing the phenomenon to its constituent parts and the relationships between them. Within this viewpoint, relationships are *necessarily* as they are. So, what happens does so by necessity. This perspective is identified as *determinism*. Determinism expresses the belief in identifiable causes that necessitate the current state of affairs, whereas this current state itself—through causal relationships—determines the future state of affairs. Nothing happens by chance. So, ‘possibilities’ that are not realized must be illusions: they were not possibilities in the first place. The configuration of the various deterministic relationships can be viewed as machine like. Hence, the deterministic, naturalistic perspective can be characterized as *mechanistic*, while conversely, the mechanistic view implies the belief in determinism. Understandably, mechanistic, deterministic thinking induces the belief in total social malleability: mankind can arrange the totality of societal phenomena in a desired way through cause-effect relationships between actions and outcomes.

As we have outlined, the mechanistic, deterministic view is virtually unquestioned (cf. Sect. 2.2.8*). Even humans are considered material-based, sophisticated machines, and the human mind is nothing more than physical processes while—a clear manifestation of determinism—the free will is considered an illusion. Associated with these views is the notion of *objective knowledge*: the justified true beliefs that are based on verifiable facts about a mind-independent reality. The facts are considered *objective*, that is, independent of an individual’s subjective opinion, interpretation, or judgment. We will summarize later that the mechanistic worldview heavily influences perceptions on (the development of) society and enterprises.

2.2.3 Meaning and Morality

Ancient approaches to understand the world focused on meaning and purpose to *explain* phenomena. Modern approaches are fundamentally different. Despite numerous and fundamental problems, the basic positivist tenets of modern science remains dominant: rationally and logically discovering truth about the (mechanical, physical) world, guided by theoretical concepts and grounded in empirical evidence. We have mentioned the various labels under which these tenets are presented and which collectively might be identified as *scientism*. One typical aspect of scientism is that meaning and purpose of human experiences have become completely out of scope (cf. Sect. 2.4.1*). Modern science *describes how* things are rather than *explains why* things are. Noticeably, the elimination of meaning and purpose from modern scientific discourse is not only manifest in physics. For example, economy is concerned with maximization of benefit or wealth in economic terms and is not so much concerned with underlying meaning and purpose. Arguably, the shift in economy towards scientism—with physics as its model—runs the risk of driving out norms and values. Next to eliminating the meaning of phenomena, the deterministic viewpoint claims that nothing happens incidentally and everything is determined, culminating in denying the free will of human beings. As argued, the mechanistic, deterministic viewpoint necessarily implies ignoring moral and ethical aspects (cf. Sect. 2.3.4*).

2.2.4 The Traditional View on Science

Science is about producing knowledge: the justified true beliefs of a scientific discipline. Since science is thus in the pursuit of truth, philosophers and scientists have wrestled with the question what constitutes the unshakable foundation for truth? What distinguishes truth from quackery? We have outlined how Western scientific thinking is influenced by trying to establish unshakable grounds for truth and knowledge (cf. Sect. 2.3.1*). This thinking is strongly influenced by (1) reductionism, claiming that complex wholes can only be understood through knowledge of the constituent parts or aspects; (2) logic-deductive thinking (closely related to reductionism), which is rationally moving from the general to the specific; (3) rationalism, expressing the belief in reason as the prime source of knowledge and the route to an objectively knowable world; and (4) determinism, claiming that everything happens by necessity (op. cit.). As we have outlined, the quest for the unshakable foundation for truth created an enormously influential dichotomy: the separation between the thinking, investigating human subject and the world to be investigated. As a consequence, the thinking subject and the external world were not seen as dynamically interrelated, but the external world was considered a separate object governed by deterministic laws and already and forever ‘filled’ with absolute truths awaiting discovery by the rational mind. It is not the meaning of things that is to be the object of scientific study, but rather their orderly relation as expressed by certain deterministic and mathematical laws.

2.2.5 Truth and Knowledge: Core Aspects

Note that the previous views on obtaining knowledge clearly concur with the naturalistic, realistic, and physicalistic viewpoints and express the scientific outlook identified as logical positivism (cf. Sect. 2.3.2*). Based on this outlook, a group of logical positivists attempted to solve the famous 'demarcation problem' by providing criteria, such as verification or falsification, to clearly separate meaningful statements from meaningless statements, hence to clearly separate science from pseudoscience or quackery (op. cit.). Unfortunately, the approach failed completely: truth is hard to come by. Moreover, the failed attempt to provide the unshakable ground for truth provided even more disquieting insights, such as the impossibility to do crucial experiments to decide between rival hypotheses or theories, as expressed by the famous Duhem-Quine thesis (cf. Sect. 2.3.3*).

Subsequent attempts to provide a foundation for truth led to three main theories about truth: (1) correspondence theory, (2) coherence theory, and (3) consensus theory (cf. Sect. 2.3.5*). Also these theories turned out to be questionable: no unshakable foundation appears to exist. Uncertainty, rather than certainty, seems to be our common fate, even within domains considered to be filled with only exactness and certainty, such as mathematics (cf. Sect. 2.3.6*). Since there is no ultimate solid foundation on which human knowledge and truth can be based, under the label *pragmatism*, various philosophers have proposed a pragmatic view on truth. Despite a variety of diverse pragmatic views, the common characteristic is the focus on usefulness and utility. Truth is what works and can be used to solve practical problems (cf. Sect. 2.3.7*). Hence, truth is about practical consequences for holding a belief. Again, problems are not avoided since the question about what is considered true now shifts to the question about 'what works' and whether the practical consequences are correctly assessed. All these issues are likely to stir considerable debate and involve 'truth aspects' and hence involve all the debate about truth mentioned before.

Despite the problems of finding the unshakable foundation for truth and knowledge, two core aspects must be acknowledged. First, all theories express in one way or the other the importance of coherence and consistency. The correspondence theory refers to truth and knowledge being in agreement with reality and hence is consistent and coherent with what reality manifests. Similarly, the coherence theory accepts truth and knowledge if coherent and consistent with an existing, agreed-upon, body of knowledge. Finally, the consensus theory considers agreement among a (scientific) group as the basis for truth and knowledge. Hence, the group expresses coherent and consistent opinions. Second, as the next paragraph will further outline, seeking truth and knowledge is a circular, iterative, and dialectic process whereby reason, ideas, and concepts on the one hand are intertwined with practice, experiences, and responses from reality on the other hand. Truth and knowledge are emerging phenomena.

2.2.6 Human Existence: The Essence for Understanding Society and Enterprises

The Experienced World as the Starting Point

Modern science, exemplified by scientism, ignores the most elementary human experiences that are the basis for defining purpose and meaning (cf. Sect. 2.4.1*). Further, the dominant method for seeking truth and knowledge objectifies the world—creates a dichotomy between the investigating subject and the world—and in doing so ignores elemental and original human experiences wherein such objectification and dichotomy are absent. What is needed is an integrated approach that embraces, and starts from, the totality of human experiences, hence an approach that reunites the two segments that have been created by the mechanistic, materialistic worldview: the objective world and the subjective world of human individuals. The philosophical thoughts expressed under the label 'existential phenomenology' offer such integrated approach. These thoughts are of utmost importance for perspectives on society and subsequently on enterprises (cf. Sect. 2.4.2*).

Existential phenomenology aims to avoid the idealism (nominalism) versus realism (naturalism) controversy by integrating and synthesizing these viewpoints, as well as aims to avoid aforementioned dichotomy by taking human subjects and the world as a unity of mutual implication, and take that relationship as a philosophical starting point. So, the focus of reflection is not the world as investigated by some scientific discipline but first and foremost the world as manifested in, and through, the very elemental and original individual human experiences. Not the objective world is of concern but the *experienced* world: the 'Lebenswelt' (lifeworld) on which all human and scientific developments are based. The perspective of existential phenomenology holds that the objective (materialistic and mechanistic) world cannot be the true world since that world has no meaning for the individual human subject. Meaning comes from the immediately experienced world. These experiences are neither purely subjective nor purely objective. Rather, it is a *relationship* between the human subject and the world, which provides the unification of subjective and objective existential aspects. This unification enables escaping the controversy between idealistic (nominalistic) and naturalistic (realistic) perspectives. A core aspect of human encounters with the world is the reciprocal, dialectic relationship. That relationship is not totally passive by merely observing the 'already' existing objective world as posed by naturalism and realism and also not totally active by expressing the idealistic and nominalistic viewpoints that the world is a construction of our own consciousness through humanly defined concepts. Yet, human consciousness is conscious about 'something' out there (naturalism, realism), while in order to make sense of that 'something,' humanly defined concepts are needed (idealism, nominalism). Within the unity of experience, learning about the experienced reality takes place. Through this process of learning, phenomena are expressed by means of a language likewise learned. This language thus determines how phenomena appear. The language 'system' defines the available space for the interpretations that give our experiences meaning and our actions direction.

Language defines our image of reality. Thus, our concept of ontology, that what is considered to exist, depends on the language used.

Human Agency, Reflexivity, and Reciprocity

A central notion within existential phenomenology is the circular, reciprocal relationship between human beings and the world: human beings shape the world and are conversely shaped by the world. Three concepts are crucial for understanding the fundamental interconnectedness of human beings and the world (cf. Sect. 2.4.2*):

- *Human agency* The capacity to consider, interpret, examine, and contemplate worldly phenomena and respond through initiative, creativity, autonomous action, and novelty.
- *Reflexivity* The condition whereby individual human action is based on reflection about, and interpretation of, the results or consequences of previous human actions.
- *Reciprocity* The condition whereby on the one hand humans are shaping the world (active) while on the other hand humans experience the world and are shaped by the world (passive).

Note that the notion of human agency expresses a clear departure from determinism since human agency manifests the ability to freely decide and act. Human agency leads to unpredictable emerging phenomena that shape the world, which in turn shapes human beings because of the reciprocal relationship. Individual human traits are thus not totally fixed but develop in concrete individual circumstances of the reciprocal relationship. The development of technology is an evident example of the condition of reciprocity. Because of reciprocity, human agency is always conditioned. Human freedom and human agency are thus both enabled and constrained by the historically developed societal context. Reciprocity implies that the notion of 'freedom' does not express the absence of limitations and influences caused by the societal context but expresses our freely developed attitude towards that context. Human freedom thus becomes manifest through the reciprocal relationship between human beings and their social context (op. cit.).

Apart from natural emerging phenomena outside the sphere of human influence, the three concepts introduced above are essential for acknowledging and understanding emerging phenomena and therefore are essential for understanding the nature of society and enterprises.

The Emerging and Intersubjective Nature of Truth and Knowledge

Insights that existential phenomenology provides make clear that the process of seeking truth and knowledge is likewise circular: iterative and dialectic (cf. Sect. 2.4.3*). There is interaction between (1) reason (ideas and concepts) conjured up by human agency and (2) the reflection about, and the reciprocity induced by, the ensuing practice. Both aspects are intertwined and play simultaneously a role: research is guided by ideas and concepts but at the same time is guided by the response from, or the confrontation with, reality. As mentioned above, truth and knowledge emerge in a continuous 'dialog' between concepts and ideas on the one hand and the response from reality on the other (op. cit.). Note how the idealist and realist viewpoints are iteratively valid. Recalling the pragmatic view on truth and knowledge, the previous insights likewise clarify that ‘what works’ emerges through the circular process fuelled by human agency, reflexivity, and reciprocity.

The notion of emergence for discovering truth and knowledge is relevant for every aspect of human existence. In pragmatic terms, the usefulness (truth) of theories and beliefs about, for example, designing aircraft, resolving economic problems, arranging society, curing diseases, establishing morals and ethics, ensuring justice, or arranging enterprises, all these aspects cannot escape the dialog with reality. Within this continuous dialog, their respective truth (validity, usefulness) will be discovered: it will emerge. This continuous dialog has yet unknown outcomes. It is all about learning, reflecting, and discovering. There is always ambiguity, no absolute knowing and no absolute certainty, since through the dialectic, reciprocal, reflexive relationships, new unknown and unforeseen phenomena will emerge that necessitate adapting existing theories or beliefs. Comparable viewpoints are presented by pragmatism, as mentioned above. The crucial notion of emergence is further discussed below when summarizing theories of society.

Finally, the very notion of truth implies that truth is principally intersubjective: truth holds for everybody. It would seem inconceivable to have permanently conflicting views that are all considered true. That is not to say that in a given period of time, no conflicting views exist, but the intersubjective view on truth holds that in time, fuelled by experiences, a (for the time being) true view (theory, belief) will emerge. This is, we feel, the essence of the consensus theory about truth (Sect. 2.3.5*).

When discussing the essentials of society and enterprises, we will argue that the perspective outlined above has profound implications for governing and designing enterprises and hence has profound implications for the whole trajectory from strategy development to the ultimate implementation.

2.2.7 Teleological and Ontological Perspectives

A Dramatic Shift

In spite of numerous and fundamental problems, the basic positivist tenets about science remains dominant: rationally and logically discovering truth about the (mechanistic, physical) world, guided by theoretical concepts and grounded in empirical evidence. We have discussed the various labels under which these tenets are presented, which collectively are identified as ‘scientism.’ One typical aspect of scientism is that meaning and purpose of human experiences have become completely out of scope (cf. Sect. 2.4.1*). As sketched, ancient, premodern science was concerned with *why* worldly phenomena occur as they do. Based on everyday experiences, explanations were provided about the *meaning* and *purpose* of phenomena. Explanations were teleological,[2] expressed by *teleological language*. The

[2] From the Greek word *telos* = goal, purpose

purpose and goals expressed by the teleological perspective point to a relationship with a human being formed by the meaning of the purpose and goals.

Contrary to premodern science, modern science does not raise the question about the purpose of phenomena. No teleological explanations play a role. In modern science, *describing how* things are has replaced *explaining why* things are. Various philosophers didn't see that as progress since a mechanistic world is essentially a meaningless world (cf. Sect. 2.4.1*). So, modern science has eliminated meaning and purpose from the scientific discourse and merely *describes* how things and phenomena are. Meaning relationships play no role. Put differently, modern science describes the nature of things and phenomena: the properties of their being. The associated language is identified as *ontological language*.[3]

The Fundamental Incommensurability

As indicated, the two types of languages play a role for one and the same phenomenon. Describing *what* or *how* something is or *why* something is follows from two fundamentally different perspectives. These perspectives have no common ground for relating one perspective to the other. For example, it is possible to describe an unknown object in terms of its physical manifestation. But such description gives no clue about its purpose (if any). Language used for describing *what* something is thus differs fundamentally from language that explains *why* something is. More formally expressed, we can say that the teleological language and ontological language, used respectively within the two different perspectives, are incommensurable. The languages (words, concepts) have no common ground that allows reasoning from a concept in one language to the other.

2.2.8 Postmodernism: Questioning Claims of Modernism

Other than the ancient, premodern (unscientific) truth-seeking approaches, the belief in reason, rationality, and the (scientific) ability to obtain truth and knowledge is commonly identified with the term 'modernism.' Next to modernism's quest for truth and knowledge, the viewpoints of modernism inherently include a propensity to control and a belief in (social) malleability. Science will offer the functional rationality of goals, means, and techniques with which we can increasingly better understand how to control and create malleability. Progress was expected in many areas, such as better government, increasing harmony by weeding out wrong opinions, scientific convergence on the true account of reality, gradual diminishing dissent on political issues, solving more and more social problems, and the transition to a more peaceful society.

There are many forms of postmodernism, but some common characteristics are that they all share discontent with the (scientific) beliefs and values of modernism.

[3]From the Greek word *óntos* = being and *logos* = word, speech, reason, doctrine

Discontent is expressed by some important points summarized below (cf. Sect. 2.4.4*).

Pessimism and Skepticism About Rational Organizing

Typical for postmodern thought is pessimism and skepticism about rationality and social malleability. An enormous growth in scientific knowledge, technology, and economy can be witnessed, as is the inability to create a proper society. Modern science *describes what is* and does not *prescribe what ought to be*. Rationality has industrialized and bureaucratized the modern world. Instrumental rationality of societal and institutionalized 'technics,' focused on economics and efficiency, has thus become the dominant mode of thinking and often an instrument of domination and control. Not value and purpose but the inherent rules and targets of institutionalized rationality are the all determining factors, which drive out morality. Adding to that is the all too often experienced sheer complexity of the institutionalized rationality that people fail to comprehend, for which failures they are nonetheless held accountable. Feelings of alienation and loss of sense of reality are inevitable results. Postmodernism argues that the amalgamation of science, technology and capital has captured and monopolized 'knowing, wanting, and having,' whereby the focus on rational and economic production has annihilated human values outside this focus. But in a deterministic, valueless universe, with human beings bereft of free will (as some modern scientists would have it), no one is accountable.

Heterogeneity, Incoherence, and the Illusion of Social Malleability

Postmodernists emphasize inevitable heterogeneity, incoherence, and the illusion of social malleability. Even in mathematics, the pinnacle of reason, there is, according to Gödel's theorem, ultimately no unity and no coherence but heterogeneity, incoherence, and uncertainty (cf. Sect. 2.3.6*). Hence, we must acknowledge and accept heterogeneity and incoherence: the multiple interpretations of phenomena and the plurality of opinions. Differences between societies, cultures, and ideologies can be widely noticed. Cultural heterogeneity implies divergence in norms and values. So, there can be no claims about how to live that apply universally to all people, places, and cultures. Shared beliefs and purposes or an overarching goal are seen as illusions, and the requirement for unity is distrusted. There is no need to ground societal measures on the desire for social cohesion, since that cannot be achieved. Not surprisingly, also malleability, the ability to design or control the development of a society, is considered a fantasy. Yet this fantasy has society in its grip. Moreover, modernism's concept of homogeneity and integration brings with it the conviction that social issues are of an integral nature and thus need integral answers to address them. Postmodernists reject these so-called 'totalizing' approaches.

Other Troubling Issues

In addition to the previous points, other issues raised by postmodernism are the following. First is the denial of objectivity and 'objective' language. There is always *interpretation* about phenomena against the context of the conceptual 'language' used. Postmodernists deny the sharp distinction between fact and interpretation. The vocabulary of language cannot be legitimized by referring to an outside world that language supposedly reflects, because that real outside world cannot be known. Language does not describe reality but creates reality. What passes for reality is merely an observation-dependent construction through shared language. Ultimately, knowledge amounts to no more than relationships between sentences. Hence, there is always circularity since legitimatization of truth rests on other sentences and cannot be based on some external objective ground (cf. Sect. 2.4.4*). Second, postmodernism stresses the power of discourse. By ‘discourse’ is meant a vocabulary of mutually supporting concepts, terms, and statements that have developed over time to describe, define, and deal with a subject matter, such as the ‘medical discourse.’ In other words, it is the language of professional and scientific disciplines. Individuals must follow the explicit and implicit rules and practices of the respective discourse, or ‘language game,’ in order to rightfully participate in the various discourses. As such, the language of the discourse has a power-enforcing function: it determines what counts as true and who can speak with authority about the subject matter. Third is questioning of human rationality and independence. Behaving rationally and independently is impossible since an individual’s opinion is determined by many influences: culture, propaganda, upbringing, education, and so on. Regarding the power of discourse discussed previously, this external power likewise conditions certain behavior of the individual participating in the discourse. Humans are formed by all sorts of external influences, not by independent, autonomous rational decisions about personal development. What modernists call ‘reason’ is itself also a socially constructed disposition.

2.2.9 Philosophy of Language

Language is essential for individual human development and socialization, as well as for societal development. The notion of ‘language’ refers to various aspects, such as (1) a system of words and marks and combinations and patterns thereof, (2) the use of human sound utterances or written symbols in organized combinations or patterns to express thoughts or feelings, or (3) nonverbal method of communication through a system of signs, symbols, and gestures. Philosophical viewpoints about language can be divided into two main perspectives.

Main Perspectives on Language: Logical and Social

First is the *positivist perspective* whereby language sentences are analyzed in view of their logical and truth consequences (cf. Sect. 2.5.1*). Words or sentences have meaning because they correspond to things or states of affair in the world. Sentences are thus considered as propositions: they assert something, such as ‘there are other forms of life in the universe’ or ‘consuming artificial sugar is dangerous for your health.’ The meaning of a sentence refers to objective conditions or phenomena in the world or universe. The ability to verify the meaning of a sentence is a key concern. Understanding a sentence means understanding the manner of verification. Sentences (propositions) that cannot be verified are considered meaningless. We have discussed the various objections against the positivist perspective on language, rendering the strict logical position as untenable (op. cit.).

Second is the *social or pragmatic perspective* that focuses on the use of language in social interaction (cf. Sect. 2.5.2*). If people would use language solely within the perspective of the logical and factually verifiable content of sentences, then the whole of social fabric would break down. As said, analyzing language solely from the perspective of its logical structure is rather abstract and completely detached from the way human beings use language in their everyday writing, communicative, or conversational practices. Meaning is considered not something abstract like the truth condition of a sentence or the possibility of verification but a phenomenon that plays an important role in human social behavior, as existential phenomenology has clearly seen. Meaning is thus always context dependent. Understanding a sentence means knowing the social context in which the sentence is used. As shown, sentences do not have a literal meaning in some abstract way, independent of people using the sentences in a certain context (op. cit.). In line with the core tenets of existential phenomenology, we note that prior to making language the object of scientific study, as done by the theories in the previous section, language is already understood through social interaction. That is, through the language practices of social behavior.

Language Determines How We Think

Section 2.2.1 introduced the viewpoint that the human mind bestows its own concepts upon the world and thereby determines how we see the world. More generally, the 'mental glasses' of language determine our perceptions of the world and shape our interests and investigations. Language affects the way we think and defines our worldview. Essentially therefore, language is a tool of thought (cf. Sect. 2.5.2*). For our topics of interest, understanding and designing enterprises, we thus emphasize that the language about enterprises has a profound influence on thinking about enterprises. The language must be such that enterprises can be addressed in all their multifaceted aspects and must include the language of the foundational social sciences.

Formalizing Communicative Patterns

According to the pragmatic view on language, the meaning of words or sentences depends on the context in which they are used. Ignoring that context is seen as an unsound abstraction from linguistic reality. Precisely herein lie the difficulties and limitations of formally modeling the communicative patterns within social groups. Moreover, language is essentially a tool for thought, rather than merely a means of communication. Nonetheless, despite these difficulties, formal modeling of communication patterns is what proponents of 'speech act' theories aim to do (cf. Sect. 2.5.3*).

Based on the essential characteristic of communication as the transmission of meaning from a speaker/sender to a hearer/receiver, we have discussed the elementary communicative activities, identified as 'communicative acts' or 'speech acts.' Numerous speech acts can be envisioned. For providing some oversight, various authors have proposed taxonomies that express patterns of speech act usages. Unfortunately, the various taxonomies differ and are a topic of considerable debate (op. cit.).

Habermas' Theory of Communicative Action

An important contribution to the understanding of the role of communication in society is provided by Habermas (cf. Sect. 2.5.4*). According to Habermas, social order is based on intersubjective consensus among human subjects about their social reality which is the result of rational communication. Social order is created by cooperating human subjects, whereby cooperation results from rational communication. There is reciprocity, since conversely, through human cooperation, shared understanding about the social reality develops. Communicative action takes place when people coordinate their actions through shared understanding based on intersubjective consensus about the social context of communication. This perspective on communication sees the use of language for establishing intersubjective consensus as more important than the use of language for describing how the world is. Intersubjective consensus is the basis for shared views and action. Understanding, consensus, and agreement are key notions and the basis for human cooperation.

Habermas' taxonomy of speech acts is based on analyzing communication pertinent to three worlds: (1) objective world, whereby communication is about the factual state of affairs in the world; (2) social world, characterized by communication about intersubjective relationships; and (3) subjective world, whereby communication expresses personal experiences. Based on these three worlds, six speech act categories are defined by Habermas (op. cit.). Examples of speech acts are *confirm* that refers to a state of affairs in the objective world, *request* expressing an aspect of an intersubjective relationship, and *complain* that expresses subjective feelings. When discussing essential enterprise modeling in Chap. 4, we will return to the use of speech acts for formally modeling communication patterns between employees.

Since communicative acts aim to achieve mutual consensus, an important aspect is the so-called 'validity' of speech acts. Validity concerns the conditions under which the speech act can be considered as a valid, that is, as an appropriate and genuine form of communication. With reference to the three worlds mentioned above, three validity conditions must be fulfilled: (1) *truth* that the statement refers to factual conditions in the objective world; (2) *rightness*, which concerns the normative and moral conditions of the speech act within the social world; and (3) *truthfulness*, which regards the sincerity of the speech act within the intersubjective world. If these three conditions are not fulfilled, the speech act is invalid: no rational communication, on which consensus should be based, has taken place. Social order can thus only be established through valid communicative acts (op. cit.).

2.2.10 Viewpoints of Eastern Philosophy

Different schools of thought express a variety of Eastern philosophical viewpoints: Hinduism, Buddhism, Confucianism, and Taoism (cf. Sect. 2.6*). Some main points are the following. Contrary to Western thought that is directed to understanding the world, Eastern thought is concerned with understanding oneself. This distinction compares with the Western focus on *rationality* and the Eastern focus on *experience*. Rather than seeking explicit, formal, and objective knowledge, the Eastern view sees knowledge as tacit, subjective, and intuitive, based on experience. Such knowledge is difficult to gain systematically and logically. Tacit knowledge is integrated and emphasizes the oneness of mind and body: wisdom that is acquired from the perspective of the entire personality. These views on knowledge make it understandable that ambiguity, uncertainty, and the many shades of meaning are more easily handled within Eastern thought. Further, seeking knowledge is not reductionistic: the search for elementary 'building blocks' as the topic of investigation which is typical for Western thought. Eastern thought is noticeably more concerned with 'the whole.' Hence, the Eastern search for knowledge has always been more holistic, based on the belief in the interconnectedness of all things, such as oneness of humanity and nature. The integrated, holistic view asserts that the wholeness of knowledge cannot be reduced to the summation of knowledge about smaller parts. Contrary to the Western reductionistic view, parts can only be understood by understanding the whole: the whole gives meaning to the parts. The explanatory arrows do not point downwards but upwards (op. cit.).

Understandably, the holistic perspective of Eastern thought is likewise manifest by the focus on the group, such as the attention for society as a whole. It concerns personal integrity, fulfilling one's duty, and social harmony. The Japanese concept of *wa* expresses group harmony and encompasses unity, cohesiveness, and team spirit. The focus on group harmony means that not such much formal roles and functions are of primary concern, but morals, norms and values.

Finally, like the pragmatic view about discovering truth and knowledge, also the Eastern view stresses the processual and emerging path to discovering truth and knowledge. The path develops and unfolds as one goes. Hence, the path, as is the truth, is an emerging phenomenon. Distinct from the Western focus on how things are—their *being*—the Eastern tradition (thus) focuses on change and growth and hence focuses on *becoming*. Knowledge and truth concerns the *process* of discovery (op. cit.).

2.2.11 Implications for Enterprise Governance and Enterprise Engineering

Theories and Concepts Used

The strict empiricist view must be rejected. Concepts and theories cannot be deduced from observational phenomena. Interpreting and understanding social and enterprise phenomena necessitate concepts and theories to give these phenomena meaning, as the viewpoint of idealism/nominalism argues. Case studies about social and enterprise phenomena without underlying theoretical concepts and associated theory are thus not very useful.

The idealist/nominalist view emphasizes that concepts and theories are of our own making. This 'language' defines enterprise reality and hence defines how enterprises are perceived. The concept of ontology—that what is considered to exist —is therefore always relative: it depends on the language (theories, concepts) used. Language determines the available space for the interpretations that give our experiences meaning and our actions direction. Conversely, for adequately addressing enterprise aspects that are deemed valid and important, a critical assessment about the adequacy of the concepts and theories used is essential: they must have the proper articulating ability. Since the nature of enterprises is not objectively given, the type of concepts and theories—the language and its articulating ability—is instrumental for addressing crucial enterprise aspects considered relevant for customers, employees, and stakeholders in general. Our observations below and in the next chapter will clarify that all too often the language used for addressing enterprises, the 'mental glasses,' is largely inadequate, such that crucial enterprise aspects about the nature of enterprise change and facets of enterprise design are ignored.

The very possibility of synthetic a priori propositions implies the possibility for a science about enterprises that is universally applicable, based on the insights of the foundational sciences (Hoogervorst 2018). Put differently, it is possible to define concepts and associated theories that are universally applicable to enterprises pertinent to enterprise governance and enterprise design. Again, the concepts and theories are of our own making and determine our ideas and convictions about enterprises and how to arrange them. Hence, it is of crucial importance to establish adequate concepts and theories.

Enterprise Mechanization: Belief in Social Determinism

As we will further outline in Sect. 2.3, the mechanization of the worldview inevitably leads to the mechanization of enterprises, as is symbolically expressed by Fig. 2.3. Mechanistic, deterministic thinking induces the belief in 'social malleability' or 'social determinism,' whereby mankind can arrange the totality of social phenomena in a desired way through causal mechanisms: a set of predefined causally related instructions, operations, and steps with an inherent, deterministic outcome. Within enterprises, this type of thinking is manifest in various forms of assumed causal mechanisms of planning and control. An unquestioned belief in planning and

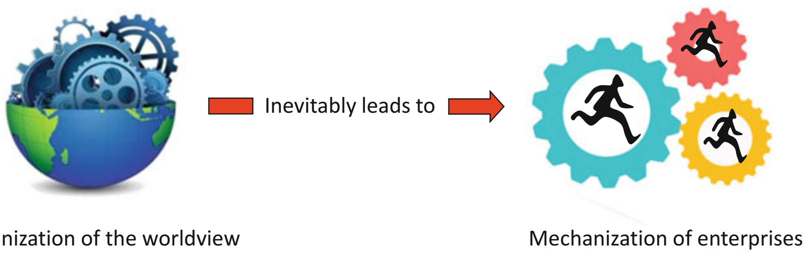

Fig. 2.3 Enterprise mechanization

control is noticeable in, for example, forecasting and validation, (strategic) planning and reporting, performance targets and assessments, budgets and accounting, and so on. Control needs data, so the necessity for massive recording and documenting is associated with the planning and control mindset. The latter aspect is a clear manifestation of reductionism: more knowledge through more detail. Reductionism is further visible by focusing on functional entities only (departmentalism) without starting from and considering the larger enterprise whole. As further summarized below, parts of the larger whole can only be understood by understanding that larger whole. Contrary to the reductionist view, the larger whole gives meaning to the parts. Note that this is precisely the point made in Sect. 1.4.1: the purpose (function) of an information system can only be understood through understanding the (construction of) the larger enterprise whole.

Enterprise Mechanization: Ignoring Social Interaction

Because of the mechanization of the worldview and the inevitable mechanization of enterprises, employees are seen as instrumental actors executing their instrumental role. But, the very nature of enterprises as social entities implies that interpretation of the social context by employees as *social* actors always plays an important role. Enterprise phenomena are interpreted and valuated against a conceptual context—the 'mental glasses'—that employees (or enterprise members in general) develop through social interaction. Only instrumentally considering enterprise phenomena without paying attention to the interpretive aspects is thus not only inadequate but all too often perilous since negative interpretations breed employee cynicism, disaffiliation, alienation, and contempt. As postmodernists emphasize, no 'objective' enterprise reality exists. What is perceived as reality is always determined by the language used, which develops through social interaction of enterprise members. It is this social construction of enterprise reality that, in positive or negative ways, has a crucial influence on employee involvement and motivation and thereby a crucial influence on enterprise performance. Lack of enterprise coherence and consistency appears to be a key determinant for the development of negative interpretations and the associated language about enterprise reality (cf. Sect. 4.6.8*).

Moral Considerations Are Inevitable

The summary of the ontological and ideological foundation will further indicate that the mechanistic and deterministic worldview is also rather dominant pertinent to enterprises. Enterprises are basically seen and designed as (money-making) machines. In doing so, the inevitable consequence is losing sight on the moral meaning and purpose of activities because these aspects are simply not the ones the mechanistic perspective brings forward, since mechanistic and deterministic thinking essentially excludes the idea of voluntary action and thereby the notion of morality with all too often disquieting consequences. Seeing employees in an instrumental way as 'cogs' in the machine, treating customers as a 'case,' following rigidly rules and regulations without caring about their original intent, the ruthless pursuit of profit maximization, all these are disquieting manifestations of the loss of meaning and morality induced by mechanistic thinking. Hence, they are the consequences of the 'mental glasses' used. However, as the summary of the ontological and ideological foundation also will indicate, the nature of enterprises is essentially nonmechanistic and nondeterministic. Acknowledging these characteristics necessarily implies acknowledging and addressing the notion of morality within the context of enterprises (cf. Sect. 2.3.4*). Ideological considerations are thus inevitable.

Truth and Knowledge: Enterprise Coherence and Consistency
An important aspect concerning the theories about truth is especially noteworthy: the aspect of coherence and consistency. Given a certain reference, the various viewpoints held must be coherent and consistent and must not express or manifest discrepancies and contradictions. Within the context of enterprises, this requirement is often violated. When summarizing the ontological foundation below, we will mention that employees often experience an incoherent and inconsistent behavior context, which creates shared disquieting opinions about the untruth and untrustworthiness of managerial communication and action. In terms of Habermas' theory of communication, communication is invalid in these cases because the validity conditions of truth, rightness, and truthfulness are not satisfied. Often a serious discrepancy exists between the explicit 'official' managerial communication and the implicit communication of managerial action with detrimental consequences (Hoogervorst et al. 2004). Feelings of employee cynicism and disaffiliation will inevitably develop. As mentioned above, these feelings develop in social interaction whereby employees interpret and valuate their behavior context. Lack of coherence and consistency of the behavior context appears to be a key determinant in developing negative interpretations, and associated language, about enterprise reality. As we will further show, the behavior context is (thus) a core aspect of enterprise design.

Truth and Knowledge: Implications for the Process of Change
Next to the coherence and consistency of viewpoints, another core aspect is the emerging nature of truth and knowledge. They come to light in a circular, iterative, and dialectic process wherein reason, ideas, and concepts are intertwined with practical experiences and responses from reality. Further, the pragmatic view on truth focuses on practical consequences and 'what works.' Specifically within the social context of enterprises, considerations must center around what is practically relevant and what is good and beneficial for stakeholders. This means an orientation to the process of finding out how to accomplish, say, strategic desirables. Pragmatism likewise acknowledges the social and evolutionary view on seeking truth and knowledge: 'what works' and how to realize strategic desirables are discovered in social interaction, ultimately leading to consensus about 'what works' and how to realize strategic desirables. Again, truth, 'what works,' as well as the process of its discovery are emerging phenomena. This insight has, as we will see in Chap. 3, profound implications for views on enterprise governance and the utilization of enterprise engineering.

Circular Relationship: Enterprise Members, Their Context, and Language
The insights of existential phenomenology are of crucial importance for understanding and designing enterprises. First, as a consequence of human agency, reflexivity,

and reciprocity, there is always ambiguity, no absolute knowing and no absolute certainty, since through the reciprocal relationship between human beings and the world, or between enterprise members and their enterprise context, new unknown and unforeseen phenomena will emerge. On the one hand, enterprise members shape the enterprise context, while on the other hand, they are shaped by that context. Further, the reciprocal relationship between enterprise members and the enterprise context implies that the context must be arranged such that it manifests desired characteristics in view of their influence on the behavior of employees and management. Such arrangement involves ideological viewpoints.

Within the reciprocal and reflexive relationship, learning about enterprise reality takes place. This reality is not objectively given as the realist, mechanistic viewpoint induces to believe. Through the process of learning, phenomena are expressed by means of a language concerning enterprise phenomena that is likewise learned. This language thus determines how enterprise phenomena appear and are interpreted. The language 'system' defines the available space for the interpretations that give experiences of enterprise members meaning and actions direction. There is oneness (unity) of enterprise members and their experiences with the enterprise. This is the ultimate source for how enterprises are experienced and perceived. All enterprise events, such as management actions, the introduction of rules and regulations, or organizational change attempts, are products of human agency as well as the subsequent topic of reflexivity and reciprocity whereby, again through human agency, enterprise members (or stakeholders in general) react to these events. It is this ever-present circular relationship, completely ignored by the mechanistic, linear, and top-down hierarchical view, that determines the success of enterprise actions.

Function and Construction Incommensurability

We mentioned the fundamental insight that teleological language, expressing the purpose of something, and ontological language, describing what something is, are incommensurable. Since these languages (words, concepts) have no common ground that allows reasoning from a concept in one language to the other, there can be no formal, algorithmic procedure—a causal set of operations, instructions, and steps with an inherent deterministic outcome—to proceed from a teleological perspective to an ontological perspective and vice versa. Applying this insight to artifacts, we must acknowledge that language about the purpose of the artifact (function) is incommensurable with language about the physical manifestation of the artifact (construction). Of crucial importance is the insight that there can be no formal, algorithmic procedure to proceed from functional statements to constructional statements. Otherwise stated, there can be no formal procedure to proceed from the enterprise purpose and goals to their conceptual realization through enterprise design. The next chapter will outline that this crucial insight has profound implications for strategy development and the realization of strategic desirables and hence has profound implications for the perspective on, and the arrangement of, enterprise governance. When discussing enterprise engineering in Chap. 4, this crucial insight translates into the insight that the function of a system is not a system property but a relationship with a system user, while the system's construction is a system property.

The Postmodern Doubt: Acknowledging Heterogeneity and Diversity
Postmodern doubt attacks the core of our convictions: (1) the ability to create (design) a social entity, (2) the importance of unity and integration, and (3) the imperative to adopt a moral absolute in the form of employee-centric organizing that should universally be applied. Apart from the distrust in rationality and reason, postmodernists question concepts or approaches that denote unity, commonality, universality, absoluteness, and totality, hence the questioning of (1) universal rationality and universally applicable moral ideas and societal arrangements, (2) the common aspect of human nature in all individuals, and (3) absolute truth. As we have summarized, postmodernism criticizes the ideas of modernism by pointing to disquieting social effects of those ideas. But rather paradoxically, such criticism assumes in our view universal moral principles on which the qualification of the social effects, hence the criticism, is based. Moreover, rectifying the disquieting social effects requires intentional actions which must assume some form of social malleability. Societal malleability is not necessarily a total illusion, although unproductive manifestations of that illusion can be noticed in various areas. But, for example, adequate public transport, good education, and health care can be arranged. Likewise, attempts to reduce the crime rate, improve traffic safety, induce energy-conscious behavior, or introduce employee-centric organizing are not necessarily hopeless.

Nonetheless, postmodernism's critical reflection makes clear that mechanistic, deterministic thinking inevitably induces the belief in social malleability, whereby mankind can arrange the totality of social phenomena in a desired way. As further summarized below, we must acknowledge that this thinking has also produced enterprise mechanization and the instrumentalization of employees. Much of the control assumed by mechanistic thinking appears to be an illusion. Acknowledging the limits of social malleability and control means acknowledging the crucial importance of emerging organizing, as stressed in the introductory chapter. Further, we must also acknowledge the inevitable heterogeneity and diversity of enterprise reality, contrary to the harmonious picture. Diverging interests and conflicts are indeed all too often manifestations of enterprise reality. While admitting that many forms of heterogeneity and diversity are perfectly acceptable or even preferable, such as in the form of local autonomy in various areas, we maintain that unproductive forms must be avoided in view of their degrading influence on enterprise performance.

The 'Mental Glasses' of Language
As summarized, language affects the way we think and defines our worldview. Essentially therefore, language is a tool of thought. Recall the postmodern claim that language does not describe reality but creates reality. What passes for reality is merely an observation-dependent construction through shared language. For our topics of interest, understanding and designing enterprises, we thus emphasize that the language used about enterprises has a profound influence on thinking about

enterprises. Using a language that is strongly influenced by the mechanization of the worldview mentioned above is thus likely to induce a mechanistic perspective on enterprises. Hence, is likely to exclude the social aspects of enterprises. All too often, the language is reduced to four concepts: processes, information, applications, and infrastructure. Contrary to this limited vocabulary, the language about enterprises must be such that enterprises can be addressed in all their multifaceted aspects. Such language is incomplete without the language of the foundational social and organization sciences.

Rational Communication: Speech Acts

Enterprises are social entities based on social interaction whereby communication in all its variety is an important aspect. The theory of communicative action presents a specific viewpoint about that variety by modeling it according to elementary chunks of communication: the communicative acts or speech acts. Such an approach has merit for understanding and designing enterprises for several reasons. First, the purposeful endeavor of enterprises necessitates social order which, according to Habermas' theory of communicative action, results from enterprise members who coordinate their actions through rational communication based on reaching mutual understanding. Second, the purposeful endeavor needs organizing. As mentioned in Sect. 1.1.1, organizing consists of three different facets: (1) arranging predefined activities and means for the presumed way of organizing, (2) defining guiding rules and regulations that guide activities for addressing certain perceived emerging phenomena, and (3) creating conditions to induce novel activities for addressing unforeseen emerging phenomena. The latter two facets concern emerging organizing. Communication is vital for all three facets which takes place within the context of background knowledge that the speaker and hearer of a speech act must be familiar with for communicating effectively. Finally, as mentioned earlier, in the case of enterprises, the validity conditions for proper speech acts—truth, rightness, and truthfulness—are often not fulfilled. Disgruntled customers and cynical employees are obvious consequences.

Central to Habermas' view is the supremacy and power of rational discourse that would cause consensus and acceptance of the validity claims. However, reflections on the consensus theory of truth outlined various troubling issues concerning that view (cf. Sect. 2.3.5*). Also the universal validity of the three validity aspects has been questioned, as is the assumption that the world we live in can be divided into the objective, social, and subjective worlds. The paragraph about existential phenomenology argued that these perspectives are highly interrelated. Nonetheless, as we will outline in later chapters, the views presented by Habermas can be fruitfully applied within the social context of enterprises for expressing the cooperative patterns of the presumed way of organizing.

Eastern Thought and Enterprise Competences

Section 1.3 defined an enterprise competence as a capacity or ability formed by the unified and integrated whole of skills, knowledge, culture, and means for adequately performing an organizational activity. Eastern thought clarifies that an important aspect of employee knowledge concerns tacit knowledge that is gained through working experience and social interaction. Unlike the mechanistic view that sees changing employees merely as an instrumental replacement of resources, Eastern thinking makes us aware about how such replacement affects enterprise competence since tacit knowledge might be lost. Further, a competence is a unified and integrated *whole*, a condition that needs a holistic perspective that Eastern thought emphasizes, contrary to the predominant reductionistic tendency within Western thought. Recall that the holistic perspective is likewise required for ensuring enterprise coherence and consistency, a crucial condition for ensuring enterprise strategic and operational performance. Another facet of the Eastern holistic perspective is the focus on the group and the relationships of group members: the social entity (enterprise or enterprise unit). Group harmony, shared norms and values, and group performance are of vital concern, rather than often self-centered, individual criteria, (performance) goals, and competitive attitudes. When summarizing the social and organizational theories in the next section, we will see how important these views are within the context of enterprises. This likewise holds for the next characteristic of Eastern thought: the focus on 'the way,' the process towards becoming.

Eastern Thought and Enterprise Governance

Arguably, within the mechanistic worldview, the focus is predominantly on outcome—results, goals, targets—since it is believed that the causal chain of deterministic measures (planning and control) will produce the outcome. Chapter 3 will show this belief as highly naïve and untenable, contrary to the mechanistic worldview. Eastern thought teaches that the nature of activities (what needs to be done) is based on insights (truth and knowledge) that emerge in the process of activities. Like also pragmatism and existential phenomenology emphasize, Eastern thought emphasizes that seeking truth and knowledge is an iterative, evolutionary and dialectic process, whereby reason and practice are intertwined: guided by ideas and concepts, and at the same time guided by responses from reality. Through this interactionist process new knowledge and truth are discovered while the nature and direction of the process itself likewise emerge (the road develops as we go). The usefulness of concepts, theories and beliefs emerges out of the constant 'dialog with reality.' It is all about learning, reflecting, and discovering. These insights have definite consequences for the perspective on enterprise governance and hence have consequences for the perspective on enterprise strategy development and subsequent change.

Summary of Philosophical Implications

1. Concepts for studying and understanding worldly phenomena are of our own making: the world, society, or enterprises 'have' no concepts. Concepts define the language for describing and addressing phenomena. For enterprises, the concepts used—the 'mental glasses' of language—are often inadequate, such that the crucial nature of enterprises is not captured and crucial aspects relevant for enterprise governance and enterprise design are thus ignored. Critical assessment about concepts used (necessary and sufficient) is thus important.

2. The dominant mechanistic worldview induces deterministic thinking which is likewise dominant in thinking about society and enterprises. This thinking expresses a propensity for assumed causal mechanisms of planning and control in various forms. Control needs data, so massive recording and documentation ensues, as a manifestation of reductionism: more knowledge is presumed through more detail.
3. Mechanistic and deterministic thinking perceives only instrumental relationships and by their very nature ignore social interaction and the emerging (nondeterministic) outcome of that interaction. Ignoring social interaction and the interpretive aspects within enterprises is perilous since the interpreted enterprise reality determines employee feelings and behavior.
4. Mechanistic and deterministic thinking excludes the idea of voluntary action and thereby the notion of morality with all too often disquieting consequences. However, as the summaries of the social and organization theories will show, the nature of enterprises is essentially nondeterministic, and the notion of morality in enterprise and individual behavior cannot be avoided. Ideological considerations are thus inevitable.
5. Theories about truth and knowledge point to the importance of coherence and consistency. Accepting statements about enterprises as truthful thus requires coherence and consistency with the experienced and socially constructed enterprise reality. This condition is often violated, leading to employee distrust, disaffiliation, and cynicism. Similarly, Habermas' theory of communication stresses truth, rightness, and truthfulness as conditions for valid communication. Incoherence and inconsistency invalidates communication. Establishing enterprise coherence and consistency is, as mentioned before, a crucial enterprise design aspect.
6. Truth and knowledge, as well as finding out 'what works,' develop in an emerging way, as is tacit and implicit knowledge. Truth and knowledge can never be the outcome of a mechanistic, deterministic process. An adequate perspective on enterprise change must acknowledge this emerging nature: truth and knowledge about how to effectuate change unfolds in an emerging process of social interaction. Hence, truth and knowledge about how to effectuate successful change can never be the outcome of the assumed causal mechanisms of control mentioned in point 2.
7. There is a continuous circular relationship—ignored by the linear, top-down, hierarchical mechanistic and deterministic view—between enterprise members and their context: they shape the context and are shaped by the context, whereby language for interpreting enterprise reality likewise develops. Since the enterprise context is (also) an aspect of enterprise design, the context must be arranged such that the continuously evolving circular relationship has desired characteristics, especially concerning the behavior of enterprise members.
8. The incommensurability between teleological and ontological language translates into the incommensurability between language about (system or enterprise) function and construction. As a consequence, there can be no mechanistic, deterministic process to proceed from functional expressions (requirements

and desirabilities) to their constructional realization. Hence, always an emerging process is involved, as point 6 summarizes, for progressing from functional desirabilities (*what*) to constructional realization (*how*). This fundamental insight determines the nature of enterprise governance.

9. The purpose and goals expressed by teleological language point to a relationship with a human being formed by the meaning of the purpose and goals. Ontological language describes the nature of things and phenomena: their being or their properties. The incommensurability between the two languages follows from the fact that describing what something *is* says nothing about a possible meaning relationship. Translated to systems, the function of a system is not a system property but a relationship with a system user, while the system's construction is a system property.
10. There are limits to social malleability and control. Acknowledging these limits means acknowledging the crucial importance of emerging organizing. Successful emerging organizing depends on proper design.
11. In addition to the predominant reductionistic perspective, a holistic perspective is essential since the meaning and purpose of 'parts' follow from the meaning and purpose of the larger whole. The meaning and purpose (mission, maxims, overarching guiding principles, etc.) of enterprises must be coherently and consistently (point 5) translated to the meaning and purpose of enterprise units and their staff and operationalized through enterprise design.

2.3 Ontological Foundation

Recall that the term 'ontology' refers to the study about the nature of 'being' or reality. With reference to the important maxim introduced in Sect. 1.1.2 stating that that all theories of organization are based upon a philosophy of science and a theory of society, the ontological foundation of enterprise governance and enterprise engineering concerns the nature or reality of society and enterprises. Our starting point is summarizing the perspectives about the nature of society for understanding the different theories of society. Together with the philosophical viewpoints discussed before, they form the basis the various theories of organization which are subsequently summarized.

2.3.1 Studying Social Entities

Investigating the nature of social reality inevitably leads to the question about the ontological nature of social reality (cf. Sect. 3.2.1*). Answers respectively refer to the objectivist/realist philosophical viewpoint and the idealist/nominalist viewpoint discussed previously. As we have outlined, for the objectivist and realist, the social world external to the individual is a real world of tangible, objective social structures and institutions. On the other hand, the nominalist and idealist maintain that the notion of an objective social world is a reification. Basically, there are only relationships between individual human beings.

The ontological assumptions mentioned above have profound consequences for methodological viewpoints about studying social phenomena. Within the objectivist/realist philosophical assumptions, society is, like the physical world, seen as an entity external to human individuals which can be studied according to the methods of the 'positive sciences,' with physics as an example to emulate. The positivist stance creates a focus on the essential 'building blocks' of society, whereby law-like relationships between social phenomena and/or social building blocks are to be discovered. Not surprisingly, this viewpoint is likely to induce a deterministic idea on human nature. Indeed, the very essence about discovering 'social laws' through positivistic methods of investigation is the assumption that human beings behave according to these laws. Hence, *determinism* is closely associated with objectivism, realism, and positivism, as mentioned when summarizing the philosophical foundation.

On the other hand, the idealist/nominalist ontological viewpoint stresses that social reality is the product of human consciousness. Put differently, reality is 'socially constructed': what is considered to be the case, the social facts, is the outcome of social interaction. Not objective 'facts' but human consciousness is the ontological foundation of reality. Knowledge is gained through personal experience whereby human beings interpret social phenomena and discuss them in social interaction. The view that considers social interaction as the basis for obtaining knowledge is identified as *interpretivism*. Since the focus is on the interactions between human beings, the way human beings interpret and arrange the social world in which they live is of main concern. Understanding social phenomena can only be obtained by considering the individual perceptions of the human beings engaged in social interaction. Because the external social context is of no primary concern, nor is that context considered in a deterministic sense, the perspective on human behavior is *voluntaristic*: behavior is the outcome of free will. Note that this viewpoint closely associates with the insights of existential phenomenology summarized in Sect. 2.2.6. The horizontal axis of Fig. 2.4 represents the two viewpoints about the ontological nature of social reality.

2.3.2 Theories of Society

The different philosophical perspectives about the social ontology and their associated research focus lead to different theories of society, either concerned with social integration, regulation, and stability or concerned with social change and reform. These concerns are depicted along the vertical axis of Fig. 2.4. Together with the horizontal axis, four quadrants are defined for characterizing archetypical theories of society (cf. Sect. 3.2.3*). Based on the characterizing dimensions, three archetypical theories of society are summarized.

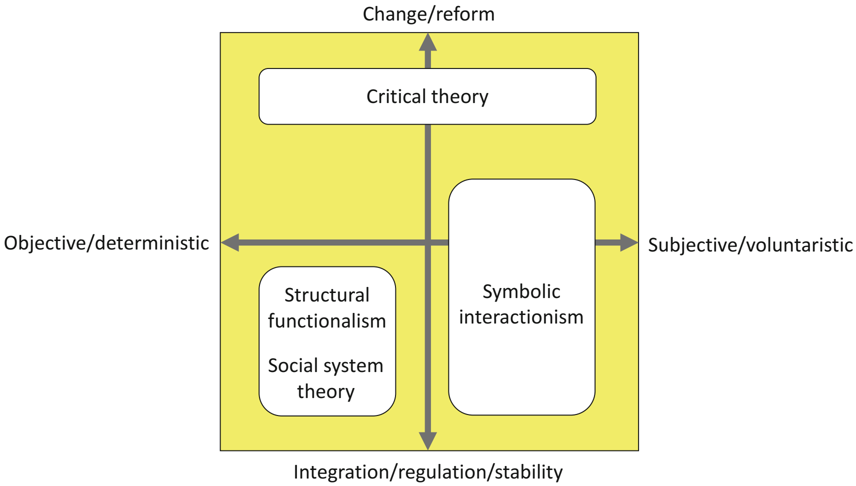

Fig. 2.4 Characterizing aspects for theories of society

Structural Functionalism

This theory of society represents a macro-level view on society and is positioned in the lower-left quadrant of Fig. 2.4. Society is considered an objective entity which defines the level of observation and analysis. Echoing the 'realist' position, the objective society is considered to exist independently of human subjects and their viewpoints about it. Society comprises certain elements, identified as *institutions* that perform certain *functions* for the stability and continuation of society as a whole (cf. Sect. 3.3.2*). A social institution *has* a social structure with the 'parts' of the social institution, being the social roles, and their interrelationships. The role-based notion thus allows conceiving a specific human being as being part of more than one social institution, thus having more than one social role. Various social institutions can be identified, such as the family, economic, financial, educational, religious, military, justice, or political institutions (op. cit.). Additionally, we identify what we might call 'shared systems' to support individuals or the offerings of social institutions. Shared systems are often technology-based systems. Examples are the digital service systems for information retrieval, communication, or transactions, of which the digital ledger based on the blockchain technology, discussed in the introductory chapter, is a prime example.

Within the structural functionalist perspective, various types of institutional functions and their consequences are identified (op. cit.). When discussing the enterprise design science in Chap. 4, we will define the notion of 'function' more formally.

As said, social institutions offer functions such that they contribute to social stability, continuation, and solidarity. Put differently, social institutions are expected to contribute to social *integration*. Hence, structural functionalism is based on an assumed overall *functional unity* of society. Hence, structural functionalism implies two important notions. First is the notion of *differentiation*, which refers to the different functions of the societal whole. Second is the notion of *integration*, referring to the condition whereby the different functions are harmoniously working together for the functioning and continuation of the whole society. Societal unity, functional interdependence, order, and stability are emphasized based on an underlying, shared moral order. A cohesive society originates in moral order, which is visible in the way essential tasks in society are arranged: divided up and assigned to social institutions (op. cit.). Hence, societal and moral order is based on the *division of labor* (*differentiation*), as expressed by the different functions offered by societal institutions, and the *integration* of these functions.

Structural functionalism is considered the dominant theory of society. Previous reflections clarify the position of this theory in the lower-left quadrant of Fig. 2.4. The objective, mechanistic, and deterministic perspective has induced a widespread application of the models and methods of the natural sciences to the study of social phenomena (op. cit.). Not surprisingly, the structural functionalist perspective is likewise dominant in thinking about enterprises.

Social System Theory

Different system categories can be identified, such as real, objectively existing systems like a clock, an animal, or the earth, but also conceptual systems are identified, like mathematics or logic (cf. Sect. 3.3.3*). For now, we restrict ourselves to real systems. A variety of system definitions are mentioned in the literature. Essentially, a real system is viewed as a unified whole of elements that operates in an integrated manner pertinent to a certain goal. Recall that Sect. 1.1.1 introduced the notion of organizing in order to overcome the natural tendency towards disorder and chaos (entropy). Since a system manifests a certain level of organizing as opposed to chaos (entropy), a system can also be defined as "a bounded set of interrelated components that has an entropy value below maximum" (Baily 1994, p. 44/45).

Unity and integration are core concepts within the system approach. Conversely, system thinking is considered essential for achieving unity and integration adequately. System thinking is anti-reductionistic by advocating a holistic focus which is essential for achieving unity and integration. Traditionally, the reductionist viewpoint holds that knowledge about a whole can be obtained through knowledge about its constituting parts. Conversely, the system perspective maintains that acquiring knowledge that way is untenable. Rather, knowledge and meaning about the parts can only follow from knowledge and meaning about the whole.

Next to real system types (open, closed, and isolated), also various system manifestations can be identified (cf. Sect. 3.3.3*). Well known are mechanical and biological systems, and a society has been compared with both these forms. We will elaborate on the limitations of the mechanical (machine) metaphor later, specifically when summarizing ideological viewpoints on work and enterprises. For now, it suffices to say that the machine metaphor falls well within the mechanistic worldview and tends to induce deterministic thinking. Both the mechanical and organic metaphor cannot properly account for social change since these metaphors assume a relatively steady-state relationship with the environment and also assume a rather stable system structure since the basic ‘makeup’ of a machine and organism isn’t changing. So, a fundamental problem associated with mechanical and biological analogies is the issue about societal development, change, and reform (op. cit.). Especially the mechanistic, but also the organismic perspective have difficulty explaining substantial, more radical change whereby the essential features of the society are changing. The morphogenic social system model introduced later aims to avoid aforementioned difficulties.

System thinking is criticized because of its excessive abstractness (op. cit.). Theoretical concepts appear difficult to apply practically for real problems. Further, the tendency to focus on harmony and (functional) integration fails to acknowledge and conceptualize power, conflict, and disintegration in social life. Comparably, the focus on system stability and preservation ignores drivers for societal change. Finally, system thinking induces a predisposition to instrumentalize human beings as system ‘elements,’ hence failing to recognize human agency and the essential social nature of society. Obviously, system thinking bears a great similarity with the structural functionalist perspective discussed above. System models are often about the system structure (system elements and their relationships), the subsystems, and so on. Social system theory is thus likewise positioned in the lower-left quadrant of Fig. 2.4. Nonetheless, while seeing an enterprise as a social system, we aim to avoid the mechanistic perspective by introducing the morphogenic social system view and subsequently the morphogenic enterprise system view. When discussing enterprise design, system thinking will be practically and fruitfully applied.

Symbolic Interactionism

Opposite the objective/deterministic position in Fig. 2.4 that characterizes the research focus of structural functionalism and social system theory is the subjective/voluntaristic position of social research. Whereas the previously discussed viewpoints objectify society and treat humans as ‘entities’ in an institution or system, researchers following the so-called interpretive paradigm take the subjective position by starting from the human individual and attempting to understand the social processes in which human individuals are engaged (cf. Sect. 3.4.1*). The subjective nature of all human affairs is stressed. Contrary to focusing on the ‘objective’ character of social reality, understanding and explanation is sought in the realm of individual human consciousness and subjectivity. Hence, society must be understood from the point of view of the human beings who are actually engaged in the performance of social activities. Put differently, the social world must be understood at the level of subjective experiences.

Given the social nature of society comprised of human beings, the interpretive paradigm is of vital importance for understanding this social nature which is seen as the emergent outcome of the activities of human beings. The interpretive paradigm closely relates to the central tenets of existential phenomenology, discussed in Sect. 2.2.6 as an important aspect of the philosophical foundation. Central is understanding the lifeworld of human beings: the phenomena and experiences within social processes that are interpreted by human beings in order to understand their social context. Interpretivism acknowledges the fundamental philosophical insight that there can be no direct access to reality, unmediated by language and concepts within that language. Both develop in, and through, social interaction. Truth and knowledge are intersubjective: they emerge as shared meaning about phenomena. Note that this belief closely associates with the philosophical viewpoint, summarized above, known as *pragmatism*.

Since society cannot be conceived without human individuals engaged in mutual interaction, the interpretive research paradigm takes this insight as the crucial notion which is central to the theory of symbolic interactionism (cf. Sect. 3.4.2*). This theory of society takes a micro-level view on society by considering individual human beings and their mutual interaction. Humans interact through symbols—images, words, gestures—as means for complex communication in every aspect of human life. Language is a prime example of a system of symbols for communication and representation.

Two principal outcomes result from social interaction. First, the intersubjective social interaction is the basis for social order, consensus, cohesion, and solidarity. As mentioned in Sect. 2.2.9, Habermas' theory of communicative action teaches that social order is based on intersubjective consensus among human beings about their social reality, which is the result of rational communication. Social order, consensus, cohesion, and solidarity are created by cooperating human beings, whereby cooperation is the result of rational communication. In terms of this paragraph, social order is the result of symbolic interaction.

Second, social interaction might be concerned with disquieting issues that human beings collectively experience. The intersubjective consensus about the troubling nature of the issues might initiate social change. Hence, as Fig. 2.4 illustrates, symbolic interactionism is not only concerned with aspects of integration and regulation in view of social order and stability but is also concerned with social change. As mentioned earlier, social change cannot be properly understood within the structural functionalist and social system theory since the interpretive aspect that lies at the heart of change is out of scope.

Social Conflict Theory

The theory of society identified as social conflict theory adopted much of the criticisms of postmodern thought summarized in Sect. 2.2.8, claiming that modernism has failed as a source and guidance for ethical and moral advancement of humanity. It is precisely on this point that the social conflict theory criticizes structural functionalism and social system theory that use the rational scientific method by merely describing the current societal situation but failing to indicate what it *ought to be* (cf. Sect. 3.5.1*). Studies are conducted about abstracted, objectified societal aspects. But such studies are criticized for not addressing real problems in society and not discussing topics worth having convictions about because the scientific concepts and method used determine the type of problems being studied. Typical in this respect is that the focus on unity, integration, and stability associated with structural functionalism and system theory inevitably ignores conflict and thereby the possibility of dealing with social change.

Evidently, the critique of social conflict theory involves value judgments and reveals normative viewpoints about disquieting social conditions. As reflected by Fig. 2.4, the critique concerns two social aspects: the macro-level, institutional aspect and the micro-level, individual aspect (cf. Sect. 3.5.2*).

The macro-level aspect of social conflict theory concerns conflicts inherent in social institutions as the result of social inequalities they create. Conflicts are, as it were, institutionalized. Insights of structural functionalism and social system theory are used when arguing that societal institutions can be a source of domination, inequality, and injustice. Radical change and reform are required to rectify these conditions.

Within the micro-level perspective, attention is paid to the individual manifestations of disquieting social conditions. Social conflict theory uses insights from symbolic interactionism to understand these individual manifestations since the notions of inequality, injustice, or social deprivation develop through social interaction. Such individual manifestations might be feelings of alienation, powerlessness, cynicism, distrust, or even inferiority. Hence, the micro-level focus is concerned with harmful effects on individual human life (op. cit.). Radical or revolutionary change is required to avoid these harmful effects. Such change emerges through social interaction. The macro-level and micro-level aspects of social conflict theory are closely related since solutions for micro-level problems of human social deprivation must come from changing macro-level societal conditions.

2.3.3 Social Interaction, Organization, and Emergence

A prime reason for the significance of symbolic interactionism as a theory of society is that only through this theory can the crucial aspects of social entities be acknowledged and understood. Four important themes of symbolic interaction can be mentioned (cf. Sect. 3.4.2*): (1) human agency, (2) interactive determination, (3) emergence, and (4) symbolization. These four themes will be briefly summarized.

The first important theme of symbolic interaction is *human agency*. Remember from Sect. 2.2.6 that this term denotes the ability to freely take action, express creativity, and seek to establish goals. Hence, symbolic interactionism sees human individuals as creative human actors. Through symbolic interaction, human actors shape and make sense of the world. In this process, social reality is defined ('constructed'). Existential phenomenology emphasizes that reflexivity and reciprocity play a central role. Recall that *reflexivity* is the condition whereby human action is based on reflection about, and interpretation of, the results or consequences of previous human actions. Additionally, *reciprocity* is the condition whereby, on the one hand, human beings shape the world through human agency and, conversely, human beings are shaped by the world they themselves have created. There is a double-sided effect since human agency itself is thus affected through reciprocity.

As a result of reciprocity and reflexivity there is *interactive determination*, which is a second important theme of symbolic interactionism. This theme is the essence of the phenomenological viewpoint: human beings and the world are of mutual implication—neither can be understood in isolation. Third, the very essence of interactive determination is *emergence*, seen as the occurrence of novel, totally unpredictable phenomena in social life. Emergence expresses the processual nature of the social world as it develops in time, created and regulated by human beings through social interaction. Said interaction is thereby also the basis for social order and integration. What kind of developments the social interaction between human beings brings forward cannot be predicted. Social phenomena are thus emergent: they appear as an unpredictable result of social organization. The notion of emergence is especially crucial for understanding social phenomena and will be further discussed in a later paragraph. Finally, the fourth theme is the notion of *symbolization*, the process whereby societal features are becoming symbols for human orientation that express meaning. All these themes have *interpretation* of the social environment by human individuals as the core underlying principle.

Symbolic interactionism expresses the notion of *idealism* and *nominalism* since reality and its characteristics are considered socially constructed, in contrast with the view of *realism* that considers these characteristics to be objectively given. According to symbolic interactionism, meaning about the world is socially produced through the process of social interaction. Different groups having different social interactions come up with different socially constructed worlds. Note that the *interpretive process* through which meaning develops is intertwined with the process of social interaction. Above viewpoints clearly echo idealism and nominalism. Further, symbolic interactionism closely relates to the philosophical viewpoint of *pragmatism*: what is considered truth and knowledge is based on social consensus. In short, the core themes of social interactionism are based on three premises (cf. Sect. 3.4.2*): (1) human action is based on meaning, (2) meaning follows from social interaction, and (3) meaning develops within the interpretive process that is intertwined with social interaction.

Symbolic interactionism has clearly seen that social interaction between individuals is the basis for social life: the reciprocal expectations for each other's behavior develops through social interaction, as are the symbols (language) that enable and define meaningful interaction. Because of human interaction, society develops and continues to function. But also the reverse is true: people develop in, and continue to function through, social interaction. Human nature is thus not an inherent personal attribute but also develops through symbolic social interaction with others. Likewise, social or symbolic interaction is the basis for learning. The process of learning is reciprocal: phenomena are expressed through symbols (language) and given meaning, while conversely the meaning of symbols (language) is learned. As is the case with human nature, also truth and knowledge are considered social phenomena. The nature of society is not objectively given, and society does not, in and of itself, present the ideas and concepts necessary to interpret and understand society (op. cit.). Ideas and concepts are of our own making. Note the idealist and nominalist perspectives.

2.3.4 Culture

Defining Culture

An important concept for understanding society and the behavior of societal members is culture. This concept emerged in the second half of the eighteenth century and was coined by anthropologists in doing ethnographic research (cf. Sect. 3.6.1*). Based on the nonmaterial (normative and cognitive) and material aspects of culture, we define culture as the whole of historically created material objects and nonmaterial aspects—values, norms, convictions, and beliefs (rational or irrational, implicit or explicit)—which societal members have learned through social interaction and which serves as a guidance for behavior (cf. Sect. 3.6.2*). Culture is an emerging phenomenon. It is based on what group members learn through social interaction.

Everyday experience teaches that language is an important part of culture because language is the essence of human communication (op. cit.). Recall that language defines and determines how we see the world. Hence, if words for designating certain concepts or ideas in one language do not appear in another language, then different worlds are perceived.

Cultural Reproduction and Circular Influence

Language is also the key to cultural transmission or reproduction, whereby the current generation passes culture to the next one. Culture is thus a relatively persistent and enduring phenomenon and is consequently hard to change. Another important reason for the tenacity of culture is the fact that culture is determined by numerous aspects that reciprocally affect one another (cf. Sect. 3.6.3*). For example, social structures, with roles and role-related behavior, have a mutual effect on societal culture in general and their institutional culture specifically. Culture will thus influence the arrangement of the structure, roles, and role-related behavior of the social institutions, while on the other hand, the operation of the institution will influence and reinforce the existing culture(s). As a case in point, bureaucratic institutions will manifest a bureaucratic culture that tends to maintain the bureaucratic institutions. Similar considerations hold for the mutual relationship between culture and shared systems, such as the influence of digital, Internet-based service systems on culture. Above observations show that, as often encountered, reciprocal relationships play a crucial role: various societal aspects influence and shape culture, while conversely, culture influences and shapes these various societal aspects.

Culture Change

Various developments create cultural change, such as new technology or the (gradual) acceptance of new ideas and beliefs. An evident example is the influx of (innovative) new technology. Also cultural diffusion manifests the transition of certain cultural characteristics from one culture to another (op. cit.).

Apart from the unforeseen emerging changes of culture, specific and intentional attempts to change culture are sometimes undertaken, such as changing a culture manifesting behavior based on superstition, individualism, or greed. Such culture change is rather difficult but not impossible. Because of the strong mutually reinforcing relationships, successful or lasting culture change necessitates addressing multiple societal aspects simultaneously. When discussing enterprises, we will identify similar strong and mutual relationships regarding enterprise culture.

Theories of Society and Culture

The concept of culture will be conceived differently within the different archetypical theories of society discussed before. Since structural functionalism is based on a macro-level view on society, culture is likewise perceived as a macro-level phenomenon. The focus is on how culture functions as an overall source of social integration and cohesion as well as a source for the common behavior of people. Interesting within this perspective is the mutual and reciprocal relationship between culture and social institutions. Alternatively, symbolic interactionism has a micro-level view on society and focuses on how culture develops as a result of human social interaction. As we have seen, language is key to symbolic interaction and is likewise key to the development of culture. Finally, the social conflict theory focuses on how certain cultural aspects drive social conflicts, such as individualistic cultural values undermining social cohesion or capitalistic cultural beliefs leading to economic inequalities and conflicts between the rich and poor (cf. Sect. 3.6.3*).

Culture as a Macro-level Societal Concept with Micro-level Behavioral Influences

As illustrated, culture is a characteristic that society *has*. Otherwise stated, culture is a macro-level societal characteristic that influences and guides human behavior. Cultural aspects are thus (also) manifest in micro-level behavior. Culture acts as an integrative force and leads to the homogenization of behavior: ways of acting common to societal members (cf. Sect. 3.7.3*). An intriguing and intricate relationship therefore exists between macro-level and micro-level social phenomena. Such type of relationship likewise plays an important role within enterprises and is thus a crucial aspect for conceptualizing and understanding enterprises.

2.3.5 Main Societal Aspects

Social Organizing and Organization

With reference to the notions of organizing and organization introduced in Sect. 1.1.1, the term *social organizing* refers to the process towards the *state* of a stable social form. We identify this stable form as *social organization*. A society is defined as an identifiable group of people who interact in a defined space by means of social organizing and who share a culture (cf. Sect. 3.7.1*). The notion of 'social organization' refers to the social structure and the functional roles within the structure and can be defined as stable and meaningful interaction relationships within a society which gives society its enduring and meaningful social coherence. Social organizing is the ongoing process of bringing *order* and *meaning* into shared social activities. Hence, social organization is the emergent result of social organizing (cf. Sect.

3.7.6*). Note the crucial aspect of 'meaning' for establishing a social organization. Likewise, the close and convoluted relationship between organizing and the meaning-creating nature of sensemaking is stressed. As mentioned, structural functionalism and social system theory have the tendency of mechanistic and deterministic thinking by instrumentalizing human beings, which has the consequence of driving out the notion of 'meaning.' When discussing enterprises as specific instances of social organization, we will encounter the same issue: attention to sensemaking and the meaning of activities is all too often absent because of the instrumental view on employees. Effective social organization is thus inherently problematic, while the very nature of organizing will be missed.

Social Organization and Unity

Similarly as in the case of a social institution, we can generally say that the social ordering of a social organization is manifest by its social structure: the pattern of social roles and their interrelationships. Hence, social organizing aims at unity and integration, and social organization is the expression thereof.

In order for social forms to continue over time, the pattern of social ordering must be maintained. This does not mean that the pattern of social ordering is static. Rather, the opposite is mostly the case: for ensuring the continuation of social ordering, there must be adaptation to changing circumstances. The endurance of social organization crucially depends on social cohesion which again refers to unity and integration. Cohesion has two facets: *functional* and *normative* cohesion. Functional cohesion refers to functional unity stressed within structural functionalism and social system theory. Normative cohesion points to the importance of a shared culture.

Division of Labor: Functional Interdependence

Because of culture, but specifically through the numerous social institutions, society has an enormous influence on the behavior of human beings. Virtually every human activity, every form of human behavior depends directly or indirectly on the provisioning of some societal functions. These functions coerce and regulate and, to some extent, standardize behavior. Societal functions offered by social institutions manifest *division of labor*: tasks are assigned to certain entities within society. Modern societies are thus characterized by mutual dependence or *functional interdependence* (cf. Sect. 3.7.3*). Division of labor and subsequent functional interdependence leads to a certain level of societal unification, which is the basis of social order.

Types of Social Action

Certain types of behavior are identified as social actions, which are considered as the essential building blocks of social relationships and therefore also essential building blocks of society. Four types of social action can be identified (cf. Sect. 3.7.4*): (1) *purpose-rational action* which concerns deliberate and rational selection of goals and the means to achieve the goals, (2) *value-rational action* whereby goals are pursued and valued for their own sake but means to achieve the goals are rationally considered, (3) *affective action* aimed at goals that are not rationally selected but based on feelings of emotional satisfaction when goals are achieved, and

(4) *traditional action* whereby actions are not based on reasoning but on common practice, customs, or habits.

In various degrees, actual actions will show aspects of these building blocks. In case of enterprises, all types of social actions play a role. Purpose-rational actions are of course rather familiar pertinent to enterprises, but the other types are, or should be, relevant as well. We might think of value-rational actions when considering how to optimally serve customers. Caring for customers or patients also involves value-rational actions. Performing tasks well just for the sake of doing them are, in Weber's terms, value-rational actions. Finally, next to traditional actions that follow from common societal practices like etiquette, also actions based on organizational rituals and mores (culture in general) are examples of traditional actions. Note that of the four types of social action, formal enterprise modeling merely addresses purpose-rational actions. Only focusing on formal models thus ignores important types of social actions within enterprises.

The Rationalization of Society: Bureaucracy and Authority

Whereas preindustrial societies were guided by tradition, industrial societies are guided by rationality: the prudent arrangement of social institutions based on efficiency and obligations stipulated by contracts. Societal rationalization was the practical manifestation of the philosophical viewpoints that led to mechanization of the worldview and further fueled by rapid technological innovation. The rationalization of society thus became visible in the machine-like nature of social institutions know as 'bureaucracies' (cf. Sect. 3.7.4*). Rationality in social organizing was an intended positive answer to arbitrariness and nepotism that not seldom characterized relationships between rulers and civilians (op. cit.). Typical bureaucratic characteristics are the following. First is *division of labor and functional differentiation*. In view of efficiency, workers are assigned specialized tasks. High levels of *formalization* is a second characteristic. Rules and regulations are defined to ensure organizational performance by instrumentalizing workers: their behavior must follow predefined instructions to guarantee organizational predictability and goal attainment. Third is *impersonality*: relationships are instrumental and functional since, contrary to arbitrariness and nepotism, everybody should be treated equally, while personal feelings might jeopardize the performance of the functional relationships. Fourth is *formal communication*: the focus on impersonality, rules, and regulations also entails formal communication between functional roles and users of the bureaucratic function. Accrued formal communication in the form of files becomes another driver for bureaucratic behavior. Fifth, there must be *personal discipline*. People must behave according to the rationality enforced by the social institutions. The sixth and final characteristic is a *hierarchy of control*: a vertical structure for supervision and 'passing down' orders and performance targets. Associated with this type of control is the *rational-legal authority* which is, unlike charismatic and traditional authority, based on position within social institutions (op. cit.). Our reflections on the topic of management versus leadership has identified fundamentally different characteristics of authority in either case (cf. Sects. 4.6.6* and 4.7.7*).

Arguably, modern bureaucracies exemplify all the characteristics briefly summarized above. Moreover, they represent virtually only rational action and rational-legal authority. Next to the advantages of bureaucracies, they also manifest various dysfunctions (cf. Sect. 3.3.2*).

2.3.6 *Emergence as a Key Social Characteristic*

Emerging Organizing

We have seen that the mechanization of the worldview is associated with the notion of determinism: the belief in the inevitable and necessary manifestation of things happening in the universe. Such belief is rather dominant in thinking about society. Specifically structural functionalism and social system theory tend to induce a mechanistic, hence deterministic, view on society. However, we have argued the inherent nondeterministic nature of complex systems (cf. Sect. 3.8*). Specifically social complexities are inherently nondeterministic and are characterized by unpredictable, emergent behavior. Such behavior emerges because of the three essential characteristics of social entities mentioned in Sect. 2.2.6: human agency, reflexivity, and reciprocity.

Recall from Sects. 2.3.3 and 2.3.5 that social organizing is the *ongoing* process of bringing order and meaning into shared social activities and that social organization is the emergent result of social organizing. This process can be illustrated with the aid of Fig. 2.5.

Suppose certain organizing actions or activities A_1 emerge within society. Numerous organizing activities can be envisioned, such as governmental interventions or activities of economic, health, or educational institutions. Creating new economic ways of conducting business, a new university discipline for teaching and research, a new communication system, a new approach to treat a disease, or a new student financial loan system; these are all social organizing activities because the social organization will change to a greater or lesser degree. Human agency is evidently essential for activities A_1 to emerge and establish their nature. Putting these activities into practice, or in Weick's words 'enacting' them, will yield or bring forward certain outcomes, results or effects, generally identified as consequences. So, the activities A_1 taken by a social entity within society will lead to the emerging consequences C_1 which create a new form of social organization. These consequences are truly emerging because people interpret, assess, reflect, and contemplate

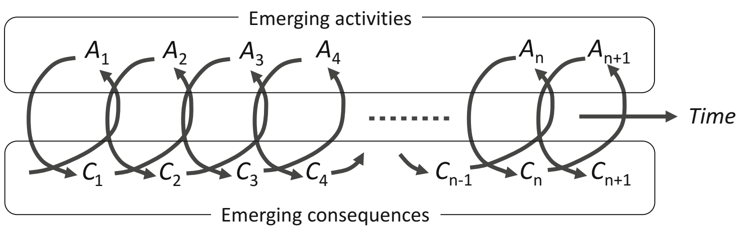

Fig. 2.5 The emerging nature of social organizing

the new situation created by activities A_1 and subsequently respond through reflexivity and human agency in unforeseen ways. These emerging consequences might differ from the intended ones and may counteract some or all of the initial intentions of the activities A_1. Depending on the nature of A_1, the emerging consequences C_1 will also emergently show that people are shaped by the newly created social organization (reciprocity). Behavior pertinent to social media is a case in point. But also the emerging consequences C_1 will be interpreted, assessed, and reflected upon (sensemaking). This and other emerging phenomena will, in an unpredictable fashion, lead to the subsequent emergence of activities A_2. The nature of the activities A_2 is thus the emergent outcome of various organizing activities which also include sensemaking about the consequences of previous activities. Executing A_2 creates the emerging consequences C_2, which form the starting point for activities A_3, and so on. Note that the emerging process of social organizing strongly contradicts the notion of social determinism and corroborates the circular relationship between members of a social entity and their context, as mentioned in Sect. 2.2.11. Recall that the summary of existential phenomenology likewise stressed the circular, reflexive, and reciprocal relationships between human beings and the world, resulting in new, unknown, and unforeseen emerging phenomena. Unforeseen things happen because not knowing is the essential condition (cf. Sect. 3.8*).

We have seen that the mechanistic character of structural functionalism virtually ignores human agency: the capacity expressing creativity, imagination, and voluntary action. But human behavior can never be fully explained by any deterministic 'laws of society.' Symbolic interactionism rejects the deterministic position about social developments. Human and social developments in all their various ramifications *emerge* out of the present social interaction as illustrated above. The future—the way society happens to proceed—unfolds as we go, as Eastern philosophy emphasizes. Contrary to the structural functionalist position, human beings are not merely passive but also active actors engaged in self-initiated behavior (human agency). Again, we recall the viewpoint advanced by existential phenomenology: humans shape the world (active) and are shaped by the world (passive), as the notion of reciprocity expresses. Symbolic interactionism likewise teaches that the notions of 'society' and 'individual' cannot be understood as independent entities but only through their interdependence.

Self-Organizing

The continuous and convoluted process of emerging actions and consequences is also a continuous interplay of various forms of sensemaking. First is sensemaking about what the organizing activities A are all about. Second, when the consequences C because of A emerge, is sensemaking of what these consequences mean or imply, which subsequently contributes to the emerging definition of new organizing activities. Unless we conceive a society as controlled by an omnipotent super intellect that does all the sensemaking and defines all the organizing activities, we must reasonably acknowledge that the continuous and convoluted process of emerging actions and consequences is fuelled from within society itself. Taking society as the level of observation, social organizing is thus necessarily self-organizing, whereby 'self' refers to the social entity.

If the social entity is conceived based on the mechanistic or organismic metaphor, then, as mentioned before, social change in the form of a new social organization is hardly conceivable or explainable since, broadly speaking, components within a machine or organism do not essentially change. So, it seems plausible that the self-organizing capacity of society can only be based on the self-organizing capacity of its 'components' being the social institutions. But these institutions are themselves social entities with 'components' as human beings. Hence, the self-organizing capacity of a social entity ultimately rests on the self-organizing capacity of human individuals. As we will further argue, for an enterprise as a social entity, the self-organizing capacity of employees is therefore crucial.

2.3.7 Ontological Dualism

Macro-level and Micro-level Aspects

Of the sociological theories summarized before, structural functionalism, social system theory, and certain facets of social conflict theory represent the macro-level perspective on society. Society is considered as an objectively given social entity that exists independently of social members and is experienced when a human being becomes a societal member. On the other hand, symbolic interactionism and certain facets of social conflict theory take the micro-level perspective. Human interactions are the primary focus, whereby societal members interpret and discuss social phenomena. Knowledge and truth about society develop through individual, subjective experiences that are interpreted and given meaning. Reality is 'socially constructed': it is the emerging result of social interaction (cf. Sect. 3.9.1*).

The Integrated Perspective: Intersubjective Objectivity

In the course of social interaction, micro-level subjective experiences are shared through language that similarly socially develops. Note the idealist and subjectivist views: social reality is not objectively given. Rather, through the process of social interaction, learning about social phenomena takes place and they are expressed by means of a language likewise learned. This language determines how social phenomena appear and thus how they are perceived. Language defines the available space for the interpretations that give experiences meaning and actions direction.

Through social interaction, an intersubjectively shared perception about the social-cultural reality emerges which provides the connection between the individual, subjective characteristics and the shared, objective characteristics of human life. So, individual subjectivity contributes to *intersubjectivity*, which is the foundation for the shared humanly constructed sociocultural reality: the intersubjective 'objective' world which is the ultimate source for how societies are experienced and perceived. For this 'objective' world, causal explanations might be formulated. Note that this perspective closely associates with the intersubjective nature of truth and knowledge discussed in Sect. 2.2.6 and is based on the insights of existential phenomenology which enables escaping the idealism versus realism divide.

Avoiding the 'Either-Or' Perspective and the Fallacy of Reductionism

As mentioned before, the ontological foundation for enterprise governance and enterprise engineering concerns questions about the nature of enterprises based on understanding the nature of society. So, the obvious question is whether the notion of 'society' refers to a real, objective entity or must be considered a reification, a name given to what are only interaction patterns between societal members. Answering this question leads to different social theories and involve different methodological issues about obtaining knowledge and truth about social phenomena. Thus, every social theory is based on an explicit or implicit social ontology: a belief about the nature of society, as discussed in Sect. 2.3.1.

For conceptualizing the social ontology, we maintain that the macro-level notion of 'society' has an ontological status that is irreducible to micro-level individual enterprise members, for example, because of the organizing relational structure of social institutions in which individual members operate. The organizing relational structure of a social institution is extrinsic to human individuals in the sense that this structure defines and 'organizes' individual human behavior and interaction patterns. This likewise holds for the macro-level influence of culture on individual behavior. Macro-level conditions thus induce micro-level individual human practices, rights, and obligations. Behavior of individual societal members can thus not be fully understood without macro-level concepts. Further, problems that individual human beings face all too often cannot be solved at their own individual level. Micro-level problems are likely to require macro-level solutions and macro-level social change (cf. Sect. 3.9.2*).

Within the micro-level perspective, attention goes to individual societal members engaging in social interaction whereby individual subjective experiences are interpreted and given meaning. A strict understanding of this perspective holds that only micro-level phenomena associated with individual societal members should be considered. Society is to be understood in terms of individual human beings and their interrelations. Only these define the ontology of society. Introducing a macro-level social ontology is seen as a reification. However, this latter position leads to an untenable form of reductionism (op. cit.). Indeed, concepts concerning the behavior of individual human beings are themselves aggregates of underlying concepts. In that case, the concept of 'personality' must also be seen as a reification since it is supposedly only determined by underlying biological concepts. But these concepts in turn are based on physical concepts, and so on. Evidently, such reductionism leads nowhere. Every level of complexity necessitates therefore its own concepts for understanding the complexity. Contrary to the reductionistic perspective, we submit that higher-level properties *emerge* out of the interaction between lower-level entities. These higher-level properties are associated with something real: it is more than just the sum of its parts. Society is real in the sense that it has characteristics and properties of its own that are not inherent in the individual societal members. Hence, these characteristics and properties must be attributed to society as a whole. The macro-level societal entity is thus more than the sum of its micro-level ‘parts.’ Moreover, this entity is of a relatively enduring nature since human individuals come and go, but the societal characteristics and properties are preserved. In that sense, human individuals experience and consider society as an external entity that enables and constrains human agency and hence affects human behavior.

Previous observations lead us to take the position of *ontological dualism*: both the macro-level (objective) and micro-level (subjective) phenomena simultaneously play a role (cf. Sect. 3.9.3*). The crucial link between the micro-level phenomena and macro-level phenomena is provided by the notion of emergence: micro-level human agency leads to unpredictable emergent macro-level phenomena. Societal macro-level phenomena are thus truly emergent since they cannot be inferred or predicted based on micro-level knowledge. Hence, both the macro-level and micro-level perspectives are essential for understanding society and addressing social issues and must thus be included in a conceptual model of society.

2.3.8 Morphogenic Social System Model

A Static or Dynamic Viewpoint on Society

A conceptual model of society refers to the composition of essential concepts and their relationships that collectively aim to represent social reality. Since society manifests a certain level of *organization*, it can be identified as a social system. A social system model should thus represent the essential constituents that make up society. These essential constituents—the ‘elements’ of the social system model—define the social ontology and should enable thorough understanding about social processes, development, and change. Conceptualizing a social system is predominantly based on mechanical or biological analogies (cf. Sect. 3.3.3*). The mechanistic analogy is fundamentally flawed since a mechanistic model cannot address adequately social change and adaptation as well as ignores human agency, reflexivity, and reciprocity as essential social phenomena. The organismic model acknowledges adaptation and change, though in a limited sense, but cannot adequately account for significant transformation. We therefore adopt the so-called *morphogenic*[4] viewpoint (Buckley 1967; Archer 2013). This viewpoint must be distinguished from the so-called *morphostatic* viewpoint that focuses on processes that aim to maintain the current social state of affairs and hence aim to reinforce the endurance of what exists. In system terms, morphostatics involves negative feedback: eliminating deviation from the existing state. Alternatively, the morphogenic viewpoint addresses social developments and change into new forms, hence social formation. As the label ‘morphogenic’ suggests, a morphogenic system is self-reproducing. Such systems are also identified as ‘autopoietic systems’ (Maturana

[4]From the Greek words *morphe* = shape or form and *genesis* = (the beginning of) creation

and Varela 1980). Hence, an autopoietic or morphogenic system is a system that produces new system manifestations by means of the existing system manifestation: change comes from within. Morphogenesis thus essentially means *self-organization* in an unpredictable, emergent way and totally driven from within society. The term 'self-organization' must be used with care to avoid a misleading interpretation as if human beings are autonomous regarding the nature of self-organization. However, as outlined below, the strong mutual relationships between the elements of the morphogenic social system model mean that autonomy can never be absolute: it is always enabled and constrained by the existing social context (cf. Sect. 3.9.4*).

Based on various sociological viewpoints, we consider three fundamental, highly interrelated concepts central for understanding social developments: *structures and systems*, *culture*, and *human behavior* (op. cit.). These concepts make up the morphogenic societal conceptual model and define the morphogenic social system. As mentioned above, the term 'morphogenic' aims to express the societal capacity to generate its form: the way it is organized. Figure 2.6 shows the graphical representation of the morphogenic social system model.

Mutual Relationships

In view of the argued position of ontological dualism, the morphogenic social system model contains macro-level and micro-level aspects. Social structures and shared systems represent the macro-level perspective. Likewise, the macro-level aspect of culture refers to shared cognitive and normative aspects. In that sense, culture is something a society *has*. But culture also includes the micro-level perspective: the beliefs, norms, and values of human individuals that are shared through social interaction. Individual human behavior is a micro-level aspect, but the resulting group behavior with common characteristics is a macro-level aspect. We have outlined that strong mutual relationships exist between the three elements of the social system model (cf. Sect. 3.9.4*). Briefly summarized, these relationships follow from cultural reproduction, discussed in Sect. 2.3.4, and the argued relationships between culture on the one hand and social structures (with roles), shared systems, and human behavior on the other hand. For example, the economic structure and associated systems will influence norms, values, and beliefs about economics and economic behavior, while conversely, cultural aspects about economics will influence the development of the economic structure and systems. The

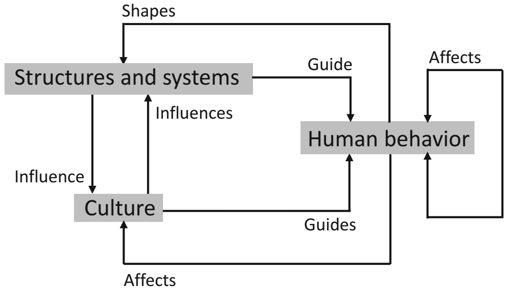

Fig. 2.6 Morphogenic social system model

additional relationships between structures and systems and human behavior exist since behavior must be coherent with the embedded characteristics of the social structures that human individuals are part of. Both the structures and systems as well as culture *enable* as well as *constrain* human agency and hence guide human behavior. Conversely, it is human behavior that affects and shapes the development of culture and social structures and systems. Finally, the circular relationship concerning human behavior expresses the fact that individual behavior affects group behavior, and conversely, group behavior affects individual behavior (op. cit.).

Unlike the physical relationships between the components of a mechanistic or organismic system, the relationships within the morphogenic social system predominantly find their nature in communication and language. We have outlined that reflexivity and reciprocity play a crucial role in the nature of the relationships between human behavior, culture, and social structures and systems. Because of the strong mutually reinforcing relationships between the three elements of the morphogenic social system model, successful or lasting social change necessitates addressing the three elements simultaneously. This is a crucial point that likewise must be acknowledged in the case of enterprises.

2.3.9 Morphogenic Enterprise Model

Conceptual Models of an Enterprise

The previous paragraph mentioned that a social system model is often based on mechanical or biological analogies. Likewise, two conceptual models have been dominant in thinking about enterprises: (1) the *mechanistic* model, based on conceptualizing the enterprise as a machine, and (2) the *organismic* model, which is based on seeing the enterprise as an organism. Because of the mechanization of enterprises mentioned in Sect. 2.2.11 and the viewpoint of structural functionalism outlined in Sect. 2.3.2, the mechanistic model is very persistent. However, as in the case of society, this model cannot adequately deal with enterprise change and adaptation, as well as ignores employee agency, reflexivity, and reciprocity as essential phenomena within enterprises. One might also observe that the mechanistic model in fact excludes any cognitive notion associated with enterprises. The organismic model acknowledges some enterprise adaptation and change but cannot adequately account for significant transformation. Cognitive abilities are recognized, but the concept of an organism in fact implies seeing the enterprise as a single-minded system. Both the mechanistic and organismic models are considered inadequate.

When practicing the employee-centric theory of organization, the notion of employee involvement is key. All employees use their cognitive capacities for operational activities as well as for enterprise change. Such involvement cannot be understood within the organismic model, let alone the mechanistic model. Properly conceptualizing enterprises from the employee-centric viewpoint must be based on the ontological perspectives presented previously. Apart from the cognitive capabilities of management, this means acknowledging the cognitive capacities of employees and employee agency and reflexivity as manifestations of these cognitive capacities. These are characteristics of a social entity that an enterprise is. Hence, we have labeled the associated enterprise model the *societalistic* or *socio-cultural* model (cf. Sect. 3.15.1*). In view of the cognitive capacities of employees, the societalistic model of an enterprise is a poly-minded model: all employees can, and are expected to, address operational contingencies and contribute to enterprise strategic developments, as we will stress when summarizing the ideological foundation.

The Enterprise Conceptual System Model

Since enterprises are social systems, we base the enterprise conceptual model on the morphogenic social system model introduced in the previous paragraph. Figure 2.7 shows the morphogenic enterprise conceptual system model.

All four components of the enterprise conceptual system model have been thoroughly discussed in Hoogervorst (2018).

Mutual Relationships

In view of our focus on practicing the employee-centric theory of organization, we distinguish human behavior in two categories: employees and management. As in the societal case, the depicted relationships are highly reciprocally influential, whereby the specific nature is obviously different and also contingent on specific enterprise circumstances. For example, information systems can enforce the strict compliance with certain rules and regulations and thereby enforce certain forms of employee and management behavior. Similar effects are induced by, for example, accounting, assessment, performance reporting, and reward systems. Conversely, there is the influence of employees and management on the development of the structures and systems, which is arguably contingent upon specific enterprise circumstances. Other important relationships are those that involve culture. As mentioned before, various phenomena create the reciprocal relationships between culture and other societal aspects (cf. Sect. 3.6.3*). The relationship between culture and

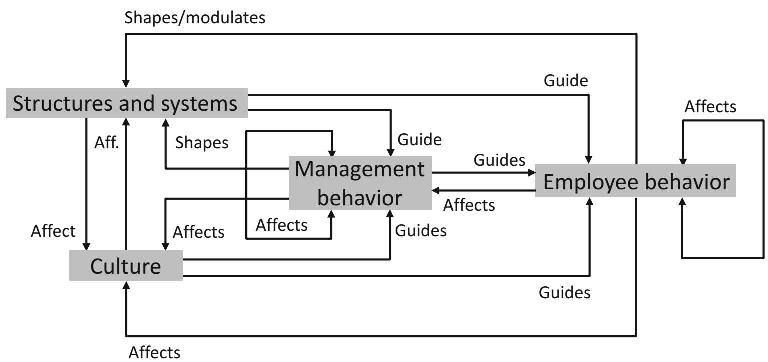

Fig. 2.7 Morphogenic enterprise conceptual system model

other enterprise aspects can be understood in a similar vein. For example, if performance reporting (an aspect of structures and systems) only concerns productivity and efficiency, associated norms and values will develop that exclude those concerning quality and customer support and satisfaction. Behavior expressing the cultural characteristics will likewise follow. Conversely, said behavior will affirm and continue existing cultural characteristics. Many failed strategic quality improvement initiatives are attributed to nonsupportive culture and management behavior. Hence, close relationships exist between enterprise structures and systems, culture, and behavior (cf. Sect. 3.15.2*). Finally, the mutual relationships between the components of the morphogenic enterprise system model further follow from the strong relationship between the formal and informal system as argued by institutional organization theory (cf. Sect. 3.13.4*).

Similarly as in the societal case, the morphogenic enterprise conceptual system model offers possibility for expressing ontological dualism as discussed previously. This dualist perspective enables addressing both the macro-level and micro-level phenomena, which is essential for understanding enterprise developments and change. Understanding the nature of the relationship between both types of phenomena is based on the foundational social and organization sciences. As we will argue below, the morphogenic enterprise conceptual system model is also essential for ensuring enterprise coherence and consistency in conducting enterprise-wide design.

Beyond Structural Functionalism

We observed that structural functionalism is the dominant theory of society. In the next paragraph, the different perspectives of organization theories are summarized, whereby the dominance of structural functionalism is similarly apparent. With reference to the morphogenic enterprise conceptual system model introduced above, the structural functionalist viewpoint is thus concerned with enterprise structures and systems, as expressed by the traditional focus on processes, functional roles, systems to support the processes and roles, and the various infrastructural arrangements to support the systems. Attention to these topics is evidently necessary but not sufficient.

The insufficiency of the structural functionalist perceptive is obvious by noticing that three out of four aspects (components) of the morphogenic enterprise model are not addressed. However, in view of the crucial importance of social and emerging organizing discussed before, aforementioned omission is detrimental since culture (norms and values) and behavioral aspects are precisely the aspects determining the ability of enterprises to address emerging phenomena. Note that structures and systems, by their very (mechanistic) nature, cannot address those phenomena. Structures and systems should be designed such that they can support emerging organizing. Going beyond the structural functionalist perspective is therefore crucial, and the concepts of enterprise engineering must enable this enlarged design scope. Case studies about successful enterprise change demonstrate that success does not primarily concern structures and systems (that would be rather trivial) but first and foremost concerns the other components of the morphogenic enterprise conceptual model (cf. Sect. 3.15.2*).

Addressing Organized Complexity

When discussing the foundational insights for enterprise governance and enterprise engineering, the problem of adequately addressing *organized complexities* was mentioned as a persisting problem confronting modern science (cf. Sect. 1.2.1*). Such complexities differ from two other categories: so-called (1) 'organized simplicities,' like mechanisms and machines, and (2) 'unorganized complexities,' like traffic flows. In the two latter cases, scientific approaches have been developed to address the complexities. Not so however, for the category of organized complexity. Hence, a core problem confronting modern science is developing theories and associated methodology and methods for addressing problems of organized complexity (op. cit.).

Enterprises show enormous variety in various facets, such as customers, employees, business partners, suppliers, legislation, means, processes, information, technology, etc. All these facets have relationships that are convoluted and dynamic. Enterprises are therefore characterized by emerging phenomena, implying that much organizing is of an emerging nature since organizing must respond to these phenomena, as stressed earlier. Complexity is further increased because the enterprise history also determines the nature of the complexity which develops over time, not only due to technological progress but also in the form of culture. In view of these numerous facets of enterprises, they can rightly be qualified as organized complexities: highly complex, as well as highly—but not necessarily properly—organized. Not properly organized appears more often than not. Highly organized thus merely means a high level of formal relationships between enterprise facets. Enterprises are sociocultural systems that rank high on Boulding's hierarchy of complexities (cf. Sect. 1.2.2*). Recall that within such complexities, aspects like roles, communication, norms and values, meaning, and the interpretation and development of social reality play an important role.

Despite the enormous difference between the organized complexity of enterprises and organized simplicities, much thinking about enterprises remains at the simplistic level: enterprise conceptualized as regulated machines (op. cit.). Although higher-level complexities exhibit characteristics of lower-level complexities, such as structure and feedback, the higher-level complexities cannot be addressed solely with the concepts of lower-level complexities, in the case of enterprises, by focusing on structures and systems only. Hence, for enterprises, we must move beyond structural functionalism, as argued previously. We submit that the theories, methodology, and methods for enterprise design, based on the morphogenic enterprise conceptual system model, might provide a fruitful approach for properly addressing the organized complexity of enterprise.

2.3.10 Organization Theories: Scope

In view of the macro-level and micro-level perspectives on society summarized before, these perspectives are similarly noticeable regarding organization theories, hence theories about organizing. Broadly speaking, organization theories focusing on the macro-level aspects of organizing are concerned with the design of the enterprise as reflected in its structures and systems (cf. Sect. 3.10.1*). Typical is the emphasis on the formal aspects of structures and systems as means to create a causal, predictable organizational 'system.' Proper arrangement of structures and systems is assumed to be the key to 'organizational effectiveness,' hence the key to enterprise performance (cf. Sect. 3.10.2*).

On the other hand, organization theories focusing on micro-level aspects are concerned with behavior and attitudes of individuals within enterprises and the conditions that influence or determine behavior. Next to behavior, important topics are learning, motivation, culture, management and leadership, and the relationship of those topics with the design of work (cf. Sect. 3.10.1*). Unlike the macro-level viewpoint, proper attention to aforementioned micro-level aspects is considered the key to enterprise performance. Note that the theoretical distinction between macro-level and micro-level theories of organization is somewhat unfortunate since, as the morphogenic enterprise conceptual system model expresses, macro-level and micro-level aspects play simultaneously a role. Insights of micro-level theories of organization can only be effectively applied under proper macro-level conditions. Integrated attention to both aspects is thus key to enterprise performance. As we will observe, the absence of an integrated approach addressing both types of theories is in our view a prime reason for lack of practicing micro-level organization theories. Important foundational micro-level insights about behavior, motivation, learning, and leadership are thus important (cf. Sects. 4.3* and 4.6*). Summarizing these insights in detail exceeds the scope of this chapter.

Organization theories can also be classified with reference to the time frame of their development. Four main categories are commonly used: *classical*, *neoclassical*, *modern*, and *postmodern* organization theories. Without claiming to be complete, we have discussed a total of 20 theories (cf. Sects. 3.11* through 3.14*). Some of the theories provide guidelines for design. Within the limited scope of this chapter, we will therefore briefly summarize (1) traditional perspectives on organizing and management; (2) theories acknowledging the social aspects of organizing; (3) contingency theories; (4) theories that acknowledge the emerging nature of organizing, as stressed in the introductory chapter; and (5) critical theories.

2.3.11 Traditional Perspectives on Organizing and Management

Starting with the classical writings of Taylor, Fayol, Weber, and Urwick, the traditional perspectives on organizing and management developed into an almost unquestioned mindset (cf. Sects. 3.11.1* through 3.11.4*). Many theories are highly management biased and consider an enterprise from the perspective of management. An enterprise is an objective entity that management can control. Typical is the instrumentalization of employees as production resources who are directed and supervised by management and are generally not expected to submit meaningful contributions other than their instrumental role. Thinking is essentially considered a management prerogative. Employees are basically passive: their behavior is defined by the organizational structures and systems on the one hand and, on the other hand, by managerial directives that outline the work that has to be carried out. Division of labor often implies deskilling of employees: the breaking up of work in simple tasks in order to make the performance of the enterprise predictable. Hence, the enterprise should behave 'machine-like', which perfectly fits the instrumentalization of workers. Focus on rules and regulations is favored as the formal, impersonal way of working. Employee behavior is 'institutionalized' and obtains a machine-like status. Institutional theory has clearly seen that the macro-level institutional context of an enterprise acts as a behavioral driver (cf. Sect. 3.13.4*). Behavior follows from the rule-like, taken-for-granted ways of conduct. Instrumentalization of employees requires that functional roles within the enterprise structure must be fulfilled such that employees are interchangeable and the performance of the enterprise does not depend on personal employee qualities.

Traditional organization theories are primarily concerned with organizational structures and systems that express the institutionalized rationality and embedded practices of management. Reorganizing means restructuring and/or the redesign of systems. Management should concern itself with organizational structures and systems for planning, commanding and directing, coordinating, controlling, organizing and staffing, reporting, and budgeting. An essential aspect within these traditional tasks is decision-making. Organizing and decision-making are closely associated, if not equated, and are the privileges of management since they supposedly have the skills and knowledge to do so (cf. Sect. 3.12.5*). Two types of activities are identified: deciding and doing, whereby deciding is of central importance. Similarly, two categories of people are identified: (1) the 'operatives' who actually produce the organizational outcome and hence are 'doing things' and (2) the 'nonoperatives' who, through decision-making, influence the behavior of the operatives (cf. Sect. 3.12.6*). Accountabilities and responsibilities are transmitted via the hierarchical structure of communication. The structure of decision-making is thereby considered an element of primary importance for establishing orderly and rational decision-making processes. Within this view on organizing, there is a hierarchy of decisions whereby decisions pertinent to the enterprise overall purpose and goals are followed by subsequent decisions within the management hierarchy. Noticeably, the decision-making process is implicitly seen as a top-down process, and the management hierarchy is paralleled with a hierarchy of decisions. Associated with the hierarchy of decisions is respective behavior (activities) for realizing the objective of the respective decisions. Adequately achieving organizational objectives is thus first and foremost the result of the decision-making (op. cit.). Together, the aspects mentioned constitute the *formal organization*: the conscious, deliberate, and purposeful ways of organizing. The next paragraph will summarize the importance of the *informal organization.*

Next to structural functionalism as the theory of society influencing organization theories, also the social system perspective is applied to theories of organization, such as the *open system viewpoint* formulated by Katz and Kahn (cf. Sect. 3.13.6*). Conforming to the organic metaphor, the overall enterprise system comprises several subsystems delivering certain functions to the enterprise system as a whole. A number of generic subsystems are identified (op. cit.). Fully in line with perspectives given above, management is seen as the locus for coordination, control, and directing. Adding to the previous system viewpoint is Miller's *living systems theory* (cf. Sect. 3.13.8*). Likewise, the organismic perspective is taken for this theory which is based on concrete systems in the biological and social world. Living systems are considered open systems and capable of self-organizing, that is, capable of self-renewal. As we have argued, it appears rather difficult to practically operationalize the living system viewpoint in the case of enterprises (op. cit.).

Notwithstanding their longevity, the influence of the structural functionalist and social system perspective is still considerable. Thus, principles that follow from seeing the enterprise as a machine or organism still dominate organizational practice. The structural functionalist and system view on enterprises is expressed by the focus on instrumental roles of employees within the enterprise organizational structure. It is about the behavior associated with functional roles.

We notice that the traditional perspectives on organizing are typical for the macro-level perspective of organization theory. A relatively stable internal and external enterprise context is assumed such that the predefined work patterns as well as the management principles and tasks continue to make sense. Note how the traditional perspectives on organizing clearly manifest the strong relationships with the different theories of society and the associated research paradigms identified in the lower-left quadrant of Fig. 2.4. The objectivist, structural functionalist characteristics of this type of thinking can be readily identified. The organization is seen as an objective entity that management can control based on clearly defined structural and behavioral patterns that define and characterize the day-to-day operation. Determinism is thus another typical characterization, expressing the belief in causal relationships between organizational phenomena as expressed by the structural patterns. Note how this approach perfectly fits within the mechanistic worldview and the subsequent mechanization of enterprises (cf. Sect. 3.11.6*). Unfortunately, other viewpoints, notably that of symbolic interactionism which is essential for understanding the social and emerging aspects of organizing, remain almost completely unexplored as far as theories of organization are concerned.

2.3.12 Acknowledging Social Aspects

Unlike the mechanistic viewpoint, some organization theories argue that the working environment is not 'objectively' given but must be considered as carriers of social value and meaning. Explanations about enterprise phenomena must thus (also) be given at the level of meaning these phenomena have for the employees involved, because they *interpret* the phenomena, as argued by the viewpoint of symbolic interactionism. Under the labels *human relations* and *human resources*, attention to the working environment led to applying psychological insights to optimize the performance of individual employees through proper working conditions (cf. Sects. 3.12.1* and 3.12.2*). Despite the humanistic flavor associated with attention to proper working conditions, this approach to human labor basically continues to view employees from their instrumental role within enterprises and hence continues to view employees as human sources of labor under management control.

Because employees interpret the formal working environment as the expression of the formal organization, several organization theories acknowledge the development and enormous influence of the *informal organization* next to, or even in opposition to, the formal organization (cf. Sect. 3.12.5*). The informal organization develops as the shared mores, beliefs, and customs of organizational life. It develops alongside the social construction of enterprise reality. Unproductive differences between the formal and informal organization might thus develop. Although the formal organization of an enterprise represents the rational organization, the rational (formal) facets will never overcome or dominate completely the nonrational, informal facets of an enterprise. In view of the crucial notions of reflexivity and reciprocity discussed before, employees will reflect about the formal organization and react to this organization in ways that will reduce the effectiveness of the formal rational organization. These two organizations can be separated conceptually but are practically inseparable. An intriguing viewpoint is that also the informal organization becomes 'institutionalized' by manifesting and representing the 'unwritten rules' and shared beliefs, norms, and values of the informal system (cf. Sect. 3.13.4*). In this way, the informal organization becomes independent of the individual human differences and becomes a persistent informal aspect associated with, and emerging through reflexivity and reciprocity from, the formal organization. The formal predefined action patterns of the formal organization will thus be modified, modulated, and influenced by the emerging characteristics of the informal organizing aspects. Put differently, the formal organizing aspects will not be manifest as they 'objectively' are since they are interpreted and, through reflexivity and reciprocity, modified and modulated by human actors. Hence, also the formal organizational characteristics emerge because of the influence of the informal organization. Noticeably, this perspective acknowledges interpretive aspects in view of the social 'construction' of the informal organization, comparable to the construction of social reality discussed before. So, institutionalization of the formal way of organizing brings forward the institutionalization of the informal way of organizing, which is an emerging process that (1) instills shared beliefs, norms, and values and (2) through human interaction defines organizational reality (op. cit.).

Despite acknowledging the social aspects, primary attention often continues to go to the formal aspects of organizing and to the instrumental role of employees. Hence, viewing employees as human sources of labor under management control continues. Some organization theories broke with the underlying assumptions of this view (cf. Sect. 3.12.3*). Key under these different assumptions is the conviction that employees want to contribute to enterprise performance and desire to be engaged in meaningful work. In doing so, employees want to take responsibility and initiative and utilize their full capacities and potential. In short, employees desire to express human agency also in working life. Within this view, work should thus not be inherently distasteful such that formal (management) control is deemed necessary for adequate performance. Enterprises must therefore create conditions for employees to use their capacities and develop their potential. Management behavior must be conducive to employee involvement and commitment, whereby some employee self-control and self-direction are guiding principles. Influential regarding these human-centered views were the theories on employees and management formulated by McGregor (*Theory X* and *Theory Y*) and Likert (*Systems of management*). Participation and involvement of employees are viewed as important and to be arranged via participative management practices (op. cit.). Within this perspective, the idea that employee satisfaction leads to performance is reversed. Rather, employee performance leads to satisfaction. Said performance depends on the meaning of work in relation to developing meaning and purpose in human life.

Traditional organization theories ignored the important reflexive and reciprocal relationship between employees and the context wherein they work. These theories treat the enterprise context as a 'neutral' phenomenon. An important neoclassical organization theory that acknowledges reflexivity and reciprocity is the so-called *sociotechnical* theory (cf. Sect. 3.12.4*). The sociotechnical approach aims to express a holistic view on enterprises based on the crucial interdependence between the social and technical aspects of the whole enterprise. The notion of 'technical' must be broadly interpreted as everything nonhuman, such as machines, infrastructure, buildings, and so on. Both social and technical aspects need to be jointly taken into account for optimizing working conditions and thereby optimizing enterprise performance. Note that the sociotechnical approach needs a blending of the social sciences which deal with the social system and the natural sciences which deal with the technical system. Various guidelines for the arrangement of enterprises have been developed within the sociotechnical approach (op. cit.).

Building on the neoclassical viewpoints about human relations, the organization theory focusing on the *quality of working life* specifically addresses the well-being of human individuals within the working environment (cf. Sect. 3.13.3*). The quality of working life is seen as a critical part of the overall quality of life. Contrary to considering workers instrumentally as production resources, a viewpoint that often leads to worker exploitation, alienation, and dehumanization, the quality of working life movement presents a collection of ideas and practices for creating a humane working life environment. A more humane working environment is seen as an ethical imperative since enterprises are seen as subsystems of the wider society and as such have a social responsibility that also concerns employees.

Of course, the question is how the notion of 'quality' of working life must be interpreted and operationalized in order for enterprises to offer such a working environment. Moreover, the question is also whether the notion of 'quality,' rather than being an individual appreciation of the working environment, can be generalized such that generic organizational attributes can be identified that make up, or afford, a quality working life. We will return to these questions when summarizing the ideological foundation. Note that speaking about the quality of working life expresses an unconditional position about certain aspects of organizing. Hence, the quality of working life approach opposes the contingency perspective discussed in the next paragraph by arguing that an appropriate working environment is a moral imperative and leads to better enterprise performance. This viewpoint is not generally accepted, and many enterprises continue to operate under the assumption that employee and enterprise interests are inherently adversarial and cannot be harmonized. When summarizing the ideological foundation, that assumption is challenged.

2.3.13 Contingency Perspectives

Among the modern organization theories, the contingency perspective on organizing comes in various forms, but they all boil down to the idea that there is no preferred or best way of organizing. Rather, an organizational arrangement must be contingent upon actual situational circumstances or conditions. Obviously such arrangement should acknowledge and address the actual situational or environmental conditions of the enterprise simply because these conditions affect the relationship of the enterprise with its environment. But generally accepting the idea that there is no best way of organizing seems rather questionable. For certain organizational aspects one might accept the contingency viewpoint, but not for other aspects because of, for example, moral convictions, or because of general laws that are valid in any situation. Nonetheless, the contingency approach essentially implies that there is not one optimal type of organizational arrangement or management approach. Universally applicable laws or principles for organizational arrangement must be treated with caution. All is assumed to be contingent upon specific circumstances of the environment. Notable contingency theories were formulated by Lawrence and Lorsch (cf. Sect. 3.13.1*) and Burns and Stalker (cf. Sect. 3.13.2*). In short, Lawrence and Lorsch focused on *functional differentiation* and subsequent *integration* in view of environmental characteristics the enterprise must address, while Burns and Stalker distinguished between so-called *mechanistic* and *organismic* organizing, whereby the mechanistic way of organizing is appropriate for enterprises operating under stable environmental conditions, while the organismic way of organizing is considered appropriate when enterprises face dynamic, unstable conditions.

The contingency theory proved to be influential for analyzing organizations from a managerial point of view which led to an almost exclusive attention for organizational structures and systems in view of environmental conditions. Note that no ideological considerations play a role since the internal organizational arrangement is considered only contingent upon external environmental conditions. One might argue that the contingency approach takes an amoral position.

2.3.14 *Acknowledging Emerging Organizing*

We mentioned that complexity, dynamics, and uncertainty lead to unpredictable emergent phenomena and make the mechanistic approach questionable. Hence, as argued in the introductory chapter, organizing must first and foremost acknowledge its emerging nature.

Continuously Evolving Flow of Events

Among the classic theories of organization, the one formulated by Mary Parker Follett takes an exceptional place (1924, 1941). She clearly understood the close, continuously evolving interrelationship between macro-level and micro-level organizing aspects. Also in the context of organizing, these two aspects cannot be isolated. Follett speaks about the *circular response* that can be noticed in human behavior and social situations (cf. Sect. 3.11.5*). Circular response essentially means that after initiating something with full control over what is initiated, absolute control is lost since the emerging nature of the response is determined by the responders, which subsequently determines further action in an emerging fashion, and so on. The circular response unifies initial organizing action and response to that action. Both aspects define the so-called *total situation*: the momentary, here-and-now status of organizational affairs. The 'total situation' is thus always the evolving reciprocal situation—the circular response—in which the unity of experience unfolds. Recall that the philosophical viewpoint of existential phenomenology likewise expresses this circular process. Within this evolving circular process, there is unity of experience about the subjective and objective phenomena. Experience is not after-the-fact interpretation, but experience and interpretation are intertwined and part of the same evolving process. Note how this perspective closely concurs with social and emerging organizing discussed in Sects. 2.3.5 and 2.3.6, respectively. Figure 2.8 graphically expresses the previous thoughts.

Because of human agency, reflexivity, and reciprocity, the character of the circular response alters. New objective reality emerges, and subsequently new thinking about that reality emerges because of the circular response. Thinking and doing are thus also reciprocally related. Acknowledging and understanding the process of circular response means acknowledging and understanding the 'deepest

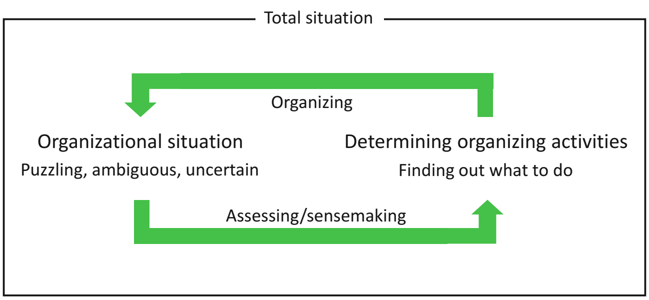

Fig. 2.8 Organizing and sensemaking as integral aspects of the total situation

truth of life' (op. cit.). The circular response expresses the notion of reciprocity: we create the environment we live in and at the same time that environment creates us.

Our previous reflections indicate that organizing and sensemaking are integral aspects of the total situation. This refers to the *Law of the Situation*: control must be an integral aspect of the organizing process itself (op. cit.). The emerging phenomena of the 'total situation'—the momentary, here-and-now state of organizational affairs—defines what needs to be done, not management merely giving orders without understanding the situation. Only in the *shared* context of the total situation can the meaning of communication be properly understood. Through cooperative relationships in which communication and the coordination of actions takes place, also the shared cultural context emerges (op. cit.).

These insights have profound consequences for understanding the nature of control within enterprises. Because of the Law of the Situation, the specifics of 'what to do next' emerge out of the evolving organizational situation.

Organizational Regulation

In view of our later discussions, specifically the plea to adopt the employee-centric theory of organization, two modern organization theories deserve special attention. First, a theory well positioned within the organizational system approach is the *viable systems theory* developed by Stafford Beer (1974). The theory falls within the tradition of organizational cybernetics that promotes a system perspective based on cybernetic viewpoints concerning the study of regulation and associated communication in mechanical and biological systems. Enterprises are considered 'viable' if they are able to survive and capable to exist successfully. Apart from the five subsystems necessary for viability, a key aspect for understanding and creating viability is *variety*, which is understood as a measure of system (enterprise) complexity as defined by the number of its possible states: the modes of system existence expressed by the momentary nature or value of its characteristics. For social systems, the number of these characteristics is enormous; hence, also the number of possible states is enormous. Based on the fundamental cybernetic viewpoint about regulation, a system can only remain viable if the variety in regulation, hence the variety of the regulating system (R), matches the variety of the system to be regulated (S), hence the requirement that variety $R \geq$ variety S. This fundamental viewpoint is known as Ashby's *Law of Requisite Variety* (cf. Sect. 3.13.7*).

In case the law is not satisfied, two principal ways are available to satisfy the law: increase (amplify) the variety of R or decrease (attenuate) the variety of S, or a combination of both, in order to match regulator and system variety. When the regulated system is an enterprise, the two principal ways to match the variety of an enterprise (S) as the regulated system and its regulating system (R) likewise apply. We have discussed the traditional but detrimental approach to reduce or attenuate enterprise variety through rules, regulations, and (management) directives, hence by the *formalization* of the enterprise such that the number of states the enterprise can be in is limited. Unfortunately, this approach also reduces enterprise regulating variety to the maneuverable space of rules and regulations. As argued, a far better approach is to amplify enterprise regulation variety (op. cit.). When summarizing the ideological foundation, we will argue that increasing the regulating capacity of an enterprise, in order to match the enormous variety to which it is exposed, requires the crucial involvement of employees. It is precisely here that much of the traditional ways of organizing fail because they reduce employee variety. It might be observed that information technology is often used as an enterprise variety attenuator, not as a regulator variety amplifier. IT systems enforce (employee) behavior that is all too often at odds with the variety an enterprise experiences (op. cit.). Note that adequately performing emerging organizing, discussed in Sect. 1.1.1, critically depends on satisfying the Law of Requisite Variety.

Organizing and Sensemaking

Emerging phenomena present novel situations that need to be interpreted and made sense of in order to address them organizationally. This insight is clearly seen by the theory that considers sensemaking, rather than decision-making, the central aspect of organizing. Unlike structural functionalism and social system theory, this theory is based in the interpretive theory of society and the micro-level subjective research paradigm. Contrary to the viewpoint that considers organizing as predefining functional roles that employees must execute, organizing is seen as the process whereby employees are reflecting, interpreting, and making sense of the organizational context in which they operate and the organizational issues that confront them. Karl Weick is probably the most prominent organizational theorist who has substantially contributed to the topic of *organizational sensemaking* (1995).

Sensemaking is the process of thinking and reasoning about the situation at hand in order to form an understanding about that situation, which is the basis for further action: new organizing activities. Sensemaking is ongoing, since the next actions are likely to trigger sensemaking again with subsequent actions, and so on. Organizing is thus first and foremost about people struggling to make sense, rather than about people engaged in (organizational) decision-making. Within Weick's perspective, sensemaking is thus the central aspect of organizing. Not the structural and decision-making aspects are of central concern but making sense of the continuous flow of organizational events that for a considerable part are of the organizational members' own making. The concepts of reflexivity and reciprocity, often stressed before, are of crucial influence. Human beings create their environments and conversely, those environments create them (cf. Sect. 3.13.5*).

Since organizing emerges through sensemaking, organizing and sensemaking are convoluted, intertwined processes. Weick uses the term 'enact' to identify human actions that constitute, bring about, make, and cause new forms of organization as the result of sensemaking. Uncertainty, ambiguity, equivocality, and confusion—all trigger sensemaking of the situation at hand. Unlike the objective, positivist perspective, the situation at hand emerges through social interaction rather than presents itself as an objective fact. Note that the views expressed by Weick closely correspond with those expressed by Mary Parker Follett mentioned before and depicted in Fig. 2.8. Specifically her viewpoint that control is an aspect of the organizing process itself, whereby the organizing activity is at the same time the directing activity, resonates well with Weick's idea that control follows from the interacting human beings whereby sensemaking and organizing are intertwined. Above viewpoints concur with the sociological perspective mentioned in Sect. 2.3.5: social organization is the process of bringing order and meaning into our shared social activities. Likewise, organizing is bringing order and meaning into shared collaborative activities.

When recalling the dynamic, complex, and therefore uncertain enterprise context, we can appreciate that the continuous and convoluted process of sensemaking and organization characterizes the experience of being thrown into an ongoing, unknowable, unpredictable streaming of the lifeworld of organizational reality. Recall the notion of ‘lifeworld’ (Lebenswelt) as a central concept within existential phenomenology, as mentioned in Sect. 2.2.6. This is the world where understanding, hence sensemaking, of ‘what things are all about’ develops. In the lifeworld of the continuous flow of experiences, the objective (realist) enterprise and the subjective (idealist) employee aspects become intertwined whereby reflexivity and reciprocity are the central aspects. The circular response is present in many ways. First, people shape their environment and are conversely shaped by the environment of their own making. Second, through sensemaking, understanding about the lifeworld develops, while conversely, this understanding is based on what is already understood. The central tenet of existential phenomenology pertinent to sensemaking is that the sense-maker and what is being made sense of are inseparable. As a consequence, there cannot be a ‘neutral’ or ‘objective’ position about organizational phenomena for understanding how they ‘really’ are.

Experiences and the outcome of sensemaking are shared through social interaction which leads to the intersubjective foundation of ‘objectivity,’ a concept that we introduced in Sect. 2.3.7 when discussing ontological dualism and represents the shared objective characteristics of the organizational lifeworld. Interestingly, we might observe the disappearance of the ability to create the shared ‘intersubjective objectivity’ because face-to-face communication is lost as a result of IT-driven ‘virtualization’: employees ‘behind screens’ are not likely to develop intersubjective objectivity through shared sensemaking. This phenomenon points again to the crucial difference between sensemaking and decision-making, since information systems can aid decision-making but defining actions is a different matter since that necessitates sensemaking. Similar effects develop in case activities are outsourced. In all these cases, possibilities for shared sensemaking are seriously diminished.

Finally, the importance of sensemaking also follows from the unavoidable limitation to rationality. For a large part, rational organizing is an illusion. As Simon convincingly argues, rationality in decision-making is limited as expressed by the important notion of *bounded rationality* (cf. Sect. 3.12.6*). For various reasons, rationality is bounded. First, when selecting courses of action among various alternatives, it is impossible to know all possible alternatives and to know all that is to say about the alternatives. Second, it is impossible to know all potential consequences associated with the various alternatives when selecting a particular course of action and not any other. Given the unavoidable condition of bounded rationality, decisions will be made based on limited or insufficient knowledge, rules of thumb, intuition, or personal convictions. Inevitably therefore, emerging phenomena occur which the bounded rationality could not foresee.

2.3.15 Critical Perspectives

When summarizing the philosophical foundation, we mentioned the serious critique of postmodernism on virtually all fundamental beliefs of modernism, specifically its central pillars: reason and progress. Postmodernism opposes mainstream traditional organization theory on virtually all accounts. Postmodern criticisms have thereby provided valuable insights (cf. Sect. 3.14.1*).

Postmodern organization theory stresses the illusion of control. Most theories about organization and management consider enterprises in an idealized form, whereby their reality is objectively given, goals and objectives are coherent and precisely defined, and associated decisions about how to accomplish them are rationally made in an atmosphere of consensus whereby management can organize and coordinate resources to accomplish what is desired. But enterprise reality is all too often characterized by ambiguity, uncertainty, recalcitrance, improvisation, conflict, and mess rather than stability order, clarity, and certainty. Various tools and techniques for work analysis, budgeting, and planning are merely fanciful instruments largely of symbolic or ritual content that provide the illusion of control to signal the message that things are under control (cf. Sect. 3.14.2*). The significant number of strategic failures mentioned in Sect. 1.4.3 similarly indicates the largely ritualistic nature of strategic planning and control.

With reference to the theories of society briefly summarized in Sect. 2.3.2, the critical social theory is paralleled by a critical organization theory. Not merely understanding an enterprise but changing it in view of some normative principles is the perspective of the critical organization theory (cf. Sect. 3.14.3*). The macro-level focus of critical organization theory criticizes enterprise institutional aspects. These aspects are often inharmonious, unjust, unhealthy, and antagonistic and are seen as the sources of conflict and crises. Critical theory identifies various forms of domination and disaffection which are attributed to the nature of enterprise macro-institutional characteristics. Alternatively, the micro-level aspects of critical organization theory focus on human consciousness and the experiences of individuals within enterprises, as expressed by feelings of distrust, disengagement, and alienation.

In line with postmodern thought, postmodern organization theory questions the notions of 'organizational unity' and 'common purpose.' Rather, heterogeneity and disharmony characterizes organizational life. The 'pluralist' perspective intends to convey the non-unitary view. Hence, the pluralist theory sees enterprises as entities imbued with conflict and power battles since the activities of individuals and groups are directed towards the achievement of their own goals, values, and interests (cf. Sect. 3.14.5*). Whereas from a unitary perspective enterprises are viewed as instruments of rational and purposive activity, the pluralist view sees enterprises as collections of groups only interested in the wider purpose of the enterprise insofar as it serves their own individual ends. Further, the unitary view is based on the notion of functional interdependence and integration. Functions are performed for the benefit of the whole. Conflicts are considered the result of irrational behavior and would not surface if behavior took place in accordance with the rational model of the organization. Since a conflict is seen as an anomaly that management can resolve through proper control, mainstream traditional organization theories have been accused of being conservative, biased towards a management perspective, and thereby supportive of preserving the status quo. The pluralist theory submits that approaches that are based on the unitary view cannot adequately understand and address the dynamics of modern enterprises. Indeed, one might safely state that the unitary assumption and the lack of attention to sources of conflict dominate current organization theory. Nonetheless, only within the interactionist, interpretive perspective on enterprise developments and change, the sources of conflict and disharmony can be dealt with in a reflective and learning manner within the context of enterprise governance.

2.3.16 The Continuous Myopia About Organizing

Section 2.3.10 summarized that many theories of organization express the objective, positivist research paradigm and also express the macro-level viewpoint of structural functionalism and social system theory. Associated with this outlook is the focus on structural aspects for ensuring enterprise integration: the harmoniously working together of the different functional parts being the functional roles within the enterprise structure or the subsystems of the overall enterprise system. Subjective, micro-level aspects are thus, almost inevitably, out of scope. Employees do not seem to exist, only the functional role they must fulfill. Organizing is, among other things, predefining the functional roles that employees must execute. Further, much of the organization theories continue to be management-biased. Organizing and integration of organizational activities are primarily seen as management tasks, whereby decision-making plays a central role.

Yet, essential perspectives about organizing are completely ignored, notably the perspectives about social organizing, emerging organizing, organizing as sensemaking, the viable system perspective, and specifically the need to satisfy the Law of Requisite Variety. All these perspectives point to the critical involvement of employees and are essential for understanding the essence of organizing.

2.3.17 Implications for Enterprise Governance and Enterprise Engineering

Having briefly summarized important theories of society and organization theories, a number of implications for properly understanding, and subsequently designing, enterprises can be mentioned.

The Dominant Focus on Structural Aspects

We have seen that the closely related viewpoints of structural functionalism and (traditional) social systems theory are rather dominant. Mechanical or biological metaphors are used to conceptualize enterprises, resulting in the mechanistic and organismic metaphors, respectively. Almost inevitably, these viewpoints tend to induce an instrumental perspective on employees, seen in their functional roles with instrumental relationships within the overall organizational structure. Hence, the instrumental view on human individuals denies them agency: the capacity of self-generated action. The driving force of human agency is thus, inherently, largely disregarded. Moreover, how enterprise members experience and make sense of their organizational context are issues that cannot be raised within structural functionalism and (traditional) social systems theory. With the mechanical or biological metaphors comes the underlying assumption about enterprise functional unity and internal consistency. Latent functions, dysfunctions, heterogeneity, incoherence, and conflict are thus ignored. Recall that these characteristics are the ones stressed by postmodern organization theory. Finally, within structural functionalism and social systems theory, the notion of social and enterprise change cannot be very well understood and addressed. Rather, the focus is on stability and preservation.

Nonetheless, from the perspective of enterprise design, the structural focus is relevant since attention must be paid to the structural, institutional aspects of enterprises: the ‘structures and systems’ that provide the formal foundational ‘skeleton’ of enterprises without which proper functioning of enterprises cannot be conceived. Furthermore, proper understanding of enterprise structures and systems is warranted in view of (1) their influence on enterprise culture and the behavior of enterprise members and (2) their nature as a possible source of conflict and alienation. Hence, an enterprise conceptual model must enable to express the institutional influence of structures and systems on culture and the behavior of enterprise members. Understanding this influence is also crucial in view of enterprise design since the structures and systems should be designed such that their influence on culture and the behavior of enterprise members (and others involved with the enterprise) is favorable.

Considering Social Interaction and Interpretation

Enterprises can only be properly designed when, first and foremost, the consequences and implications are acknowledged that enterprises are social entities made up by human beings. As the theory of symbolic interactionism and the associated interpretive research paradigm emphasize, the focus must be on human social interaction. Through social interaction, meaning about organizational reality develops within the interpretive process that is intertwined with social interaction. Social (symbolic) interaction is the basis for enterprise order, cohesion, and solidarity and hence is the ultimate basis for enterprise integration over and above structural integration. Enterprise design must enable ‘social organization’: the development of stable and meaningful interaction relationships which gives an enterprise its enduring and meaningful social coherence. Recall that within the process of social organization, four types of social actions have been defined that are relevant for enterprise design. Through social interaction and the interpretive process, learning takes place about enterprise phenomena. Meaning and culture (norms and values) develop. Likewise, the 'informal organization' develops which forms an important guidance for employee and management behavior. In view of these observations, enterprise engineering must not only possess traditional concepts for addressing structural aspects but, equally important, concepts for addressing the interpretive aspects.

Enterprise Design Should Ensure Coherence and Consistency Between Structural and Interpretive Aspects
Without understanding the significance of symbolic interactionism and the interpretive nature of enterprise reality, enterprises cannot be properly understood and (thus) properly designed. Such understanding is vital, not only in view of the fundamental character of social interaction but also because symbolic interactionism provides insight in the linkage between the formal enterprise aspects (structure and systems) and the informal aspects (the socially developed reality). Insight in such linkage is crucial for the ability to create coherence and consistency between the formal and informal enterprise aspects. The importance of enterprise coherence and consistency has been stressed when summarizing the philosophical insights. As we will clarify when summarizing the ideological foundation in the next section, detrimental forms of employee cynicism and disengagement develop when the interpreted enterprise reality differs from the formal, espoused reality. Aforementioned coherence and consistency is thus a fundamental concern for enterprise design. An enterprise conceptual model must therefore enable to address the basic tenets of both structural functionalism and symbolic interactionism. Likewise, as said before, enterprise engineering must have concepts for addressing structural, as well as interpretive aspects.

Enterprise Conceptual Model
Structural functionalism, expressing the formal institutionalized aspects of enterprises, and symbolic interactionism, expressing the social and intersubjective aspects of enterprises, must be jointly considered in conceptualizing enterprises. Such conceptualization not only enables to properly design structures and systems but also enables to incorporate three essential concepts in the design perspective: human agency, reflexivity, and reciprocity. Recall that human agency is seen as the human capacity to consider, interpret, examine, and contemplate the social (enterprise) context and respond through initiative, creativity, autonomous action, and novelty. Reflexivity is the condition whereby action of enterprise members is based on reflection about, and interpretation of, the results or consequences of previous actions, while reciprocity refers to the condition whereby on the one hand enterprise members shape the enterprise through human agency and, conversely, are shaped by the enterprise they themselves have created. There is a double-sided effect since employee (and management) agency itself is thus affected through reciprocity. Characteristics of enterprise members (employees and management) develop in, and are (also) the product of, human agency, reflexivity, and reciprocity. Apart from external influences, these three essential concepts enable the understanding

of *emergence*: the occurrence of novel, totally unpredictable enterprise phenomena. Emergence expresses the processual nature of the enterprise lifeworld as it develops in time, created and regulated by human beings through social interaction. In designing enterprises, we must thus be critically aware of these aspects since design must be such that reflexivity and reciprocity show favorable characteristics, in order that human agency is manifest in productive ways, for example, in employee initiated behavior for solving customer complaints or operational deficiencies.

Emerging Change and Emerging Organizing

It is important to acknowledge the crucial notion of emergence: the manifestation of new, novel, unique, and radically unpredictable occurrences in the world. These occurrences or developments have multiple dimensions, such as economical, social, political, and technological. Complexity and dynamics fuel the inevitable uncertainty. Enterprises must adapt to the uncertain, emerging developments. Given the nature of emerging developments, adaptation can never be the algorithmic outcome of rational planning: a set of predefined activities with a known, *predictable* outcome that would ensure enterprise adaptation to yet unknown, *unpredictable* developments. Hence, enterprise governance must have characteristics that match those of the emerging developments to which the enterprise is exposed, as required by the Law of Requisite Variety. Enterprise change—the manifestation of enterprise adaptation—is likewise emerging: it is unfolding in the process of enterprise life. Bring to mind that postmodern organization theory has likewise stressed these points by speaking about the illusion of control.

Accepting both structural functionalism and symbolic interactionism also implies accepting a fundamentally different viewpoint on organizing and control, both operationally and strategically (governance). Because of emerging phenomena, organizing does not only concern the arrangement of predefined activities and means (presumed organizing) but also concerns addressing the emerging phenomena (emerging organizing). Moreover, emergence not only has to do with emerging organizing activities itself, but emergence is also manifest in the consequences of organizing, for example, created by those affected by organizing because of reflexivity and reciprocity: they react to the social process of organizing, leading to emerging results. Reflexivity and reciprocity unify the initial organizational action and response to that action into an emerging synthesis. These phenomena operate simultaneously, are highly intertwined, and define the 'total situation': the momentary, here-and-now state of organizational affairs. That state of affairs defines what needs to be done. Stated otherwise, the current state of affairs forms the basis for finding out the necessary organizational actions, rather than management merely giving orders without understanding the situation.

Defining what needs to be done involves sensemaking about the current situation. This is a continuous activity since, despite the structural functionalist notions about organizational regularity and stability, we have seen that organizational situations are highly dynamic. Hence, organizing is largely a dynamic, ongoing activity since work activities have to be ordered in view of numerous emerging organizational contingencies. These contingencies are interpreted and given meaning through the process of sensemaking and subsequently acted upon. In turn, the actions themselves create new situations that must be made sense of, and so on. This viewpoint expresses the process of social organization mentioned before: organizing is the ongoing process of social organization, whereby emerging phenomena are brought forward as a result of organizing. These emergent phenomena again trigger the process of sensemaking. Organizing and sensemaking are thus highly intertwined. Such view on organizing has definite consequences for enterprise design, such as for the competences and self-efficacy of employees and the nature of information supply in order to allow sensemaking and organizing to proceed productively.

These insights have also profound consequences for understanding the nature of operational control. Because of the Law of the Situation, the specifics of 'what to do next' emerge out of the evolving organizational situation. Control is thus an aspect of the organizing process itself, based on sensemaking. The organizing activity *is* the directing activity, not some (management) control external to the process. Rather, the social interacting *is* the control. We have stressed that proper control needs organizational unity, a condition also amply stressed before. Evidently, the condition of organizational unity is an aspect of enterprise design. Moreover, seeing control as an aspect of the ongoing organizing process itself has profound consequences for enterprise design, specifically for the nature of employee involvement in organizational processes.

Emerging change and emerging organizing express the nature of self-organizing, seen as the capacity to continuously and autonomously define and realize purpose and goals, as well as define and effectuate activities (organizing through sensemaking and enactment) for ensuring adequate enterprise developments in the face of emerging phenomena. Clearly, acknowledging emerging change and emerging organizing and the need to self-organize require specific enterprise conditions to be created enterprise design.

Enhancing Employee Variety

Closely related to the previous point is the following. We have seen that traditional approaches to organization tend to reduce or attenuate enterprise variety through rules, directives, and management control, hence by the institutionalization of the enterprise. In doing so, much external and internal variety is not addressed nor acknowledged. Recall that the traditional approach to predefined organizing tends to deskill employees and hence reduce their variety. Enterprise regulation is thus limited to the maneuverable space allowed by rules and management directives. As argued, the approach to attenuate enterprise variety creates a serious problem since relevant external or internal variety might not be addressed. Enterprises face enormous variety, contrary to the stable institutional image of structural functionalism. This makes regulation through rules and management directives often ineffective.

We mentioned that the enterprise regulating capacity must be amplified through the critical involvement of employees. In doing so, the enterprise offers more variety in enterprise responses in face of the variety it experiences. These crucial insights have deep implications for enterprise design. It might be observed that information technology is often used as an enterprise variety attenuator, not as an enterprise regulation variety amplifier. IT systems enforce behavior that is all too often at odds with the variety inherent in customers, employees, patients, or citizens. Serious mismatch conditions will thus develop. As we have noticed, planning and control are considered essential management tasks. However, as mentioned before, and will be further discussed in Chap. 3, planning is a variety attenuator. Planning enforces to follow predefined steps that essentially ignore variety. But (operational) organizational actions should not be based on predictions that cannot be reasonably made but based on sensemaking about an unfolding, emerging situation. Also in case of strategy development, variety reduction is manifest in the notion of 'strategic planning.'

Acknowledging the ever-increasing dynamics of the modern enterprise context means acknowledging the need to increase the enterprise regulation variety. Such increase is a crucial concern for enterprise design and, as will become clear when summarizing the ideological foundation, has far-reaching consequences for viewpoints on employees and management.

Summary of Ontological Implications

1. Structural functionalism and social system theory are dominant theories of society. These theories have strongly influenced organization theories and significantly contributed to the mechanization of enterprises and the instrumentalization of employees. As a consequence, the important aspect of employee agency is largely ignored, while, as the ideological foundation will show, employee agency is the very source of enterprise operational and strategic performance. Enabling employee agency and enhancing variety in employee behavior is, contrary to instrumentalization, a key aspect of enterprise design. Information systems should support such increase rather than reduce variety.
2. Symbolic interactionism focuses on human social interaction, which is the very essence of enterprises seen as social entities. Through social interaction, enterprise phenomena are interpreted, culture develops, and intersubjectively shared opinions about enterprise reality are created. That reality might differ from the officially espoused reality, thereby creating the incoherence and inconsistency with all the negative influences mentioned before.
3. Social organizing is the emerging result of social interaction and the basis for social order and integration. Social interaction is characterized by different forms of social action. Organization within enterprises is thus likewise the emergent result of social interaction. Organizing and sensemaking (interpretation) are highly intertwined and take place within the 'total situation' (Law of the Situation. As stressed earlier, emerging organizing is thus a key aspect of organizing and is characterized by a continuous flow of activities and subsequent interpretation of the consequences of the activities, leading to further organizing activities, and so on. Self-organizing is essential for maintaining this continuous flow and for satisfying the Law of Requisite Variety.
4. Culture is an important societal aspect that develops through social interaction and acts as a guidance for behavior. Although often ignored, enterprise culture is

likewise an important behavioral determinant. Culture is influenced by various mutually related aspects. All these aspects must be taken into account when attempting to change culture. A crucial issue is therefore how desired cultural characteristics can be created such that desired behavior is evoked and stimulated.

5. Based on the morphogenic social system model, the morphogenic enterprise conceptual system model aims to acknowledge both macro-level (structural functionalist) and micro-level (interpretive, interactionist) enterprise aspects by considering four components of the model and their relationships: structures and systems, culture, management behavior, and employee behavior. Because of the strong mutual relationships between the components of the model, enterprise coherence and consistency depends on the ability to adequately address these components concurrently and in view of their mutual relationship. Successful enterprise change and design rests on this ability.
6. Unlike the mechanistic or organismic metaphors, the morphogenic enterprise conceptual model enables to address the three essential concepts that fuel and determine enterprise developments: human agency (especially employee agency), reflexivity, and reciprocity. Through this model, the ever-present circular relationship between enterprise members and their context can be understood (shape and being shaped), thereby understanding the essential nature of enterprise change processes. This essential nature is the basis for the approach to enterprise governance outlined in the next chapter.
7. Traditional organization theories are virtually only concerned with structures and systems and ignore cultural and behavioral aspects. Yet, these latter aspects are crucial for establishing successful enterprise change. Adding to the previous points, enterprise governance and enterprise engineering must adequately acknowledge and practically operationalize the crucial importance of cultural and behavioral aspects.
8. Various unavoidable emerging phenomena—driven by, for example, complexity, dynamics, ambiguity, bounded rationality, recalcitrance, power battles, conflict, and mess—make planning and control all too often an illusion and of ritualistic nature. Only within the interactional, interpretive view on enterprise development and change can these emerging phenomena, also those driven by conflict and disharmony, be dealt with in a reflective, learning manner within the context of enterprise governance.

2.4 Ideological Foundation

When designing enterprises, it is impossible to avoid ideological (normative, ethical) issues, either explicitly or implicitly. Take a system for employee performance target-setting and assessment as an example. Arranging such a system and its characteristics are based on explicit or implicit convictions about employees, such as those expressed by the Theory X or Theory Y anthropological viewpoints mentioned in Sect. 2.3.12. Likewise, creating an information system that unambiguously informs customers about their consumer rights and options is founded on explicit normative and ethical convictions about treating customers. As mentioned in Sect. 1.1.2, our central convictions of the ideological foundation are given by the employee-centric theory of organization briefly recapitulated below. The summary of the ideological foundation proceeds as follows.

We start by reflecting on the question why enterprises exist. Different answers are given which determine the extent to which the employee-centric approach can be effectuated. With reference to the dominant Western philosophical ideas, the mechanization of enterprises and its consequences are subsequently summarized. Next, we will summarize views on enterprise change, whereby the dominant influence of the mechanistic worldview becomes manifest. In view of the problematic nature of this influence, an essentially different perspective on governance and the operationalization of enterprise change desirables (choices, intentions, initiatives) will be outlined in Chap. 3.

With reference to the importance of emerging organizing and satisfying the Law of Requisite Variety discussed previously, the significance of employee involvement and practicing the employee-centric theory of organization will be briefly discussed. Given these topics, we will summarize essential aspects of employee behavior and the behavior context. Despite the plea for employee-centric organizing, we will depict actual enterprise reality as oftentimes discouraging and unpromising. Finally, the implications of the ideological foundation for enterprise governance and enterprise engineering are sketched.

2.4.1 Why Do Enterprises Exist?

Two main answers to this question are commonly given based on either economic or social considerations. The economic considerations are founded on the transaction costs theory formulated by economist and Nobel laureate Ronald Coase. Basically, this theory asserts that enterprises exist insofar as they can acquire something (execute a transaction) internally at a lower price rather than acquiring that something through market mechanisms (cf. Sect. 4.2.1*), all that under the assumption that both options are equally possible. Either option involves costs, so in economic terms, the choice between both options boils down to a choice between transaction costs, assuming of course that the precise nature of a transaction and its associated costs of either an internal or market transaction can be determined accurately. This assumption is all too often fallacious, leading to disastrous consequences (op. cit.). Essentially, the economic viewpoint seems to imply that if the market can perform a transaction cheaper, the internal transaction must be terminated. Note that only economic and financial variables are considered as the primary or exclusive criteria for enterprise performance and decision-making, and thus in the end also for enterprise existence.

Not surprisingly, the focus on transaction costs and the associated resources ultimately boil down to contracts. An enterprise is merely an interrelated set of contracts, which also concern the employer-employee relationship (op. cit.). Employee contracts must be such that they make employee behavior consistent with economic self-interest and thereby reduce the cost of performance monitoring and evaluation. Management must act such that transaction costs are minimized. Note how all these ideas perfectly match those of corporate governance, summarized in the introductory chapter.

A typical consequence of the economic perspective on enterprise existence is the juridicalization of enterprising, a problem mentioned in Sect. 1.2.4. The language of contracts is thus associated with conflicts and litigation and is essentially based on distrust. Building trust, loyalty, motivation, and dedication in view of a socially and morally justifiable purpose are alien ideas, as is the conviction about loyal, motivated, and dedicated employees as a source of competitive advantage. Moreover, the abandoning of in-house transactions in favor of market transactions might entail losing social cohesion and the ability of joint sensemaking about emerging organizational phenomena, subsequently leading to the erosion of organizational competences and enterprise performance (cf. Sect. 3.13.5*). Finally, note that transaction costs economics neatly fits the mechanistic viewpoint whereby enterprises are merely seen as profit-generating machines.

Section 1.2.4 mentioned the purpose and social responsibility of enterprises. Social considerations concerning the existence of enterprises rest on the theory of society that sees enterprises as social institutions having a purpose (or purposes) and offering certain functions to society which transcend the mere money-generating viewpoint (cf. Sect. 4.2.1*). Apart from the primary function concerned with delivering products and services, other functions can be envisioned, among which the affordance of employment is an important one. Consequently, the social perspective on enterprise existence is further based on the premise that enterprises have a social responsibility towards society at large and the enterprise stakeholders in particular. Of these stakeholders, customers and employees are specifically important. Aforementioned premise means that disgruntled customers, or employee distrust, cynicism, and physical or mental illness in any form cannot be acceptable consequences of organizing. Evidently, moral concerns play a role. An enterprise is not a collection of impersonal human instruments that are controlled by financially focused contracts and mechanical rules and protocols whereby customers are treated accordingly based on formal rules, contracts, 'fine print,' and contempt. Rather, enterprises must be seen as social entities with cooperating people that serve commonly shared purposes guided by commonly shared norms and values. Those overarching orientations provide meaning in work, bind people together, and are the basis for loyalty and trust.

2.4.2 Rejecting the Mechanization of Enterprises

The Characteristics

When summarizing the philosophical foundation, the dominant mechanistic world-view was sketched. This worldview is associated with (1) *determinism*, the belief that reality is governed by causal (cause-effect) relationships between phenomena, and (2) *reductionism*, the focus on the constituting elements (building blocks) of reality, since through understanding these elements, the totality of reality can be understood. Recall that the theories of structural functionalism and social system theory express aforementioned mechanistic viewpoints. Overall, the philosophical viewpoints and the social theories have influenced the development of mainstream classical, neoclassical, modern, and postmodern organization theories. As we have seen, many of these theories express viewpoints that can be rightly qualified as the mechanization of enterprises. In essence, this mechanization has the following characteristics (cf. Sect. 4.2.2*):

- Instrumentalization of employees: considered only for their functional roles and controlled by mechanistic measures, such as performance targets, contracts, and periodic assessments.
- Various organizational structures, systems, and management directives determine the instrumental behavior, among which contracts that stipulate obligations. Structures and systems express the institutionalized rationality and the embedded practices of management.
- Rules and regulations are favored as the formal, impersonal way of working and attenuate enterprise variety, contrary to the Law of Requisite Variety.
- Focus on management hierarchies as decision-making structures and communication structures for 'passing down' orders.
- Management is seen as the locus for knowledge, decision-making, and control, as well as the source for organizational coordination and integration.
- The enterprise is objectified: an entity under the control of management. Said control is effectuated by typical management tasks, such as forecasting, planning, directing, exercising authority, and supervision.
- Relationships between workers and the employer are considered inherently adversarial, based on distrust, and need to be governed by contracts in order to deal with the different interests of both parties.

Questionable Focus and the Fundamental Attribution Error

Enterprise mechanization is clearly manifest in the enormous rise of traditional management (op. cit.). Associated with this increase in management roles and the naïve idea about management as 'getting things done through other people' is the similarly significant increase in management-induced nuisance: rules, protocols, data gathering, record keeping, administration, targets, evaluation reports, yearly plans, and frequent meetings to discuss all that material. The whole mechanistic approach and its propensity to control further entail the widespread use of individual performance contracts, performance targets, and performance reviews. Key performance measures must, supposedly, be clearly defined, well communicated and reinforced, reviewed frequently, and closely tied to financial payment (op. cit.), all that in the unquestioned belief in planning, measurability, and control. Recall Deming's analysis of common and special causes for poor enterprise performance, mentioned in Sect. 1.4.3. Virtually all causes of poor performance are common causes: are the inherent consequences of the way of organizing. In other words, possibilities to perform well are lacking. Yet, the widespread use of individual performance contracts, performance targets, and performance reviews signals the message that employees are the source of poor performance and that their willingness to perform well cannot be trusted. These practices manifest the fundamental attribution error: situational causes are attributed to persons (cf. Sects. 1.2.5* and 4.8.2*). We argue that these individual performance-related measures of control are rather unproductive and futile. Moreover, they are unjustified and contribute to employee feeling of distrust and cynicism.

Employees experience the burden of enforced control—the very nature of mechanization—as not contributing to the purpose of their work. But, as a self-fulfilling prophecy, enterprises operating under these mechanistic convictions will demonstrate these convictions to be valid since mechanistic enterprises induce and evoke mechanistic behavior (cf. Sect. 4.2.2*). Figure 2.9 aims to depict the essence of enterprise mechanization.

Contributing to the mechanistic malaise is the growing influence of business school education that promoted the idea of management as a profession that can be practiced without specific knowledge of the enterprise or enterprise unit that is 'managed.' Thereby, a 'zone of detachment' is created between managerial work and the organizing and production specifics of an enterprise (cf. Sect. 1.7.2*). Said zone of detachment is created by the managerial nuisance mentioned above which obscures the enterprise reality experienced by employees. In the terms of Mary Parker Follett, the zone of detachment results in management not being part of 'the total situation' that defines the shared reality and the meaningful actions to be taken, as briefly outlined in Sect. 2.3.14.

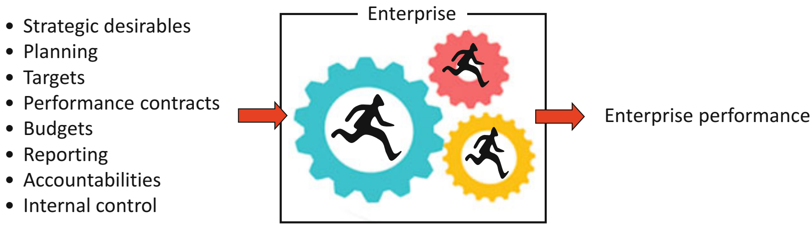

Fig. 2.9 The essence of enterprise mechanization

2.4.3 Enterprise Mechanization: Meaning and Morality Vanish

Meaningful Work

Studies show that the crucial condition for psychological and physical health is 'personal mastery,' also identified as self-determination. That is, being in control of things that personally matter and being able to give meaning to existence (Zuboff and Maxmin 2003). Applying this insight to the working environment means that it must have the characteristics of meaningful work (cf. Sect. 4.7.5*). The crucial condition for avoiding employee alienation and evoking employee involvement lies in understanding the purpose and significance of the nature and arrangement of tasks and (therefore) finding meaning in performing the tasks. Otherwise stated, personally felt meaning is about the immanent and inherent purpose of one's actions. Hence, the working environment must have the characteristics of meaningful work (op. cit.). Understandably, this crucial condition is satisfied when employees are genuinely involved or responsible for defining, adapting, or improving their working arrangements, as examples of employee-centric organizing demonstrate (cf. Sect. 4.7.8*). One example concerned a car manufacturing plant with highly standardized production processes. A key aspect in establishing the way of working in these processes was the significant involvement of employees, such that they have influence over their own jobs within the production system and experience in the actual operation a collective autonomy pertinent to jointly felt purposes and goals. Everybody had a voice, irrespective of position. Major effects were manifest on employees' self-esteem, self-respect, and the feeling of self-efficacy. Hence, certain formalized work patterns are not necessarily synonymous with enterprise mechanization. Various domains can be mentioned where certain activities are highly standardized and often also sequentially ordered and whereby the persons executing the activities do not consider themselves as being instrumentalized. Examples are the standard operating procedures for aircraft or procedures for the handling of patients. Alienation of employees is thus not necessarily connected to formalization and standardization of work (cf. Sect. 3.5.2*).

Loss of Meaning and Purpose

As our philosophical reflections indicate, the essence of a mechanistic perspective is the absence of meaning and purpose, hence also the absence of morality. Therefore, we consider a mechanized enterprise as one where employees are instrumentalized such that they carry out tasks without the personally felt significance and meaning, thus without experiencing the immanent and inherent purpose of one's actions. We submit that mechanistic management and institutionalized rules and regulations that impose administrative and control nuisances, to which employees or customers attribute no meaning and significance, are thus truly manifesting the mechanized enterprise. Within such enterprise, performance is assumed to be higher the more employees—in an instrumental manner—behave according to predefined tasks, rules, and procedures. Emphasis is given to internal (managerial) control, planning, budgets, performance contracts, targets, and the associated reporting. The mechanistic way of organizing thus expresses the characteristics of bureaucratic organizing mentioned earlier (cf. Sect. 3.7.4*).

As mentioned before, within the mechanistic perspective, relationships between workers and the employer are considered inherently adversarial and need to be governed by contracts in order to deal with the different interests of both parties. Employment relationships are thus anything but based on trust. Rather, these relationships are based on distrust, which further drives the need to regulate and formalize, including employee performance control mentioned above (cf. Sect. 4.2.2*). Note how this perspective neatly connects with theories that support and enforce the mechanistic way of organizing: the Theory X perspective on employees, the bureaucratic theory of rational action, and the transaction costs theory about enterprise existence. As a self-fulfilling prophecy, enterprises operating under these mechanistic convictions will demonstrate these convictions to be valid, since employees behave as the theories expect them to do (op. cit.).

Unfortunately, the tenacity of the mechanistic viewpoint is considerable and with detrimental consequences. Documented cases have been published showing how the traditional mechanistic, top-down 'command-and-control management paradigm' has led to higher costs and poor performance. Likewise, much evidence illustrates how mechanistic thinking has infiltrated and perverted public institutions like health care, education, and public administration. Enterprise mechanization with its intense focus on measurability, performance indicators, and subsequent output control necessitates employees to 'devote' considerable time to generating management-required data rather than devoting attention to the inherent purpose of their job (op. cit.).

2.4.4 Views on Enterprise Change

When summarizing the ontological foundation, we discussed a number of archetypical theories about society and their influence on organization theories. As can be expected, that influence is likewise noticeable pertinent to viewpoints about strategy development (the formulation of enterprise desirables to be realized) and enterprise change that subsequently should realize the desirables. Various schools of thought can be mentioned (cf. Sect. 4.4.3*). For our purpose, and with reference to the archetypical social theories, we can categorize the different schools of thought into two main perspectives (op. cit.).

The first perspective asserts that strategy development and subsequent enterprise change concerns *planning*: (1) a managed, formal process, divided into clearly discernible steps, (2) suitable for rational decision-making, and (3) guided from the management-top of the enterprise, associated with goals, budgets, targets, and milestones as expressed by the plans (cf. Sect. 4.4.5*). Note that the notion of strategic planning fits very well within the mechanistic approach to organizing.

Based on the foundational insights presented, various objections against the notion of strategic planning have been argued (cf. Sect. 4.4.6*).

The second perspective claims that strategy development and subsequent enterprise change is first and foremost a *learning* process. This perspective closely associates with the theory of society expressed by symbolic interactionism and the associated notions of social and emerging organizing discussed before. Strategy as a learning process thus stresses that strategy is the emergent outcome of social processes that unfold in a dynamic, complex, and uncertain enterprise environment (cf. Sect. 4.4.7*). In the next chapter, we will further discuss the two perspectives and argue the untenability of the planning perspective. Obviously, enterprise learning cannot be conceived within a mechanized enterprise.

2.4.5 Satisfying the Law of Requisite Variety

Of the modern organization theories summarized in Sect. 2.3.14, the viable systems theory was emphasized as particularly important. Crucial in this theory is the Law of Requisite Variety formulated by Ashby. We repeat that the law states that the variety of a regulating system must be at least equal to the variety of the system to be regulated. Slightly differently formulated the law requires that the number of possible regulating actions must be at least equal to the number of emerging contingencies that the system to be regulated might manifest (op. cit.). In view of enterprise operational aspects, we reformulate this fundamental law for the enterprise operation as

The variety of enterprise operational regulation $\geq$ Variety of enterprise operational contingencies

Likewise, for enterprise strategic aspects we have

The variety of enterprise strategic regulation $\geq$ Variety of enterprise strategic contingencies

Since enterprises are very complex entities, the variety of enterprises operational and strategic contingencies is enormous (cf. Sect. 4.5*). This not only holds for the current near future situation of an enterprise but even more so for variety in the distant future whereby the precise nature is considerably more unclear. As summarized in the next paragraph, the Law of Requisite Variety has profound implications for the arrangement of enterprise operational regulation. Similarly, the next chapter will outline the implications of the Law of Requisite Variety for strategic regulation, which we have identified as enterprise governance. For now, the critical insight to be noted is that in the case of enterprises, the fundamental law of system regulation can only be satisfied through the involvement of employees, as recapitulated below.

2.4.6 The Importance of Employee Involvement

When speaking about employee involvement, we identify behavior of employees that fundamentally exceeds the mere functional behavior enforced and allowed by enterprise mechanization. Considering employee involvement in a mechanized enterprise is thus a contraction. Central in our ideological considerations is the employee-centric theory of organization. For that, the importance of employee involvement and participation must be argued. The notion of employee involvement is based on viewing employees from their creative potential, rather than from their instrumental capacity. Within this perspective, employee involvement can be defined as (cf. Sect. 4.3.1*):

- *Employee involvement* The manifestation of employee agency (creativity, initiative, autonomous action) for safeguarding or enhancing enterprise performance, such as through ideas for improvement or by addressing, solving, or rectifying organizational contingencies that emerge in the complexity and dynamics of organizational life.

In terms of the Law of Requisite Variety, employee involvement is the manifestation of employee variety. Creating employee involvement thus means enhancing employee variety beyond the instrumental bandwidth of behavior. However, as we have seen, the mechanization of enterprises reduces rather than enhances employee variety. Management is considered the source for enterprise performance. Instrumental behavior of employees is essentially invariant, deskilled behavior defined by rules, regulations, and management directives.

We have presented two types of considerations for arguing the importance of employee involvement: (1) empirical considerations and (2) theoretical considerations. The empirical considerations are based on numerous publications in the organizational literature demonstrating the positive and essential contributions of employees pertinent to core enterprise performance areas: productivity, quality, service, learning, and innovation (cf. Sects. 4.3.2* through 4.3.6*). In addition to empirical evidence for employee involvement, the theoretical arguments for such involvement are based on the implications of the Law of Requisite Variety mentioned before. After discussing principal ways to address enterprise variety and arguing that management alone cannot satisfy the law, the inevitable conclusion is that the fundamental regulating law can only be satisfied through the critical involvement of employees (cf. Sect. 4.5*). This insight is expressed by the notion of *distributed management* and *distributed governance* (op. cit.). Chapter 3 outlines the notion of distributed governance.

2.4.7 The Employee-Centric Theory of Organization

With reference to the foundational insights, the philosophical foundation for practicing the employee-centric theory of organization is given by the viewpoint of existential phenomenology that stresses the elementary experiences in the lifeworld of employees (human beings in general) as the basis for truth and knowledge. These experiences are interpreted and given meaning and thereby define the experienced enterprise reality. Core concepts are reflexivity and reciprocity: the enterprise context and employees (enterprise members in general) are in a continuous influential relationship as Sect. 2.2.6 showed. Ignoring this philosophical viewpoint means ignoring the very essence of employees as human beings which is at the heart of employee-centric organizing.

Closely associated with the previous philosophical insights are those of the ontological foundation as expressed by the interpretive paradigm and theory of symbolic interactionism outlined in Sect. 2.3.2. Knowledge and truth about enterprises reality is gained through individual experiences of employees who interpret enterprise phenomena and discuss them in social interaction. Subjective experiences are shared through social interaction using language that likewise socially develops. This language determines how enterprise phenomena appear. The language 'system' defines the available space for the interpretations that give experiences meaning and actions direction. Recall that social interaction is the basis for social organizing, hence enterprise organizing: the ongoing process of bringing order and meaning into shared enterprise activities. It is the employee-centric focus that acknowledges this vital process and the close and convoluted relationship between organizing and the meaning-creating nature of employee interaction.

As sketched in Sect. 2.3.7, through social interaction, *intersubjectivity* emerges, which can be understood as foundation for the shared meanings about the enterprise reality. It is the socially constructed enterprise reality: the intersubjective 'objective' enterprise context. One might speak about the intersubjective foundation of objectivity, which is the ultimate source for how employees experience and perceive enterprises. This intersubjective 'objective' enterprise context exists independent of an individual's appreciation of it, and for this 'objective' enterprise context, general characteristics might be formulated. We have argued that addressing employee-centric organizing necessitates taking the view of *ontological dualism*: both the macro-level (objective) and micro-level (subjective) phenomena must be taken into account. Without considering ontological dualism, the crucial notion of emergence—the manifestation of the unexpected and the unforeseen, which is the very reason for the essential notion of employee involvement—cannot be acknowledged nor understood, because it is the reciprocal relationship between macro-level and micro-level phenomena that addresses and brings forward emerging developments. (cf. Sects. 3.9.3* and 4.7.1*). Theories about employee behavior and motivation, briefly mentioned below, provide the link between these macro-level general characteristics and micro-level employee behavior and motivation. Further, as we will discuss later, the macro-level characteristics of the enterprise context are the topic of enterprise design.

An important ontological insight about the nature of complex (social) systems is provided by the Law of Requisite Variety discussed above. This law is the basis for the first ideological foundational aspect for the employee-centric theory of organization, since, as mentioned in the previous paragraph and will be further clarified in the next chapter, only through employee involvement can the fundamental regulating law be satisfied. Other ideological considerations are based on (cf. Sects. 4.7.2* through 4.7.7*) (1) arguing the inadequacy of the primary financial focus of enterprises and showing that this focus leads to poor enterprise performance (also financially) compared with enterprises focusing on quality, service, and employee development; (2) rejecting the instrumentalization of employees and arguing the importance of enterprise humanization and the affordance of meaningful work; and (3) outlining the so-called unitarist perspective on enterprises whereby employee concerns and enterprise concerns are harmonized. Additionally, the employee-centric theory of organization has been shown to require leadership rather than traditional management for establishing employee empowerment and freedom for creating conditions for employee involvement. The meaning and purpose of work, moral values, and trust are cardinal issues. A few cases of enterprises practicing the employee-centric theory of organizing are discussed (cf. Sect. 4.7.8*). Note that practicing this theory of organizing can only be done through proper enterprise design. Hence, the foundational insights for the employee-centric theory of organization must be brought formally within the enterprise design scope. Evidently, enterprise engineering must be able to address these insights through theories, methodology, and methods.

In view of our reflections, we reiterate that a mechanized enterprise whereby employees are instrumentalized such that they carry out tasks without the personally felt significance and meaning, hence without experiencing the immanent and inherent purpose of one's actions, can never practice the employee-centric theory of organization.

2.4.8 Enterprise Health

In view of earlier observations, it seems inevitable that the dominant focus on structures and systems for enterprise design induces mechanistic thinking, precisely the thinking that excludes employee-centric organizing. However, employee-centric organizing is conditional for creating a 'healthy' enterprise that is able to continuously and successfully exist. This is what Drucker has recognized for a long time: "The test of a healthy business is not the beauty, clarity, or perfection of its organization structure. It is the performance of people" (1985, p. 602). Because structural functionalism, with its inherent mechanistic thinking, cannot address employee-centric organizing properly, a change in the focus about enterprises is needed: "because getting and staying healthy involves tending to the people oriented aspects of leading an organization, it may sound 'fluffy' to the hard-nosed executives raised on managing by the numbers" (Keller and Price 2011, p. 10). Employee-centric organizing is essential for enterprise health and thereby for enterprise success since "more than 70% of failures are driven by what we would categorize as poor organizational health, as manifested by such negative symptoms as negative employee attitudes and unproductive management behavior" (op. cit., p. 22). Again, this fact underlines the importance of the argued broad, holistic, and multidisciplinary nature of enterprise governance and enterprise engineering. Taking the morphogenic enterprise conceptual system model as a reference, we have identified important characteristics that define enterprise health (cf. Sect. 4.7.9*). These characteristics are reiterated in Chap. 4 for sketching the scope of enterprise governance and enterprise engineering.

2.4.9 Employee Behavior and the Behavior Context

The argued critical involvement of employees necessitates a focus on employee behavior, since it is through certain forms of employee behavior that employee involvement becomes manifest. Practicing the employee-centric theory of organization thus means designing the enterprise in such a way that the desired forms of employee behavior are induced and enabled. For doing so, foundational insights concerning behavior in general and that of employees specifically are essential.

Various viewpoints about (employee) behavior have been discussed (cf. Sect. 4.6.2*). Within the limited scope of this chapter, only a few insights about behavior can be summarized. An important insight is that internal (personal) and external (contextual) conditions play a highly interrelated and convoluted role concerning human behavior. But the influence of the external, contextual conditions is dominant, also because these conditions affect personal characteristics. This also holds for enterprises. In view of our employee-centric focus, we are thus concerned with the contextual conditions as experienced by employees. Desired employee behavior can be arranged by enterprises through creating appropriate contextual conditions. So, as Ghoshal and Bartlett observe, "rather than focusing on changing individual behaviors, the more important challenge is to change that internal environment—what we call the behavior context—that in turn influences people's behaviors" (1997, p. 142). Creating the appropriate behavior context evidently concerns enterprise design.

Internal organizational arrangements create the behavior context in which employees operate. Based on the morphogenic enterprise conceptual system model introduced before, the behavior context is defined by (1) enterprise culture, (2) management behavior, and (3) the enterprise structures and systems. These three enterprise aspects are the major behavior determinants. Taking Fig. 2.7 as a reference, the behavior context is shown in Fig. 2.10.

As Fig. 2.10 expresses, three behavior determinants constitute the behavior context: structures and systems, culture, and management behavior (cf. Sect. 4.6.2*). In view of the employee-centric way of organizing, this context is of crucial

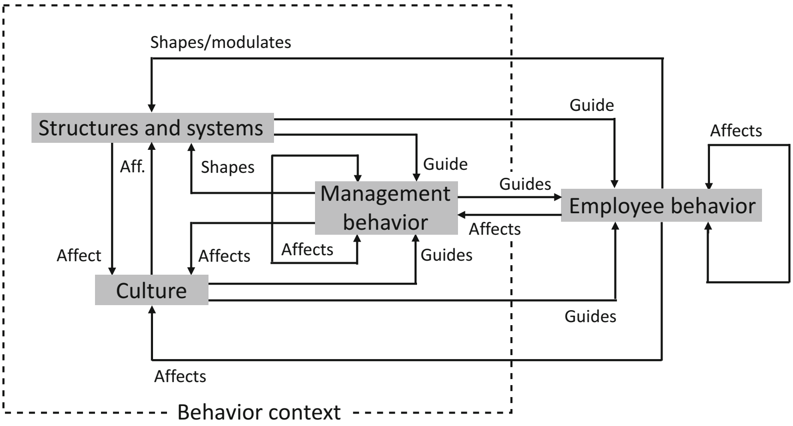

Fig. 2.10 Enterprise behavior context

importance. The focus on this context concurs with the observation of Ghoshal and Bartlett stating that "the power of the behavior context lies in its impact on the behavior of individual organizational members" (1997, p. 173). The influence of this context is direct and indirect. In a direct sense, behavior is directed and coerced by the three behavior determinants. In an indirect way, the behavior context can be seen as a source of implicit (intentional or unintentional) communication with employees, thereby affecting behavior, since the context signals to employees what is (apparently) expected and valued (Hoogervorst et al. 2004). Rather than the espoused practices and values, the behavior context manifests the practices and values in use (op. cit.).

Because of their determining influence on employee behavior, the three aspects of the behavior context are key success factors with respect to the employee-centric way of organizing. We have discussed these three important behavior determinants in order to illustrate their influence on employee behavior (cf. Sects. 4.6.5* through 4.6.7*). Because of the argued mutual relationship, behavior change can only be sustained under consistency and coherence of the three determinants of behavior (cf. Sect. 4.6.8*). This further supports the arguments presented in the introductory chapter about the importance of unity and integration. The presented case study examples illustrate that successful enterprise change crucially depends on the characteristics of the behavior context (Sect. 4.7.8*). Finally, the focus on employee behavior also necessitates discussing motivation theories and the insights these theories provide pertinent to human behavior. Five motivation theories were discussed whereby the insights of these theories are linked to the employee behavior context, such that desired characteristics of the behavior context can be identified (cf. Sect. 4.6.4*). Summarizing the motivation theories exceeds our current space. Nonetheless, various prescripts for proper enterprise design of the behavior context can be determined based on the motivation theories. The importance of enterprise coherence and consistency can likewise be argued with reference to theories of motivation (op. cit.) Insights of the motivation theories further teach that the traditional focus on employee control, such as through performance targets and periodic assessments, is fundamentally flawed since the implicit message to employees is that their performance willingness is distrusted. This practice becomes a self-fulfilling prophecy and destroys employee motivation and breeds employee cynicism. As argued, a far better approach is to focus on the *performance possibilities* of employees, which are determined by the characteristics of the behavior context (op. cit.). These possibilities are all too often insufficient, leading to inadequate enterprise performance for which employees are nonetheless held responsible.

We reiterate that practicing the employee-centric theory of organizing implies that the associated foundational insights must be brought formally within the enterprise design scope. This requirement can be made more specific: enterprise engineering must be able to address insights about the behavior context through theories, methodology, and methods.

2.4.10 Enterprise Reality: Discouraging and Unpromising

Despite overwhelming arguments for practicing the employee-centric theory of organization, actual enterprise reality is oftentimes rather bleak. We have argued six major disquieting issues.

First is the inadequacy of traditional management accounting systems. A fundamental mismatch developed between embedded, historically defined management accounting principles and the requirements which followed from changing enterprises and environments. Traditional accounting systems appear to produce irrelevant and misleading information and do not capture what is important, such as the (economic) value of quality, service, customer satisfaction and loyalty, employee involvement, learning, etc. Unfortunately, traditional management accounting can be dramatically deceiving about the enterprise financial state of affairs and is a serious impedance to practicing the employee-centric theory of organization (cf. Sect. 4.8.1*).

Second is the inadequate and demoralizing approaches to employee performance management and appraisal (cf. Sect. 4.8.2*). This inadequacy is based on the erroneous belief in the ability to relate the enterprise (unit) output results to individual employee efforts. This belief is dangerously naïve. Enterprise complexity with embedded rules and procedures, functional diversification, and related responsibilities will lead to massive interrelations and interdependencies, making a simple relationship between effort and performance debatable. Further, enterprise complexity, dynamics, and the associated uncertainty lead to unpredictable emerging phenomena that must be addressed and will make it difficult, if not impossible, to establish reasonably accurate targets and valid effort-result relationships. Recall that these emerging phenomena were the very reason to argue for employee variety and employee-centric organizing in order to address emerging phenomena. Upfront definition of employee performance measurement is pointless. The approach is demoralizing and destructive because, as a clear manifestation of the fundamental attribution error, employees are held responsible for poor enterprise performance which is the consequence 'common causes': the way the enterprise is arranged and operates. Enterprise performance variation is not under employee control and is virtually always the result of inherent enterprise system variation, for which employees are nonetheless held responsible. As argued above, employee behavior is determined by the behavior context of which the characteristics are largely outside employee control. Erroneously, lack of performance possibilities is mistaken for lack of performance willingness on the part of employees (cf. Sect. 4.6.4*). Further, theories about employee motivation teach that the effectiveness of traditional (financial) rewards and incentives is seriously questionable. Even more so, these approaches are harmful. Evidently, employee commitment cannot be bought through incentives. The resulting compliant behavior will basically be calculative, aimed at merely securing rewards. Performance-related or incentive pay thus undermines performance (cf. Sect. 4.8.2*).

Third is the elusive promise of a better workplace. Despite a plethora of management fads that surfaced around the 1980s and spoke about employee empowerment, business ethics, mission statements expressing social responsibility, team focus, self-directed teams, quality circles, employee involvement circles, management as a coach, leadership, organizational culture, reengineering, and so on, not much changed (cf. Sect. 4.8.3*). Not only the contradictory nature of the various management approaches created employee cynicism but also the fact that management did not behave according to the espoused theories and excluded employees from the accrued benefits created by employees or even made employees redundant because of improved efficiency. Reengineering and restructuring often meant no more than cost-cutting and resource reductions. While words like 'trust,' 'commitment,' and 'loyalty' were common among these new management approaches, the very behavior of management turned these words into hollow phrases. In short, the command-and-control model of the mechanized enterprise remained firmly in place which contributed to the massive betrayal of employees. Many publications have identified indifferent, critical, cynical, disaffiliated, and disparaging employee behavior because employees experience adverse workplace conditions, incoherent enterprise practices, and lack of enterprise integrity (op. cit.). Aforementioned conditions are detrimental to successful enterprise change since employee cynicism fuels resistance to change, while employee involvement is crucial for successful change. Ultimately, the elusive promise of a better workplace amounts to depriving employees of the possibilities for personal well-being through conducting meaningful work by which feelings of self-esteem and self-respect are developed.

Fourth is the fruitless bureaucratization and juridicalization (cf. Sect. 4.8.4*). Enterprise mechanization discussed in Sect. 2.4.2 is manifest in an overwhelming bureaucratic burden created by a disproportionate focus on rules, regulation, protocols, record keeping, objective setting and fulfillment, evaluation, reporting, plans, performance targets, performance assessment, and contracts, to name but a few topics. Recall that the transaction costs theory merely sees an enterprise as a collection of contracts that outline the obligations of enterprise actors. Fuelled by complexity, dynamics, and uncertainty, unforeseen developments emerge that are nonetheless ignored within the mechanistic scope. Increased juridicalization and litigation is the inevitable consequence. Adding to this malaise are the effects of corporate governance requirements that have intensified reporting, auditing, and further juridicalization. Apart from the negative economic effects resulting from the considerable bureaucracy and its associated high costs, the increased bureaucracy and juridicalization pose also economic risks and do not contribute to enterprise performance (op. cit.).

Fifth is the mechanization of IT deployment (cf. Sect. 4.8.5*). It is no surprise that, given the dominance of strategic planning and control, also the deployment of information technology (IT) likewise manifests those characteristics. Much of the IT governance approaches focus, as the introductory chapter indicates, on mechanistic aspects such as planning, decision-making, controls, and accountabilities, whereby management has the central role. Strategic IT planning is expected to produce business and IT alignment and portrays an assumed causal chain of cause-effect relationships, starting with formulating strategic IT goals and ending with their implementation and reaping benefits. All that is supported and controlled through performance indicators and measurements that permeate all layers of the enterprise. If that simple, one might wonder why the majority of IT strategic initiatives fail. We have criticized these approaches strongly (op. cit.). As examples of such inadequate approaches, the questionable value of IT project and portfolio management for establishing business and IT alignment is already apparent based on the discussion in Sect. 1.4.1 and will be further argued in the next chapter after presenting a fundamentally different viewpoint about enterprise change.

The mechanization of IT deployment entails the danger that also IT systems manifest mechanistic characteristics. We might thus expect that IT is used such that the mechanistic characteristics are supported and enforced. Indeed, it seems highly unlikely that within the mechanistic atmosphere of strategic (IT) planning, as described above—and manifest in plans, targets, investments, budgets, accountabilities, performance measures and assessments, and so on—IT would be developed in ways that are opposite these mechanistic characteristics. In terms of the Law of Requisite Variety, IT utilization then works as an enterprise and employee variety attenuator. For example, within bureaucratic enterprises, the bureaucratic way of organizing becomes automated and makes it even harder to behave in ways other than 'the system' dictates. In this way, the impersonal IT system with its embedded rules and regulations for which nobody seems responsible becomes an alienating enforcement of bureaucracy (op. cit.). As argued, employee involvement and employee-centric organizing and their nonmechanistic characteristics require similar IT system characteristics. It is with this in mind that we are rather suspicious of a mechanistic approach to IT governance because of running a high risk that enterprise mechanization is (maybe unwillingly) enhanced and IT utilization becomes an enterprise and employee variety attenuator rather than a variety amplifier. Possibilities offered by IT are thereby not, or counterproductively, developed (op. cit.).

Sixth is the continuing crises (cf. Sect. 4.8.6*). The crises are manifest in various areas. The focus on economic gain and intense pressure to perform has led to questionable enterprise behavior. We have argued that the mechanization of enterprises and associated management behavior inevitably entails moral risks. Various cases discussed show that once the focus on economic performance takes over, immorality creeps in (op. cit.). Further, as mentioned before, instrumental behavior induced by enterprise mechanization has no moral connotation following from purpose and meaning and emotional relationships between and with people. Such instrumental behavior is manifest in the juridicalization of relationships between consumers and enterprises. Mechanistic approaches are morally indifferent, create adverse workplace conditions and subsequently widespread employee cynicism and indifference, and ultimately inflict severe social harm (op. cit.).

2.4.11 Revisiting the Importance of Enterprise Coherence and Consistency

After portraying the oftentimes bleak nature of enterprise reality in the previous paragraph, the importance of enterprise coherence and consistency (unity and integration) gains extra weight since serious forms of incoherence and inconsistency were indicated. As mentioned, employee apathy, distrust, disaffiliation, and cynicism are the detrimental consequences. Not only are incoherence and inconsistency sources of poor enterprise performance and strategic failures but also sources of negative employee feelings and behavior, which through a serious multiplier effect, additionally contribute to poor enterprise performance and strategic failures. In turn, these effects further breed aforementioned employee feelings and behavior (cf. Sect. 4.6.8*).

A case study about transforming a poorly performing enterprise with extreme forms of negative employee behavior into an excellently performing enterprise with involved and committed employees clearly demonstrates the importance of coherence and consistency of the behavior context (cf. Sect. 4.7.8*). Any issue that could threaten the coherence and consistency of the behavior context, and hence could impact employee trust, involvement, and commitment, was considered a major issue. With reference to the common causes of poor enterprise performance mentioned in Sect. 1.4.3, the remarkable fact to be noted is that the dramatic shift in performance was gained with the same workforce. This demonstrates in a remarkable way that not people but the way of organizing turned out to be the determining factor. Recall our critical observations about performance management and assessment of employees in the preceding paragraph in the context of this example.

2.4.12 Implications for Enterprise Governance and Enterprise Engineering

As we have learned, the ideological foundation for enterprise engineering argues normative viewpoints for the arrangement of enterprises. Therefore, the ideological foundation has profound implications for the nature of enterprise governance (distributed governance), which must (also) be based on ideological viewpoints, as well as for enterprise engineering since its theories and methods must be able to express and address the ideological viewpoints summarized above. The main implications are as follows.

Acknowledging the Social Purpose of Enterprises

Whereas the ontological considerations necessitated to acknowledge first and foremost the social nature of enterprises, the ideological considerations go further and claim that enterprises must have a morally justifiable social purpose and have a responsibility towards the stakeholders of enterprises and society at large. Important stakeholders are customers, employees, business partners, suppliers, and the neighboring community. Contrary to the economic perspective with its narrow focus on transaction costs and (performance) contracts—neatly fitting enterprise mechanization—enterprises exist to afford various social functions, thereby contributing to the integration and stability of society as a whole. As mentioned, social functions evidently include the delivery of products and services, but affording employment is also an important social function. Based on the argued holistic perspective, the enterprise meaning, purposes, and functions should be the overarching reference—the commonly acknowledged reasons for existence—for cooperating employees who are further guided by commonly shared norms and values associated with the overarching reasons for existence. Unfortunately, within the mechanized enterprise, moral aspects about enterprising and employment cannot be properly acknowledged and addressed.

Given the importance of coherence and consistency mentioned oftentimes before, the overarching meaning, purposes, and functions must be translated into organizing practices. As the philosophical and ontological implications indicate, such translation can never be the outcome of a mechanistic and deterministic process of planning and control but the emerging outcome of the process of finding out *how* the meaning and purpose must be made real for every employee and every way of organizing. Enterprise governance, outlined in the next chapter, will be perceived accordingly, while enterprise engineering must aid in the actual embodiment of meaning, purposes, and functions in concrete design, such as artifacts like performance criteria, job profiles, information systems, culture and behavior characteristics, and so on. Note that information systems can be very effective in linking, also operationally, the overarching reasons for existence to meaning, purposes, and functions, hence to local reasons for existence.

Creating Meaningful Work and Conditions for Self-Organizing
Based on the overarching meaning and purpose of enterprise activities, local activities must likewise have meaning and purpose that are congruent with and support those of the enterprise. As said, avoiding employee alienation and evoking employee involvement lies in understanding the purpose and significance of one's own tasks and (therefore) finding meaning in performing the tasks. Although the content of tasks and activities differs for different functional purposes, general characteristics for meaningful work have been identified (cf. Sect. 4.7.5*).

Self-determination is the crucial condition for psychological and physical health and is thereby a crucial aspect of meaningful work. For the working environment, this condition translates to employee self-efficacy and self-organizing, which are inherently associated with employee empowerment and freedom, contrary to the mechanistic, instrumental perspective. We have argued that all these conditions require leadership characteristics rather than traditional management characteristics (cf. Sects. 4.6.6* and 4.7.7*). The characteristics of meaningful work and the conditions for employee empowerment and self-organizing are core areas of attention for enterprise design.

Focusing on Performance Possibilities for Employees
In view of the sobering fact that virtually all causes of poor enterprise performance are the inherent consequence of ways of organizing (common causes), performance possibilities for employees are evidently not adequate. Hence, rather than questioning the performance willingness of employees by focusing on employee performance targets, performance contracts, and performance reviews, a far more productive, reasonable, and just approach is to focus on performance possibilities and abandon the all too often demoralizing ritual of employee performance measurement and appraisal mentioned in Sect. 2.4.10. The introductory chapter stressed the importance of enterprise unity and integration for enterprise strategic and operational performance. Performance possibilities for employees thus depend on this crucial condition which must be addressed through enterprise design.

Ensuring Employee Involvement and Behavior Variety
Empirical evidence proves the positive and essential contributions of employees pertinent to core enterprise performance areas: productivity, quality, service, learning, and innovation. Further, only through employee involvement combined with adequate variety in behavior can the Law of Requisite Variety be satisfied. Emerging organizing, oftentimes stressed before, depends on satisfying this law. Recall the previous points: (1) the overarching enterprise meaning, purposes, and functions and their translation to local meaning, purposes, and functions; (2) the creation of meaningful work and conditions for self-organizing; and (3) the focus on performance possibilities for employees. All these points form a coherent and consistent approach to enable employee involvement and employee behavior variety. Obviously, all these aspects are core attention areas for enterprise design, specifically the enterprise behavior context that determines employee behavior, as expressed by the enterprise morphogenic conceptual system model. Bring to mind that information systems, as parts of the structures and systems component of the model, often act as

variety attenuators. Hence, information systems design must be an integral part of the design of an appropriate behavior context, congruent with the viewpoint expressed in Sect. 1.4.1.

Adopting the Morphogenic Enterprise Conceptual System Model
Necessary for addressing the determinants of employee behavior is the adoption of the morphogenic enterprise conceptual system model, since structures and systems, culture, and management behavior must be concurrently addressed for ensuring a proper, coherent, and consistent behavior context. Further, essential for enterprise continuation is the ability to change and adapt. Unlike the traditional focus on structures and systems that characterizes most approaches to enterprise change, enterprise engineering must be able to effectively deal with culture, management behavior, and employee behavior, since these components of the morphogenic model appear to be crucial for successful enterprise change. Hence, enterprise engineering must have the ability to deal with all components of the model since only through addressing the components in a coherent and consistent way can effective change be understood and enterprise design for realizing successful change be accomplished in a unified and integrated way.

Adopting the Employee-Centric Theory of Organization
Arguments for adopting the employee-centric theory of organization are plentiful (Hoogervorst 2017, 2018). Some of these arguments were summarized above. By reiterating some previous points, the importance of the employee-centric theory of organization can be readily acknowledged. First, the social purposes and responsibilities of enterprises imply concern for the various functions enterprises afford. Next to adequately delivering products and services, these functions include the affordance of employment. Proper employment involves ethical consideration since employee alienation, distrust, cynicism, and physical and mental illness are not considered proper employment consequences. Avoiding these consequences clearly requires employee-centric organizing. This requirement refers to a second point discussed before: the creation of meaningful work. Creating (designing) the characteristics of meaningful work needs the employee-centric theory of organizing in order to understand what the characteristics should be. Third, empirical evidence teaches that employee involvement is crucial for enterprise performance pertinent to productivity, quality, service, learning, and innovation. Further, only through employee involvement can the Law of Requisite Variety be satisfied, which is crucial for enterprise operational and strategic performance. Both reasons for employee involvement point to the notion of emerging organizing discussed before. Evoking employee involvement depends on proper characteristics of the behavior context. Insights for addressing these characteristics, closely associated with those for meaningful work, are provided by the employee-centric theory of organization.

Adding to the previous considerations is the following. Enterprise change manifests the ability to learn. From an operational perspective, learning is essential for the process of continuous improvement. Enterprise learning also lies at the heart of strategy development and subsequent realization. All these learning capabilities are based on employee learning, which crucially depends on employee involvement, as mentioned before. Hence, an effective enterprise governance competence must have learning ability as a core characteristic. The next chapter will clarify how such learning is perceived in the case of governance. Obviously, enterprise engineering has to have the ability to effectively address (1) meaningful work and employee involvement; (2) the appropriate behavioral context (culture, management behavior, structures, and systems), such that employee involvement and employee variety is enabled; (3) enterprise learning, both strategically as well as operationally; and (4) given the focus on employee behavior, enterprise engineering should have the ability to effectively link insights of the traditional organization sciences, especially those concerning human behavior and motivation, with the concepts for enterprise design. In view of the dominant influence of information systems as a facet of the structural functionalistic enterprise aspects, enterprise engineering should have the ability to translate previous requirements into the design of information systems, such that these systems support employee involvement and work as employee and enterprise variety amplifiers rather than variety attenuators. In short, enterprise engineering must be able to deal with the employee-centric theory of organization. Concepts for enterprise design that reflect only the structural functionalist perspective on enterprises make it, understandably, inherently difficult to do so.

Acknowledging the Unitarist Perspective on Employee and Enterprise Interests
Our resume of organization theories indicated that the traditional ideas, either implicitly or explicitly, consider employee and enterprise interests as incompatible if not conflicting. Management control and coercive measures are deemed necessary to align employee behavior with enterprise interests, such as the well-known recipe of performance targets, performance control, and periodic performance assessments. This dualist position conforms with enterprise mechanization and the instrumentalization of employees: to be made as reliable as machine parts.

Arguments for adopting the employee-centric theory of organization clearly prove the importance of employee involvement beyond their instrumental behavior for adequate enterprise operational and strategic performance. Yet, at the same time the organizational conditions (behavior context) for enabling employee involvement are those that afford employees meaningful work which allows them self-organization, self-efficacy, and personal development. Employee and enterprise interests can thus be harmonized. Rather than adhering to the dualist position, the unitarist position on employee and enterprise interests should be acknowledged as the basis for organizing. The unitarist viewpoint and the employee-centric theory of organizing are the foundations for enterprise health: the condition to prosperously continue and develop.

Ensuring Enterprise Coherence and Consistency
The importance of enterprise coherence and consistency is amply stressed before in view of enterprise performance and strategic success but also in view of avoiding negative employee feelings and behavior, which in turn further contributes to poor performance and lack of strategic success. Ensuring coherence and consistency of the behavior context is thus crucial and points to a unified and integrated enterprise design. Again, as mentioned above, enterprise engineering must be able to address

the morphogenic conceptual system model comprehensively such that (possible) instances threatening enterprise coherence and consistency can be dealt with.

Summary of Ideological Implications

1. Traditional approaches to organizing are mechanistic: the enterprise as a machine with employee as instrumental parts. The machine-like concept by its very nature excludes moral considerations about organizing and employment.
2. Enterprises are social entities that have a social meaning and purposes for society by affording certain functions which include employment. Responsibilities of enterprises extend beyond the narrow economic perspective and include stakeholders of various kinds. The social impact of enterprises cannot be ignored.
3. Disquieting employee conditions leading to physical or mental illness, as consequences of inappropriate organizing, are unacceptable. Avoiding these consequences—and avoiding the fundamental attribution error—necessitates adopting the employee-centric theory of organizing.
4. Through adopting the employee-centric theory of organizing, a coherent and consistent approach is created for (1) properly effectuating the social purposes of enterprises, (2) creating meaningful work, (3) enabling employee involvement, and (4) satisfying the Law of Requisite Variety which is essential for enterprise operational and strategic performance.
5. Unlike the dualist position about the incompatible nature of employee and enterprise interests, the unitarist viewpoint claims the opposite. Arguments for the employee-centric theory of organization corroborate the unitarist viewpoint. Both these foundational views are conditional for enterprise health.
6. By adopting the employee-centric theory of organization, an important contribution to enterprise coherence and consistency can be realized if the insights of this theory can be addressed through enterprise design.
7. Enterprise change is based on enterprise learning, which in turn depends on employee learning. This latter learning is inconceivable within an instrumental perspective on employees. The non-instrumental perspective acknowledges employee agency and their contribution to change (distributed governance).
8. Enterprise governance must be based on the principles of distributed governance, while enterprise engineering must be able to effectively address all components of the morphogenic enterprise conceptual system in order to translate the insights of the employee-centric theory of organization into concrete design.

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Chapter 3
Enterprise Governance and the Process of Enterprise Design

3.1 About the Nature of Change in Social Contexts

3.1.1 Enterprise Adaptive and Reshaping Initiatives

Section 1.3 introduced two essential enterprise competences, respectively, concerned with enterprise operation and enterprise change. Enterprise governance is the competence—unified and integrated whole of skills, knowledge, culture, and means—for continuously inciting enterprise adaptive and reshaping initiatives and their unified and integrated operationalization through enterprise (re)design and subsequent implementation. The enterprise adaptive and reshaping initiatives have different forms concerning (1) the scope or impact of change and (2) the timescale or lead time of change. Most likely, the two characteristics are highly correlated, with a continuum ranging from small to large changes. Roughly speaking, small changes might be associated with the process of continuous operational improvement, while large changes are of a strategic nature, as Fig. 3.1 illustrates.

We mentioned earlier that the operational and governance competence are highly interrelated, as will be further argued below when discussing the notion of distributed governance. The continuum between continuous operational improvement and strategic change already indicates the close relationship between both competences.

As mentioned, change and adaptation often have a strategic nature, that is, certain desirables are formulated that enterprise change should accomplish. We define strategy as:

- *Strategy* The totality of choices, intentions, and initiatives—shortly identified as strategic desirables—that provide an overall orientation for the future development of the enterprise.

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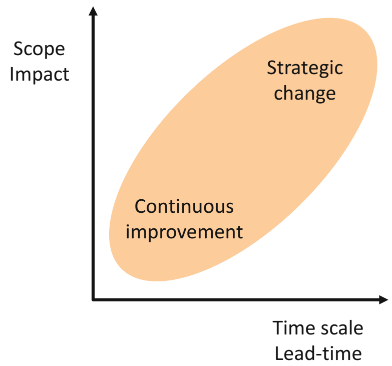

Fig. 3.1 Different characteristics of enterprise change

For understanding the nature of change in social contexts like enterprises, the next paragraph introduces a number of strategic desirables and discusses their complexity and the inevitable initial lack of clarity.

3.1.2 Strategic Desirables: Complexity and Initial Unclarity

Above, we have defined an enterprise strategy as the totality of choices, intentions, and initiatives—shortly identified as strategic desirables—that provide an overall orientation for the future development of the enterprise. A strategic desirable is thus the expression of an aspect of the enterprise strategy. Our viewpoints about enterprise governance will be presented against the context of some examples of strategic desirables given below:

1. A company supplying commodity communication services (telephone, electronic mail, Internet access, etc.) wants to expand into a new geographical and customer area. Since the nature of commodity services makes it easy for customers to switch to another supplier, the company wants to sustain customer loyalty by making customer intimacy a strategic focus of the new market entrance. Among the ideas for creating customer intimacy is the delivery of complementary services alongside the commodity services. Innovative use of (information) technology is envisioned, with a productive integration of the physical and virtual world, as a cornerstone of creating customer intimacy.
2. Societal members (citizens, shop owners, public transporters, educational staff, government officials, etc.) are more and more concerned with increasing crime. The national police department considers the idea of using (electronic) social media as an aid in addressing this problem. All stakeholders should support the eventual approach taken such that participation is valued, evoked, and sustained.
3. A long-standing enterprise faces the problem of attracting young professionals and wants to use new and modern communication means and channels to promote the company and to improve the recruitment and selection of

professionals. Additionally, the means and channels should not only clarify the various positions and associated competences but must enable potential candidates to do self-assessment about personal attributes, the characteristics of the most appropriate and desired type of work, and the match with the various job profiles.

4. A new European utility (electrical energy and gas) company is 'legally' established through the acquisition of several previously autonomously operating, and often state-owned, utilities. The new company not only intends to integrate and streamline the previous utilities, included in which is the elimination of redundancies, but moreover intends to transform the bureaucratic, inward-looking culture and behavior into customer-oriented and service-oriented culture and behavior. These challenges are intensified by Europe's open, liberal energy market policies that create increased competition and customer power.
5. Employee cynicism and disaffiliation, combined with poor operational performance and defecting customers, have plagued an organization for some time. New executive management understands that simple 'solutions' are not available and aims to (among other things) address this serious problem by embracing the employee-centric way of organizing. Central in this intention is the creation of meaningful work and using information technology not only to support working activities but, moreover, for enabling employee self-efficacy and linking individual activities and purposes with the overall enterprise purpose, norms, and values.
6. Growing bureaucracy has stiffened the operations of a governmental institution, made employees complacent, and stakeholders dissatisfied. Institutional response times are at an all-time high not only due to bureaucracy but also because of the rather central nature of decision-making which is, above all, seen as a management prerogative. Politicians demand change. Management contemplates the idea of using information technology innovatively for combining local (employee and unit) autonomy with overall operational and regulatory unity to improve organizational responsiveness. Some people within the institution have raised awareness that technology alone will not solve the problem.
7. An industrial factory operates at a mediocre quality level: considerable defect rates for the products produced and a subsequently high volume of rework. Employees are not specifically quality-oriented because of the perceived lack of performance possibilities, while management reporting and employee assessment virtually concern productivity only. Besides, the use of separate quality inspectors leads employees to believe that quality is not their affair but that of the inspectors. In an attempt to change the tide, the factory wants to reorganize: eliminate separate quality inspection, make employees responsible for the quality produced, and introduce the concept of continuous improvement.

When reflecting on these strategic desirables, two common characteristics stand out: (1) enormous complexity since multiple enterprise aspects play a role that have to be addressed by applying the foundational insights for enterprise engineering and (2) initial unclarity about how to realize the strategic desirable. These two characteristics portray any nontrivial strategic desirable and are the basis for our further reflections.

The examples of strategic desirables express in a brief form what is proposed, wanted, or intended. But how are strategic desirables identified? That is, how do they come into existence as the expressions of a desired future enterprise reality? Under the label 'strategic planning,' the traditional viewpoint is identified that views (executive) management as the source of strategic wisdom. This wisdom supposedly enables management to formulate strategic desirables and initiate their realization top-down through the causal steps of planning and control which human actors operating in the causal chain commit to carry out. In line with the notions of emergence, emerging organizing, and emerging change discussed in the previous chapter, we have strongly criticized the planning and control viewpoint and argued that strategic desirables are the unpredictable (in process and content) emergent outcome of social interaction (cf. Sects. 4.4* and 4.5*).[1] This perspective rejects the mechanistic flavor of structural functionalism and is rooted in the social theory of symbolic interactionism stating that human beings interpret reality and define it through social interaction (the 'social construction' of reality). The emergent social definition of reality likewise, and emergently, brings forward what is needed, wanted, or intended. At the same time, this constitutes the infant and inchoate 'starting point' (even this term is questionable) of a new social organization. As amply stressed, the process described is continuous and circular because developments concerning the new organization are interpreted and socially defined, subsequently leading to new emerging developments or desirables. Since enterprises are social systems, precisely the same processes bring forward the strategic desirables in an emerging fashion, which form the infant and inchoate starting point for new organizational forms. Surely, the mentioned complexity and initial unclarity of the strategic desirables confirm the infant and inchoate nature of the starting point. Even the moment in time of such starting point cannot be precisely defined.

As mentioned in Sect. 2.4.4, the views briefly outlined above have also been identified as 'strategic learning' whereby strategy development is seen as a learning process (cf. Sects. 4.4.7* and 4.5.5*). Learning not only concerns insights gained but, moreover, concerns the ability to improve action and behavior (cf. Sect. 4.3.5*). Hence, strategic learning is not only about gaining insights into strategic desirables but furthermore concerns the enterprise ability to improve performance through successfully turning the strategic desirables into reality. Our discussions below will further corroborate the perspectives presented so far.

[1] An asterisk (*) identifies a reference in *Foundations of Enterprise Governance and Enterprise Engineering* (Hoogervorst 2018).

3.1.3 Two Different Phases of Chance and Their Incommensurability

A core reason for failing strategic initiatives mentioned in Sect. 1.4 is the use of fundamentally inadequate beliefs about how the need for change becomes identified and how to accomplish successful enterprise change. The previous paragraph discussed beliefs about the process of identifying strategic desirables, either as a planning or learning process. Given the formulation of strategic desirables, such as the ones mentioned before, this paragraph focuses on fundamental philosophical insights about turning desirables into reality. Recall from these insights that concepts we have—our mental map—determine how 'reality' is observed and defined. Inadequate concepts will lead to erroneous ideas about reality, while essential aspects that should define reality are ignored. This is widely manifest in the case of enterprise change.

Change is about accomplishing something new. For enterprises, change implies accomplishing a new organization: a new state of being organized, as the examples in the previous paragraph illustrate. The scope and scale of change might vary greatly, but the process of change always consists of two fundamentally different facets or phases: the *conceptual* realization and the *physical* or *concrete* realization. As we will further outline below, the first phase concerns the *creative* process of progressing from *what* is desired—understandably often at first formulated in general and vague terms because of the mentioned complexity and unclarity—to *how* that is realized. Commonly, the conceptual realization is identified as a *design*. A design specifies the nature of the new situation: it expresses what the new situation *is*. Note that the creative process of design is integrative: aimed at synthesizing the desirables into an integrated whole. The key characteristic is learning.

Our philosophical discussions clarified that the language describing what something *is* (ontological language) is incommensurable with the language expressing the purpose or function of something (teleological language) (cf. Sect. 2.2.7). Since these language domains have no common ground, the essential consequence of this incommensurability is that no algorithm—a causal set of instructions, operations, and steps, with an inherent, deterministic outcome—can be defined to proceed from *what* is desired to *how* that is conceptually realized. Otherwise stated, it is impossible to proceed algorithmically, in a planned fashion, from the expressed strategic desirabilities to their conceptual realization (the design) that effectuates what is desired.

The second phase of enterprise change concerns the physical or concrete realization, based on design. Notably different from the first phase, the process in the second phase is essentially algorithmic as building and assembling processes express: it concerns putting the design into reality. The crucial difference is this. Designing is a *creative* process with an *unknown*, emerging result: the conceptual realization. Building, assembling, or implementing is an *algorithmic* process with a *known* outcome: the concrete realization of the design (cf. Sect. 3.8.5*). An algorithmic process can be planned: defining the instructions, operations, and steps for

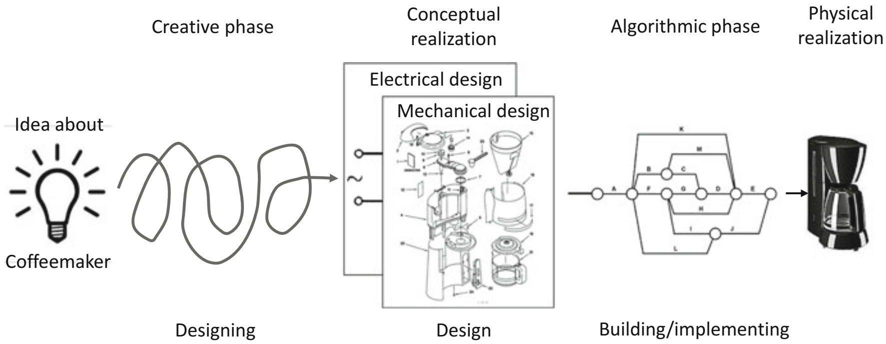

Fig. 3.2 Two distinct phases of change

accomplishing the inherent outcome. Note that, unlike designing, planning is reductionistic. It starts with the known outcome and works backwards to define the instructions, operations, and steps. These essentially different phases of change should not be confused, also in cases where change initiatives have short iterative cycles between designing and building. Unfortunately, many approaches to enterprise change can be noticed whereby algorithmic and planning-based methods are used for the first phase of enterprise change. The detrimental consequences are widely manifest. Needless to say, the enterprise governance competence, and especially the central enterprise governance function discussed below, must be competent in addressing both phases of change.

Figure 3.2 graphically illustrates the two phases of change for a technical system: the realization of a coffeemaker. As shown, the creative phase leads to the conceptual realization of the desirability to have a machine making coffee, as expressed by the mechanical and electrical design. Subsequently, the machine is built in the second phase. Note that the schematic of activities and steps—the algorithmic procedure or plan—is based on the *known* result (the design of the coffeemaker). Making the plan for building the coffeemaker is, as stressed above, reductionistic: working backwards from the end-result to the starting point of activities. No creativity is involved. Precisely the same characteristics hold for enterprises.

3.1.4 Social Organization and the Elusive Notion of Social Determinism

When summarizing theories of society, the notion of *social organization* was identified as a crucial concept and understood as the process towards a stable social form. A core aspect of social organization is bringing order and meaning into shared social activities (cf. Sect. 2.3.3). Crucial is the focus on 'meaning' as the essence of meaningful and enduring interaction relationships on which the stable social organization is based. These insights likewise hold for enterprises. They are not the static manifestation of a onetime design but the dynamic manifestation of an ongoing process of social organization. Within this dynamic process, meaning unfolds through human interaction, as is stressed by the viewpoint about emerging organizing (cf. Sect. 2.3.6) and the modern organization theory that considers sensemaking as the basis for organization and hence sees sensemaking and organizing as highly convoluted (cf. Sect. 2.3.14). Recall that the dominant structural functionalist viewpoint summarized earlier tends to induce mechanistic and deterministic thinking that ignores and drives out the meaning-seeking and sensemaking aspects as the very nature of organizing. When contemplating the nature of the strategic desirables mentioned in Sect. 3.1.2, the previous observations are clearly corroborated. Realizing the strategic desirables implies progressing to a new form of social organization, whereby the ongoing meaning-seeking and sensemaking aspects are evident since it has to be determined what the strategic desirables and their development are all about.

Further, an important aspect of social organization is the ordering into a unified and integrated whole, that is, ordering into a functional and normative unity. Exactly the same perspective applies in the case of enterprises. The importance of enterprise unity and integration has been argued before. Thus, enterprise change concerns progressing into a new, unified, and integrated form of enterprise social organization which is characterized by:

- Bringing new order and meaning into shared enterprise activities.
- Creating new functional and normative unity.

Note that, as before, the viewpoints outlined above are rooted in the interpretive sociological paradigm and the theory of symbolic interactionism that stress the importance of social (enterprise) processes and that of understanding social (enterprise) organization from the viewpoint of people participating in these processes. As mentioned before, within the interpretive paradigm and the perspective of symbolic interactionism, enterprise reality is seen as an emerging outcome of human activities. Meaning, truth, and knowledge emerge through shared activities. Core aspects of social organization are (cf. Sect. 3.4.2*):

- Human agency.
- Interactive determination.
- Emergence.
- Symbolization.

Through human agency—the expression of autonomous action, creativity, and accomplishment—enterprise reality is shaped (designed). Shaping this reality is a cooperative affair, as is expressed by the notion of interactive determination. By means of human interaction and interactive determination, new forms of organizing—the new enterprise designs—emerge. Symbolic interactionism has clearly seen that the new organizational forms bring forward new symbols (language and material entities) that are used to make sense of the new organizational forms and deal with them. Modern social media and its associated technology provide a lucid example of this process. But also the examples of the strategic desirables presented in Sect. 3.1.2 show that their realization creates new organizational forms whereby symbolic interactionism leads to emerging interpretations of those new organizational forms. Understandably, the new organizational forms are becoming new symbols of human orientation, interpretation, and meaning. Recall the comparable viewpoint expressed by existential phenomenology: humans shape the world and are conversely shaped by the world (cf. Sect. 2.2.6).

In line with our earlier observations, through the process of social (symbolic) interaction, learning takes place about the needed enterprise change and about how to accomplish the intended change. Such learning takes on different forms: (1) more directly operationally oriented as in the process of continuous improvement, and (2) strategic leaning that is commonly interpreted as having a more extended time horizon of change. Figure 3.1 of Sect. 3.1.1 shows the continuum in scope/impact and timescale/lead time. Although differences pertinent to these two characteristics of change are acknowledged, the essential nature is the same, as the continuum suggests. In both instances of change, learning through social (symbolic) interaction is essential. Clearly, the characteristics of this process concern the creative phase of change, as mentioned in the previous paragraph. Social organization and hence social change cannot take place by ignoring the creative phase and assuming that a planned, algorithmic process can bring about the intended social organization. When discussing how social change takes place in society, empirical evidence likewise proved that such change can never be the outcome of rational planning (cf. Sect. 3.8.1*). Social determinism appears to be an elusive notion, like strategic planning, as will be further argued below.

3.1.5 Emergence and the Ignorance About Knowledge Deficiency

Uncertainty is an inherent characteristic associated with complex systems, such as societies or enterprises, whereby their components and the relationships between them change in unforeseen ways, all causing the breakdown of deterministic predictability. Unforeseen, unknown, and often unintended (system) behavior will thus emerge (cf. Sect. 3.8.2*). Effects and consequences of actions are distant in space and time and often subtle and not obvious, making assumptions of a cause and effect nature between action and outcome invalid since causal links disappear in the complexity of reality. As history teaches, human beings and society in general are more affected by what is *not known* than by what is known and hence are more affected by *unpredicted* events than by predicted ones (op. cit.). Contrary to what the mechanistic worldview wants us to believe, there are novel occurrences in the world (and universe at large) that are *inherently* beyond prediction. Prediction is impossible, not because of lack of data but because of the inherent nature of phenomena (cf. Sect. 3.8.4*). In other words, as stressed before, there is *emergence*: the manifestation of new, novel, unique, and radically unpredictable occurrences. All these characteristics hold for enterprises as well. Uncertainty is fundamental, not only because of external and internal contingencies but also because there is no certainty that decisions made and actions taken will produce desired results. Moreover, uncertainty cannot be avoided by improved (process) modeling, producing more information, or creating more management interventions.

However, the mechanistic, reductionistic, and deterministic viewpoint eliminates awareness, let alone acknowledgement, about novel and unpredictable occurrences. Many actions within, and studies about, social life assume mechanistic characteristics by taking measures to control reality and using concepts to study reality that are fundamentally at odds with the very nature of reality (op. cit.). The illusion of understanding a complex phenomenon or (strategic) initiative, as well as the overvaluation of supposedly factual information contribute to the erroneous belief in planning and control. Further, the dominant mechanistic mindset produces the assumption about the close relationship between activities and results whereupon the whole misleading notion of performance management in enterprises is based. Despite emergence, uncertainty, and the illusion of prediction in the case of complex social systems, prediction and the assumption about causal relationships are virtually institutionalized, all manifesting the ignorance about knowledge deficiency despite the unavoidable bounded rationality discussed in Sect. 2.3.14. Arguably, this ignorance contributes to ignoring uncertainty and emergence and induces confidence in the limited available knowledge and a preference for planning and control based on this confidence. As a consequence, there is virtually only attention for issues internal to the planning: focusing on what is assumed to be known. But within the realm of strategy development, planning is naïve since the future is unknowable. It amounts to confusing emerging processes with algorithmic processes. Note that in areas where planning is fundamentally at odds with the nature of the topic of concern—which is nonetheless forced into a planning perspective—there is the danger that the plan takes on a life of its own. Despite the inherent vagueness, uncertainty, and lack of knowledge, the plan becomes reified: imbued with concreteness and correctness that supposedly truly reflect the future reality (cf. Sect. 4.4.6*). This is indeed a dangerous reification: a (financial) numbers game, completely detached from enterprise reality. Failing project 'plans' are the well-known manifestations.

3.2 Enterprise Change and Enterprise Governance

3.2.1 The Mechanization of Governance

Recall from Sect. 1.3 that governance is concerned with enterprise change. Not surprisingly, the predominant mechanistic perspective on organizing is similarly visible in the perspectives on governance. The introductory chapter outlined that perspectives on governance presented in the literature have a strong, if not exclusive, mechanistic character and are therefore also strongly coupled with tasks and responsibilities of enterprise (top) management. When discussing the problematic business and IT alignment issue, we noticed that IT governance is primarily structure and management oriented and concerns accountabilities, (investment) decision-making, and planning and control. Management is considered crucial for establishing the deterministic causal chain from (IT) strategy to the ultimate enterprise gains as a result of the strategic (IT) initiative. The top-down, decision-making management hierarchy is viewed as the key to enterprise performance. When discussing corporate governance and the accountancy view on governance, the mechanistic flavor was likewise noticeable. Corporate governance is viewed as a system of internal management control, while enterprise governance, according to the corporate governance proponents, is about the responsibilities and practices of executive management concerning the strategic direction and ensuring that the associated objectives are achieved (cf. Sect. 1.5.6*). Rather optimistically, the realization of enterprise performance is supposed to follow from setting objectives and the subsequent planning and control.

Based on various foundational insights, we have strongly criticized the mechanistic planning and control perspective on enterprise governance (Hoogervorst 2018). Some of these insights have been summarized before, such as (1) the emerging nature of truth and knowledge (cf. Sect. 2.2.6); (2) the crucial notion of social interaction (cf. Sects. 2.2.6 and 2.3.2); (3) the fundamental incommensurability between functional (*what*) and constructional (*how*) perspectives (cf. Sect. 2.2.7); (4) the viewpoints about social and emerging organizing (cf. Sects. 2.3.3, 2.3.5, and 2.3.6), the viewpoint about organizing as sensemaking (cf. Sect. 2.3.14), and the notion of emerging change (op. cit.); (5) satisfying the Law of Requisite Variety (op. cit.); (6) the different phases of enterprise change (cf. Sect. 3.1.3); (7) the elusive notion of social determinism (cf. Sect. 3.1.4); and (8) emergence and the ignorance about knowledge deficiency (cf. Sect. 3.1.5). The paragraphs below will further corroborate the untenability of the mechanistic approach to enterprise governance.

3.2.2 *Enterprise Change and the Law of Requisite Variety*

Section 1.3.5 defined enterprise governance as:

- *Enterprise governance* The enterprise competence (unified and integrated whole of skills, knowledge, culture, and means) for continuously inciting enterprise adaptive and reshaping initiatives and their unified and integrated operationalization through enterprise (re)design and subsequent implementation.

Below, we will outline what this competence looks like. For now, our focus is on the interpretation of ‘continuously inciting enterprise adaptive and reshaping initiatives.’ In view of the discussion in Sect. 3.1.1, the adaptive and reshaping initiatives range from continuous improvement to strategic change. In terms of the Law of

Requisite Variety introduced in Sect. 2.3.14, the variety in regulating change must at least be equal to the variety in phenomena that necessitate change, identified as the change contingencies. In short:

The variety of enterprise change regulation $\geq$ Variety of enterprise change contingencies

Specifically for enterprise strategic aspects we have:

The variety of enterprise strategic regulation $\geq$ Variety of enterprise strategic contingencies

Enterprises are high-variety systems subject to constant perturbation due to internal and external contingencies. When summarizing the viable systems view on enterprises in the previous chapter, we observed as a key requirement the ability to address variety properly, that is, react to the variety to which the enterprise is exposed. Hence, the enterprise must have adequate regulating capacity to address variety. It seems plausible that a rigid enterprise cannot properly address the variety it faces properly because it has limited 'maneuverable space,' or regulating ability (cf. Sect. 4.5*). As mentioned, the Law of Requisite Variety must be satisfied for operational contingencies as well as for change contingencies. The next paragraph will argue that the planning and control approach to enterprise governance cannot satisfy the Law of Requisite Variety.

3.2.3 The Fundamental Enterprise Regulating Mismatch

Plan, Planning, and Projects

The mechanization of enterprises has been described before. Central is the assumption of deterministic cause-effect relationships. All too often however, as we have emphasized, the assumed deterministic principle proves to be a fallacy. We illustrated the planning and control dominance in the realm of governance, strategy development, and the subsequent operationalization of strategic intentions. The essence of this approach can be outlined as follows. A plan is a precisely defined, detailed method and/or scheme of activities, worked out *beforehand*, for accomplishing a clearly defined objective. Since the scheme is worked out beforehand, there are known action-outcome relationships. In terms of Sect. 3.1.3, a plan is the expression of an algorithm: a causal set of instructions, operations, and steps with an inherent deterministic outcome. Executing a plan is thus an algorithmic process. As stressed earlier, the making of a plan is reductionistic, starting with the clearly defined objective and working out backwards the tasks that have to be accomplished. Planning is the devising of a plan, whereas control concerns securing that everything progresses according to plan. Obviously, the latter means no surprises. The unexpected must be avoided. Hence, planning and control as a governance mechanism offers little (ideally no) variety: the plan dictates the sequence of activities and behavior.

Associated with this thinking is the notion of 'project.' Literature about project management speaks about a 'project' if there is clarity *beforehand* about the (1) goal or objective to be realized; (2) time span of activities; (3) means, activities, and their logical relationships; and (4) measures for control of the internal and external environment in order to ensure that the defined activities proceed according to *plan* (Wijnen and Kor 1996). We might thus say that a project is the undertaking of efforts to realize a goal or objective according to a plan. Shortly, a project is a carefully planned and organized set of activities for realizing a specific, clearly defined, onetime goal or objective. It is important to realize that a project is always associated with reductionism: starting from the clearly defined goal or objective, the required means as well as the necessary activities and their relationships are defined backwards, such that when executed forward, they will produce the defined goal or objective, as exemplified by the building of the coffeemaker discussed in Sect. 3.1.3.

The Mismatch

Bear in mind that the notion of *variety*, introduced when summarizing organization theories in the previous chapter, was identified as the measure of complexity of a system, defined as the number of its possible states. The notion of 'state' was understood as a mode of system existence expressed by the momentary nature or value of its characteristics. For an enterprise, the number of characteristics is enormous; hence, also the number of possible states is enormous, due to the vast quantity of enterprise aspects and their varying status: customers, employees, material, products, services, utilities, equipment, and so on. Clearly, enterprises are high-variety systems that are subject to constant perturbation due to internal and external contingencies. This corroborates once again that enterprises are very complex entities confronted with considerable dynamics and uncertainty. Emergence, the occurrence of the unexpected, manifests thus an enormous variety and necessitates enterprises to be able to react to yet unknown issues. Governing enterprises thus necessitates maximum possible variety in order to satisfy the Law of Requisite Variety.

As Fig. 3.3 illustrates, there is a serious mismatch between the minimum variety that planning and control offers as an operational or strategic (governance) regulating mechanism and the variety required in view of the complexity, dynamics, and uncertainty—hence emergence of the unexpected—faced by enterprises operationally as well as strategically. Evidently, planning acts as a variety attenuator (cf. Sect. 4.5.2*). Planning enforces to follow predefined steps that essentially ignores variety. But (operational) organizational actions should not be based on predictions that cannot be reasonably made but based on sensemaking about an unfolding, emerging situation. Moreover, planning and control thinking presumes clearly defined goals or objectives for which predefined means and activities can be defined for accomplishment, but the emerging phenomena largely defy such presumption. Also in case of strategy development, variety reduction is manifest in the notion of 'strategic planning.' However, strategy development must address emergent phenomena: the

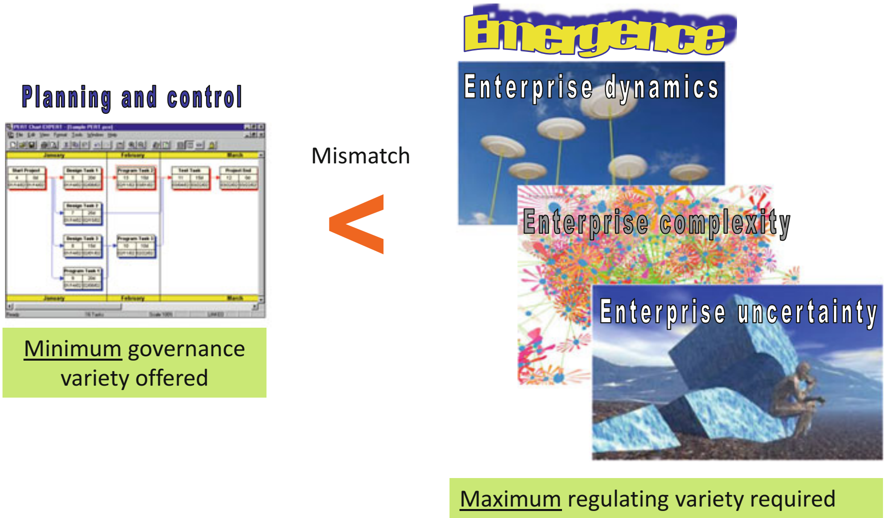

Fig. 3.3 A serious regulating mismatch

novel and unpredictable developments that the enterprise needs to address strategically. These dynamics produce a serious mismatch between the required regulation variety and the available regulating variety because the planning approach implies variety attenuation and creates nearly solid enterprises that cannot respond properly to the variety they face.

Additionally, the following might be added. First, the objections against the strategic planning view clearly corroborate that the identification and formulation of strategic desirables, such as the ones mentioned in Sect. 3.1.2, can never be the outcome of a planned process: executing a causal set of instructions, operations, and steps that would lead to novel insights and associated strategic desirabilities (cf. Sect. 4.4.6*). On the contrary, the identification and formulation of strategic desirables are the emerging outcome of enterprise *learning* processes (cf. Sects. 4.4.7* and 4.5.6*). Second, as the next paragraph will outline, the realization of strategic desirables likewise involves learning about how to transition from what is desired to its conceptual realization. This concerns the creative design process of finding out how the strategic desirables must be realized, as Sect. 3.1.3 illustrated for the desirable of producing a coffeemaker.

Given the above reflections, a fundamentally different perspective on enterprise governance must thus be introduced.

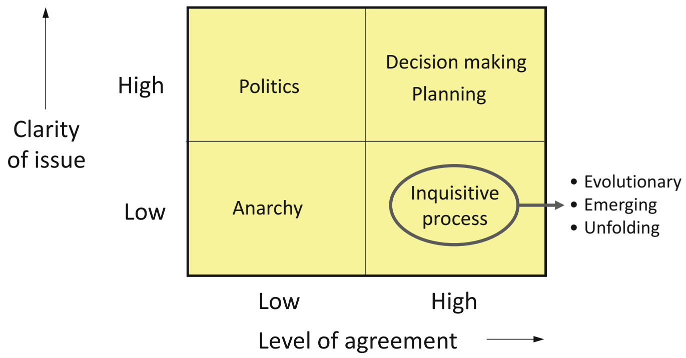

Fig. 3.4 Clarity and agreement matrix

3.2.4 The Inquisitive Process of Strategy Operationalization

When operationalizing strategic desirables (choices, intentions, initiatives), always two important aspects are involved:

- *Level of agreement* The degree of consensus among stakeholders about the change initiative, hence consensus about *what* to accomplish.
- *Clarity of issue* The level of comprehensibility and understanding about *how* the change initiative is to be accomplished.

These two aspects are depicted in the matrix of Fig. 3.4.[2]

Four typical situations can be identified. The situation with a low level of agreement about what to accomplish and also no clarity about how to accomplish anything has been labeled as ‘anarchy.’ In certain cases, there is full understanding about the ways to accomplish various initiatives, but there is low agreement about which of these initiatives to prefer. For example, a governmental budget deficit can be reduced through various initiatives, but disagreement exists about which initiative to select. So, the quadrant can be, rightly so, labeled as ‘politics.’ Sometimes, the agreement about what to accomplish and the clarity about how to do that are both high. Then the situation is relatively simple: make a decision and plan the execution of activities to realize the objective. An example is repairing a faulty system (agreement) with a known fault cause, hence a known repair procedure (clarity). However, very often there is high agreement about *what* to accomplish but low clarity about *how* to do so, for example, in case of an unknown cause for system failure. Other examples are agreement about lowering employee absenteeism or increasing safety. In these cases, investigation is necessary: an inquisitive process must commence for providing the required clarity.

We submit that enterprise objectives must nearly always be positioned in the lower-right quadrant of Fig. 3.4. For example, there is likely to be a high level of

[2]Original source of the matrix unknown

agreement that customer satisfaction or employee motivation must be increased, employee absenteeism must be reduced, quality deficiencies must be reduced, compliance or security must be enhanced, process inefficiencies must be eliminated, product failures must be avoided, or new technology must be successfully introduced (to name but a few issues). But it is highly unlikely that it is precisely known *how* to accomplish these objectives. Hence, only through an inquisitive process of analysis and synthesis are issues gradually understood and made clear. As can be readily ascertained, the characteristics of high agreement (about *what*) and low clarity (about *how*) likewise hold for the strategic desirables mentioned in Sect. 3.1.2.

Fundamentally distinct from the deterministic idea of strategic planning and control, the inquisitive process enables the circular process (circular response) of sensemaking and enactment discussed in Sect. 2.3.14. It is this inquisitive process that can (1) cope with the bounded rationality; (2) cope with the ongoing, unknowable, and unpredictable stream of experiences associated with strategic issues; and (3) address the ill-defined realm of strategic desirables and the possible issues of disharmony and conflict mentioned in Sect. 2.3.15. In terms of the two different phases of change discussed in Sect. 3.1.3, the inquisitive process concerns the creative phase wherein enterprise design takes place. The inquisitive process is multidisciplinary: all enterprise aspects, including IT, must coherently be addressed together with all relevant stakeholders. The process is iterative, evolutionary, and emergent, gradually yielding clarity for the various issues. Once that is the case for certain aspects, the upper-right quadrant applies: the content of certain tasks can be planned and executed, that is, the algorithmic phase of enterprise change can commence. All too often, governance is conceived as a linear top-down process whereby the situation of the upper-right quadrant is assumed to directly apply. Such a situation is virtually never the case which is yet another reason to reject the 'planning and control' governance approach.

In view of the purpose of enterprise governance, it is the enterprise governance competence that carries out and enables the inquisitive process and translates strategic desirables into enterprise (re)design (creative phase). Again, if and only if through this process issues become clear—thus through re(design), it becomes apparent *how* objectives are to be realized—then and only then can activities be planned, and one can speak about a project by which the (re)design will be implemented (algorithmic phase). Said implementation is also part of enterprise change and therefore included in the scope of enterprise governance. Core competencies within the enterprise governance competence will be discussed below. Clearly, the inquisitive process characterizes the very essence of an investigative process to discover an effective solution to a problem (Hevner et al. 2004). Put another way, the inquisitive process characterizes the very essence of a design process. The inquisitive process is about reflecting, searching, learning, and discovering, whereby (design) results are emerging.

Noticeably, under the labels 'appreciative inquiry,' 'cooperative inquiry,' or 'action research,' approaches have been suggested that basically fit within the presented enterprise governance view and the notion of an inquisitive process for investigating enterprise issues with the intent of enhancing enterprise performance, hence with the intent to devise a new enterprise design (Barrett and Fry 2005; Burns 2007).

3.2.5 The Creative Process of Enterprise Design

Earlier, we identified lack of enterprise unity and integration as a core reason for strategic failures and inadequate enterprise performance. Others have used the word 'concinnity'—the skillful arrangement of parts to create a harmonious whole—for establishing enduring excellent enterprise performance (Sisodia et al. 2007). Section 1.4.3 mentioned that research clearly indicates a strong relationship between enterprise performance on the one hand and enterprise unity and integration on the other hand. As stressed before, unity and integration do not occur spontaneously but have to be established through enterprise design. This necessitates thorough knowledge about, and insight in, the numerous enterprise aspects that need to be unified and integrated.

Enterprise design and all its associated aspects are the province of the inquisitive process mentioned above. As stressed, this is a creative, nonalgorithmic process whereby activities at the start of the process are not clearly defined and *cannot* be clearly defined, as the examples in Sect. 3.1.2 illustrate. Reiterating our observations in Sect. 3.1.3, the enterprise design process does not have the characteristics of a planned process and hence does not have the characteristics of executing a project according to a predefined plan, again a formal reason for rejecting mechanistic governance.

Figure 3.5 expresses the previous insights for two strategic initiatives. When the strategic change initiative is initiated, the freedom of choice is, given certain overall conditions, maximum: the starting point of the inquisitive process in the lower-right part of Fig. 3.5. Through executing the inquisitive process (the design process), issues, wants, and needs are investigated and made specific. Things become clear: vagueness disappears and decisions can be made, such that the change initiative (the new design) gradually 'materializes.' Hence, the freedom of choice reduces and clarity about *how* to realize the strategic initiative increases. The inquisitive process (creative phase) ends when the design is finished: the point in the upper-left part of Fig. 3.5. Then and only then can one speak about a project. Hence, then and only then there is clarity about *how* to make or build something and execution can be planned (algorithmic phase). Clarity is provided by the artifacts the design process produces. These artifacts that outline the future enterprise arrangements (ways of organizing) in the forms of models and representations mentioned in Sect. 1.5.2. Representations cover a wide spectrum of artifacts, such as documents detailing the implications of the meaning and purpose(s) of the enterprise and the enterprise units, performance criteria, job profiles, information systems and their purposes and functions, or culture and behavior characteristics, and so on.

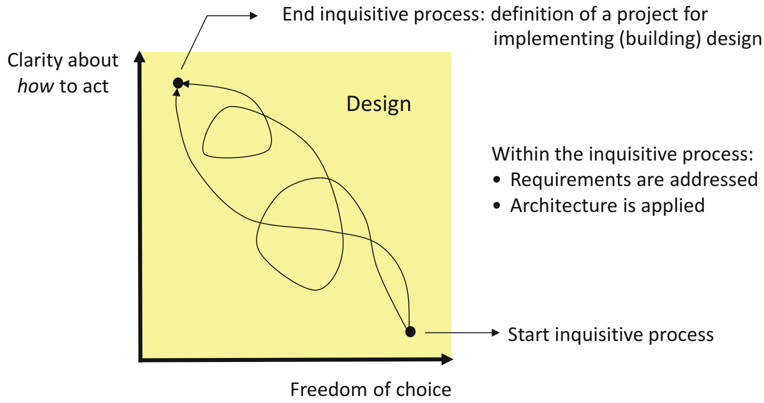

Fig. 3.5 Progress of two creative, nonalgorithmic design processes

As Fig. 3.5 aims to illustrate, the creative design process (the inquisitive process) manifests an unpredictable progression. Within this process, the theories, methodology, and methods of enterprise engineering are used to (1) formally address strategic initiatives and areas of concern and translate them into enterprise design and (2) ensure enterprise unity and integration. Requirements associated with the strategic desirables are addressed in the design process, while the design is guided by design principles (architecture) in order to ensure unity and integration, as well as for addressing areas of concern. All these topics are further outlined in the next chapter. The various enterprise aspects, among which are corporate governance compliance, information supply, and IT, are concurrently addressed, whereby relevant stakeholders are involved. The enterprise design process is thus inherently multidisciplinary. Obviously, the enterprise design theories and methods must be able to accommodate the multidisciplinary character of enterprise design. We stressed before that numerous approaches to enterprise design fail in this respect.

Note that the inquisitive process, hence the multidisciplinary creative process of design whereby all stakeholders are involved, exemplifies the organizing principles defined within the organization theory of Mary Parker Follett mentioned in Sect. 2.3.14: (1) coordination by direct contact of the responsible people concerned, (2) coordination in early stages, (3) coordination as reciprocal relating of all the factors in the situation, and (4) coordination as a continuous process. Such coordination (involvement) is an important facet of the enterprise governance competence.

3.2.6 Incommensurabilities: Function Versus Construction and Designing Versus Planning

In addition to our earlier observations, the fundamental incommensurability between function and construction and between designing and planning can be explained as follows. Section 3.2.3 described a plan as a precisely defined, detailed method and/or scheme of activities, worked out *beforehand*, for accomplishing a clearly defined objective. Recall that the making of a plan is reductionistic, starting with the clearly defined objective and working out backwards the tasks that have to be accomplished. Executing a plan, however important that might be in certain cases, involves no creativity concerning the end-result since the known end-result is the very basis of the plan. In case of a design process, however, the outcome is *not* known and the end-result is *not* defined. A creative process essentially cannot be planned. Every attempt to do so denies the emerging character of designing.

The fundamental distinction between planning and designing can be further illustrated as follows. Strategic desirables are always expressed by teleological or functional language, whereby goals, purposes, wants, or needs are expressed. Put differently, it concerns *what* must be realized and *why*. In case of the concrete realization of strategic desirables, ontological or constructional language is used. It concerns *how* the strategic desirable ultimately is operationalized, hence how it is turned into reality. As mentioned before, these two language domains are incommensurable: they have no common ground. This crucial insight, which we have summarized in Sect. 2.2.7 of the philosophical foundation, can be further illustrated as follows. When we encounter an unknown object, it is possible to describe the object in terms of its physical manifestation. However, such description provides no indication about the possible function or purpose of the object. Language for describing *how* something is (the construction) is thus fundamentally different from language that explains *why* something is (the function). Note that an object might have more than one function or purpose. More formally expressed, teleological language on the one hand and ontological language on the other hand are language expressions associated with two fundamentally different perspectives on the same phenomenon. As said, these languages are incommensurable: they have no common ground that enables to formally reason from one language domain to the other. This impossibility implies that it is likewise impossible to progress algorithmically from functional or purpose statements (what, why) to constructional statements (how). Hence, the crucial point is the impossibility to progress algorithmically through a plan—a predefined series of steps and activities—from functional wants and needs to their constructional concretization (conceptual realization). There is no formal procedure that can make that happen. The above observations are additional objections against the notion of strategic planning (cf. Sects. 4.4.6* and 4.5.5*). Remember that the conceptual realization of strategic desirables is characterized by a creative, emerging (design) process which fundamentally cannot be planned. Like the philosophical and ontological implications indicate, it is the inquisitive (design) process that provides the emerging link (the path develops *in* the process) between *what* is desired and *how* that is realized. Figure 3.6 graphically expresses these essential viewpoints.

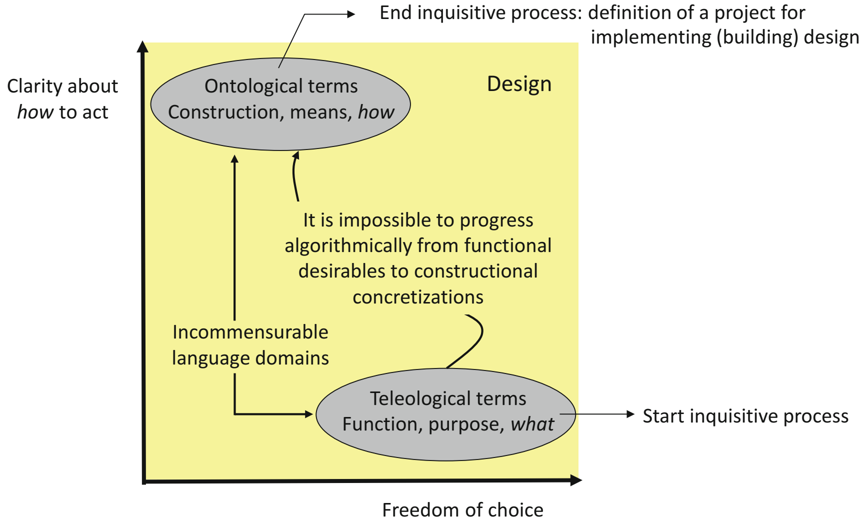

Fig. 3.6 Fundamental incommensurabilities

3.2.7 Enterprise Governance as the Competence for Change

As indicated, the enterprise governance competence—the unified and integrated whole of skills, knowledge, culture, and means for continuously inciting enterprise adaptive and reshaping initiatives and their unified and integrated operationalization through enterprise (re)design and subsequent implementation—is concerned with enterprise (strategic) change. Satisfying the Law of Requisite Variety requires that the enterprise governance (strategic) change regulating variety exceeds, or at least equals, the variety of strategic contingencies. We have argued that the required governance regulating variety cannot come from enterprise members being instrumentalized through planning and control measures and argued further that the planning and control governance approach creates a serious mismatch with the complex, dynamic, and uncertain enterprise reality. Experiences show that events progress unpredictably, while activities have an iterative and emerging nature, rather than a sequential and planned nature (Mintzberg 1994; Ciborra 2002). Rightly, "when an organization undergoes a transformation it experiences a process that is dynamic and iterative, rather than a one-way sequence of separate steps" (Keller and Price 2011, p. 19). Hence, regulating variety of the enterprise governance competence is formed by knowledge and skills of enterprise members engaged in strategic learning and by the carrying out the creative, inquisitive enterprise design process. Note that learning is voluntaristic, whereas planning is deterministic. Herein lies the advantage of the learning-oriented rather than planning-oriented view on governance: complexity, dynamics, and uncertainty make it unfruitful to precisely define strategic activities in advance. A skilled governance competence is the very foundation for dealing with complexity, dynamics, and uncertainty and the ability to determine the nature of activities and when and how they are to be performed. This competence is essential, given the complex and largely unpredictable, hence emerging, character of strategy development and the ultimate implementation. It is this competence that—through an inquisitive process—interprets the, partly technology-driven, environmental dynamics and operationalizes, details, and works out vague, generally formulated (macro) strategic intentions into possible strategic developments and their operationalization. It is this competence that—other than the top-down, planning control view suggests—initiates strategic developments bottom-up, which anticipate possible enterprise developments and their associated dynamics (enterprise enablement). It is this competence that constitutes and shapes the strategic dialog and the (in)formal social interaction and participation of stakeholders. It is this competence that ensures a unified and integrated enterprise design and the implementation thereof. Hence, it is this competence that effectuates enterprise transformation. Finally, it is only this competence that provides the necessary variety to satisfy the Law of Requisite Variety discussed above. Note that the learning-oriented view on enterprise governance is in itself an aspect of enterprise design. The paragraphs below will outline how the enterprise governance competence must be precisely conceived and created. Given the emphasis on strategic learning, the enterprise governance competence rests for a considerable part on the individual competences of employees.

3.2.8 Phases of Enterprise Realization

For illustrating the scope of enterprise governance, four phases of enterprise realization are shown in Fig. 3.7. Core areas of attention in each phase are presented. We have identified the four phases as:

- *Orienting/intending* Conceptual exploration.
- *Development/design* Conceptual realization.
- *Building/implementation* Physical, ready-to-use realization.
- *Delivery/operation* Physical, in-use exploitation.

The inquisitive process discussed in the previous paragraphs is concerned with the orienting/intending and development/design phase. Enterprise design is addressed in the development/design phase. Hence, this is the phase where the enterprise engineering theories, methodology, and methods, which will be discussed in the next chapter, are applied. It must be stressed that through the inquisitive process, many strategic initiatives are developed in the development/design phase, for example, strategic initiatives concerning customer interaction, HRM, security, or the use of certain types of technology. So, as indicated schematically by the dotted line, the phases orienting/intending and development/design have an interacting, iterative relationship. As stressed before, the development process is iterative, concurrent, and emergent.

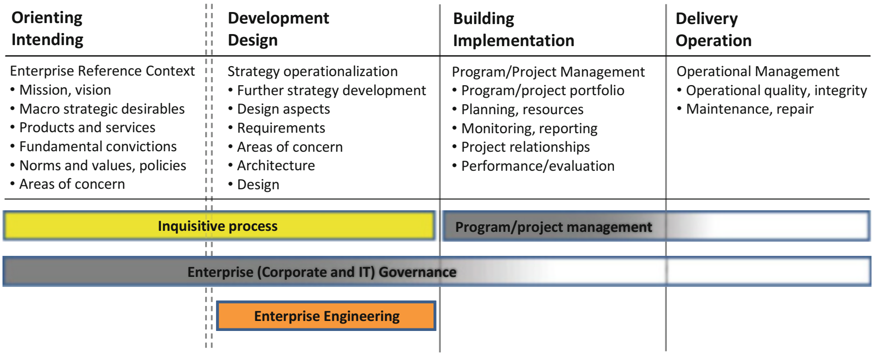

Fig. 3.7 Phases of enterprise realization

The transition to the building/implementation phase—hence the transition from the lower-right quadrant in Fig. 3.4 to the upper-right quadrant—must in our view be based on rather strict conditions. This concerns the strict distinction between the creative phase and the algorithmic phase mentioned before. Indeed, it seems obvious that only then can building and implementation commence—thus one or more projects are executed—if it is precisely defined what the project result must be. Put differently, the transition from the development/design phase to the building/implementation phase must, at least for the activities undertaken in the project, be based on a clear, specific enough design. Comparable considerations hold for the transition towards the deliver/operational phase.

Note that enterprise governance encompasses all phases. The extension towards the operational phase follows from the fact that (1) people engaged in operational activities can come up with brilliant ideas that have strategic impact and (2) all enterprise strategic changes must ultimately be made operational. We return to the first point when further exploring the nature of enterprise governance when acknowledging "the motor of corporate entrepreneurship. This resides in the autonomous strategic initiatives of individuals at the operational levels in the organization" (Brugelman, In: Mintzberg et al. 1998, p. 188). The second point for extending enterprise governance into the operational domain is similarly relevant for program/project management. As with design (conceptual realization), also the final implementation (physical realization) of enterprise (re)design cannot be properly done without involving operational staff. Finally, the fact that enterprise governance is concerned with the building/implementation phase does not necessarily mean that the enterprise governance competence actually executes projects (that might be the domain of service providers), but it means that the enterprise governance competence provides guidance pertinent to, for example, the content and structure of project proposals, progress reporting, relationships between projects, and project evaluation arrangements. The case illustration in Chap. 5 will further detail the enterprise governance competence.

3.2.9 Distributed Governance and the Relationship Between the Enterprise Operational and Governance Competence

We have defined enterprise governance in the introductory chapter as the *competence*: the unified whole of knowledge, skills, and technology for continuously inciting enterprise adaptation and reshaping initiatives and their unified and integrated operationalization through enterprise (re)design and subsequent implementation. Conceptually, enterprise governance is the direction-giving capacity for future enterprise developments and for achieving and maintaining enterprise unity and integration.

The Principal Aspects of Enterprise Governance
Associated with the mechanization of enterprises is the idea that management is the source for enterprise performance since they supposedly have knowledge and therefore the decision-making prerogative. Introducing an enterprise governance competence giving guidance to enterprise developments might be interpreted as a new form of mechanization in disguise: the renewed monopolization of 'knowing and wanting' by a governance competence. This danger is not unreal since, as the summary in the previous chapter outlined, mainstream ideas about governance perfectly fit the mechanization of enterprises. We will offer a fundamentally different view, which is introduced with the aid of Fig. 3.8.

The lower part of Fig. 3.8 symbolically depicts enterprise operations (the operational competence), while the upper part shows a central enterprise governance function. The latter function might be labeled as Enterprise Governance Office, or Enterprise Development Office. Operations, including operational management, concerns everything not related to governance, hence everything that regards the current enterprise 'being' as discussed in Sect. 1.3.5. For the sake of simplicity, we focus on the delivery of products and services by employees (symbolized by circles) having all kinds of collaborative relationships (symbolized by solid arrows) for producing the products and services.

Within the morphogenic and employee-centric perspectives summarized in Sects. 2.3.9, 2.4.7, and 2.4.8, employees are not viewed as instrumental 'parts' carrying out operational tasks but viewed as thinking individuals who can not only act prudently pertinent to unforeseen operational contingencies (Law of Requisite Variety) but moreover are also able to reflect, learn, and generate improvement ideas about operational processes, productivity, quality, products, or services. For these ideas, employees are sensitive to all kinds of external or internal stimuli. Next to and in conjunction with operational relationships, employees thus also have mutual reflective and learning relationships, as expressed by the dotted arrows. This perspective on governance has been emphasized in view of excellently performing enterprises. Leaders of these enterprises "know that they are not the source of all strategic wisdom in the company; employees at any level can come up with brilliant ideas that could transform the company" (Sisodia et al. 2007, p. 87). We reiterate that

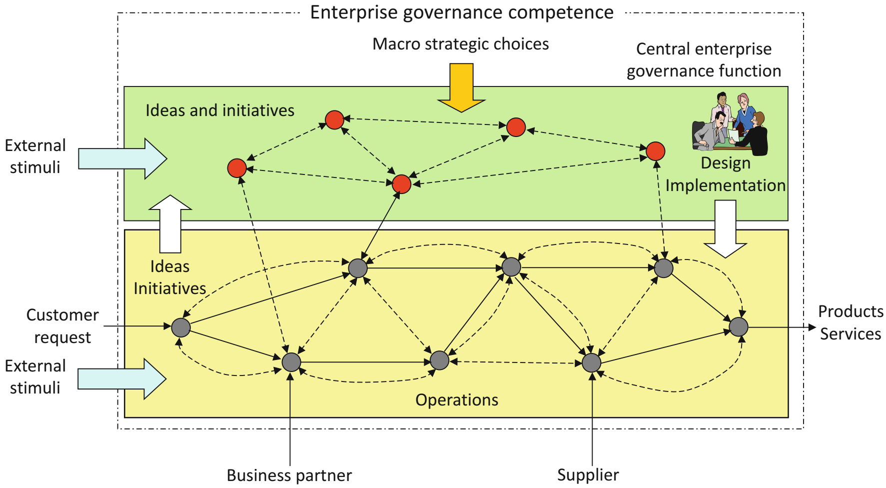

Fig. 3.8 Enterprise governance competence

analyses about the origin of strategic ideas indicate that these ideas rarely come from 'the top' but originate from employees (Christensen 1997; Moss Kanter et al. 1997; Hoogervorst 2017). Comparably with the insights in the importance of employee involvement for operational performance, as expressed by the notion of distributed management discussed in Sect. 2.4.6, the fact that employee involvement is also crucial for strategy development is expressed by the notion of *distributed governance* mentioned in Sect. 2.4.6. Enterprise adaptation and change concerns all enterprise members; everyone must be encouraged to contribute. Distributed governance expresses the necessary and essential contributions of employees concerning strategy development. Others speak about distributed intelligence (Schwaninger 2009) or distributed creativity (Espejo and Reyes 2011). Note that the notion of distributed governance can only be understood and practiced by using the morphogenic enterprise conceptual model. Acknowledging the reciprocal and reflexive relationship in the case of distributed governance means acknowledging that employees are governed on the one hand and, conversely, effectuate governance themselves on the other hand. The aforementioned relationship means that governance is an intentional force for guiding enterprise developments while at the same time an emerging effect of these developments. Practicing the employee-centric theory of organization is evidently essential for effectuating distributed management and distributed governance.

The Central Enterprise Governance Function: Guidance, Development, and Implementation

As Fig. 3.8 shows, part of the enterprise governance competence is the central governance function. This function is essential for effectuating the following three important roles.

First is the *guidance role*. Change must be stimulated but also guided since, as we have seen in the introductory chapter, enterprise unity and integration must be ensured as a critical condition for enterprise strategic success and adequate enterprise performance. Said unity and integration can obviously only be effectuated through a central, overarching governance authority that avoids conflicting ways of organizing. In view of the complexity of enterprises, ensuring unity and integration requires guidance over multiple areas through the definition of design principles that guide enterprise design, as we will outline in the next chapter.

Second is the enterprise *development role*. Carrying out enterprise design, the conceptual realization of strategic desirables, is also a core activity of the central governance function. The guidance and development roles concern the creative phase of enterprise change discussed in Sect. 3.1.3.

Distributed governance expresses the idea that strategic desirables can originate from various sources, like the central governance function, enterprise operations, or (top) management. Strategic desirables that are formulated by top-management are identified as 'macro strategic choices,' which likewise need to be further developed. Obviously, enterprise design requires multidisciplinary enterprise organization knowledge in order to ensure adequate operationalization of strategic desirables and at the same time ensuring enterprise unity and integration, as stressed in Sects. 1.4.3 and 1.4.4.

Third is the building or implementation role for putting the designed artifacts into reality. With reference to the two phases of enterprise change, the third role concerns the algorithmic phase.

The central governance function is essential for providing the foundation and stimulation for enterprise developments. Both the guidance and development governance roles play concurrently and iteratively a role. Within these roles, also the relationships with employees concerned with operational activities (in general, the relationships with stakeholders) must be made effective. Creativity and ideas of employees must be stimulated and nurtured but developed in ways that do not jeopardize enterprise unity and integration. Such development is obviously not the core task of employees concerned with operational activities but must be accomplished by employees competent in enterprise design. Conversely, ideas and developments from within the central enterprise governance function must be made productive and effective within the operational environment and hence must be developed with the involvement of employees within the operational domain because that is the domain where enterprise change must ultimately work. It is this mutual relationship between the central enterprise governance function and enterprise operations that avoids the monopolization of 'knowing and wanting.' All these relationships make the overall enterprise governance competence effective. When we speak of the enterprise governance competence, we commonly refer to the central enterprise governance function, but the relationships with and among the employees within the operational domain must always be taken into account. As indicated, this perspective on governance been identified as 'distributed governance' (Dietz and Hoogervorst 2012, 2013). Nonetheless, the foundational and stimulating role of the central enterprise governance function is essential.

We have amply emphasized that the mechanistic, planning and control governance approach manifests a serious mismatch with the complex, dynamic, and uncertain enterprise reality. Experiences show that events progress unpredictably, while activities have an iterative and concurrent nature, rather than a sequential and planned nature. Indeed, "when an organization undergoes a transformation it experiences a process that is dynamic and iterative, rather than a one-way sequence of separate steps" (Keller and Price 2011, p. 19). Herein lies the advantage of the argued view on governance: complexity, dynamics, and uncertainty make it unfruitful to precisely define governance activities in advance. A skilled governance competence is the very foundation for dealing with complexity, dynamics, and uncertainty and the ability to determine the nature of governance activities and when and how they are to be performed. This competence is essential, given the complex and largely unpredictable, hence emerging, character of strategy development and the ultimate implementation. Table 3.1 summarizes the two different views on enterprise governance.

In summary, it is through the enterprise governance competence that the inquisitive process can be carried out, wherein the, partly technology-driven, environmental dynamics are interpreted that lead to strategic desirables which are subsequently detailed and worked out. We reiterate that it is this competence that—other than the top-down, planning control view suggests—initiates strategic developments bottom-up, which anticipate possible enterprise developments and their associated dynamics. It is this competence that constitutes and shapes the strategic dialog and the (in) formal social interaction and participation of stakeholders. It is this competence that ensures a unified and integrated enterprise design and the implementation thereof. In this way, the governance competence effectuates successful enterprise transformation. In view of our previous discussion, it is only through this competence that the necessary variety to satisfy the Law of Requisite Variety can be provided. Note that the distributed view on enterprise governance is in itself an aspect of enterprise design: it is by the organization of the enterprise that the distributed governance competence is created.

Table 3.1 Key differences between traditional and distributed governance

Traditional governance view	Distributed governance view
Management knowledge and decisions	Shared knowledge and decisions
Change initiated top-down	Change emerges enterprise-wide
Employees as labor	Employees as creative sources
Determinism	Emergence
Linear, planned progression	Inquisitive, evolutionary progression
Assuming clarity about what to do	Discovering clarity about what to do
Planning	Learning
Defining outcome	Focusing on process
Neutral context	Reciprocity
Objective reality	Social construction of reality
Either-or thinking/logic	Inclusive thinking/paradox

Two Competences of the Central Enterprise Governance Function
Section 3.1.3 outlined that change always involves two sequential phases: the creative design phase and the algorithmic building or implementation phase. Enterprise governance must express competences pertinent to both phases. Specifically, the central enterprise governance function is instrumental in establishing both competences. For understanding their nature, particularly the competence concerning enterprise design, essential aspects of the enterprise engineering theories, methodology, and methods must be known. The next chapter will outline these topics. Subsequently, the case illustration in Chap. 5 will detail the central enterprise governance function: functional roles, skills, and processes. For now, we mention that the creative phase is executed by the competence for enterprise development/designing, while utilizing the enterprise engineering design theories, methodology, and methods, whereas the algorithmic phase is executed by the competence for building/implementing, using program and project management techniques. Establishing the central enterprise governance function and its two competences is the first step in creating the enterprise governance competence and the basis for further developing governance maturity outlined in Chap. 5.

3.2.10 Inadequate Approaches to Enterprise Change

A major inadequacy has been discussed before: the use of techniques that are useful in the algorithmic phase (building and implementation) also for the creative phase. Even worse, the latter phase is often ignored by labeling every strategic initiative a 'project' and subsequently using project management techniques to 'manage' the initiative despite the fundamental initial unclarity. Obviously, not much management can take place. Such approach ignores the fundamentally different nature of the two phases of change discussed before and ignores the importance of the inquisitive process. All that neatly fits the mechanization of enterprise governance and leads to the fundamental enterprise regulating mismatch discussed in Sect. 3.2.3. A few additional examples of inadequate approaches are discussed below.

Project Portfolio Management
Closely associated with the inappropriate use of project management techniques is the erroneous idea of (project) portfolio management. Section 3.2.3 defined a project as a carefully planned and organized set of activities for realizing a specific, clearly defined, onetime goal. Recall that the notion of 'project' is necessarily associated with reductionism: based on the clearly defined objective, the means, activities, and their relationships are defined backwards such that, when executed forward, they produce the defined objective. However, as outlined in the previous paragraphs, operationalizing strategic desirables essentially implies an initial lack of clarity, which necessitates the inquisitive process that gradually sorts out and synthesizes the various aspects and incrementally leads towards clarity about *how* to operationalize a strategic desirable. As oftentimes stressed before, then and only

then one might speak about a project. So, strategy development and subsequent enterprise (IT) design ultimately lead to the definition of projects (or programs of logically related projects) for implementing (building) the design. The projects define the project portfolio. This is a helpful list of all enterprise programs and projects and the associated core project data. While not debating the convenience of such a list, the importance attributed to project portfolio management is in our view largely misconceived.

Since advocates of project portfolio management largely write about IT governance, we will present the viewpoints from that perspective. Some authors consider IT project portfolio management as the very core of IT governance: “IT governance is the system by which an organization’s IT portfolio is directed and controlled” (Maizlish and Handler 2005, p. 65). Similarly, “IT portfolio management is where the *real* financial management decisions are made” (Kaplan 2005, p. 54). IT portfolio management is seen as a “control point for the entire IT management system” and “governs an internal market economy built around supply and demand for information technology and related services” (op. cit., p. 55). In accordance with the mechanistic, management-oriented governance perspective, portfolio management is regarded as a decision-making vehicle. Note the mechanistic tune: “a central feature of the IT portfolio management method is that it demands accountability—complete with both the authority to meet objectives and real consequences for failing to do so—for IT investment decisions” (op. cit., p. 75). IT project portfolio management is seen as the mechanism for ensuring optimum returns on the portfolio of IT investments. Others claim that “while it is not a silver bullet, IT portfolio management is the next best thing—a proven, rational, and practical value-revenue generation and cost-reduction approach that works, enabling companies to create and maintain a sharp focus while having visibility and control of their investments across their organizations” (Maizlish and Handler 2005, p. 2). It assures that IT investments are performing according to plan. Essentially, “the IT portfolio, much like a financial investment portfolio, needs to have articulated objectives, acceptable returns, and diversified (and tolerable) risks” (op. cit., p. 218). As asked earlier, if it is that simple, why are so many (IT) ‘projects’ failing?

The importance of enterprise unity and integration has been emphasized repeatedly in view of achieving enterprise objectives successfully. So, a unified and integrated enterprise design, wherein IT is an integral part, is the basis for a coherent and consistent set of (IT) projects. In view of this obvious fact, one might wonder what the notion of ‘management’ in case of (IT) project portfolio management precisely means. Within the mechanized IT governance approach and its focus on investment decisions, the IT project portfolio is created by including or removing projects based on some financial criterion ranking. One might seriously question on what (theoretical) grounds such an approach could lead reliably to a set of coherent and consistent projects and thus could lead to a coherent and consistent enterprise. Apparently, not enterprise and IT design but the (financially) ‘optimized’ portfolio defines the projects to be executed. Remarkably, as an unjustified overvaluing, IT portfolio management is considered the driver for IT success. In order to make this claim plausible, various topics are included under the label IT project portfolio management, such as business case and risk assessment, cost estimates, financial (ROI) calculations, and asset management (Bonham 2005; Kaplan 2005). It seems that IT project portfolio management is the jack of all trades. In fact, IT project portfolio management is equated with IT governance: governance boils down to how a portfolio of projects is 'managed.' The notion of IT project portfolio management thus signals the questionable message that IT success is all about managing a project portfolio with its associated financial criteria, much like an investment portfolio. "The portfolio idea gives management the illusion of being able to plan and decide how to pick or drop the more revenue-generating applications or systems. But that freedom is simply not there" (Ciborra 2001, p. 33). Cases about adequate governance analyzed by Ciborra corroborate the untenability of this form of governance: "they all seem to be distant from the portfolio approach" (op. cit., p. 34). Unfortunately, IT project portfolio management draws attention away from what really matters: unified and integrated enterprise and IT design as argued in Sect. 1.4.1. Ultimately, all these inadequate approaches to change have disastrous consequences: failing strategic initiatives.

The 'SMART' Idea

Section 1.5.1 mentioned the nonsensical practices advanced by the so-called 'management industry' that has produced an enormous amount of misleading advice based on hypes, anecdotes, or unsubstantiated pseudotheories. Some examples were presented earlier. Another questionable advice within the realm of enterprise change is the requirement that the change initiative should be made 'SMART.' Commonly, the letters in this label stand for specific, measurable, achievable or attainable, realistic, and time-based or time-bound. Other, somewhat trivial, interpretations of the letters can be found such as that the change initiatives (or goals) should be agreed upon and relevant. The SMART idea originated in the 1980s in an article about, not surprisingly, corporate planning (Doran 1981).

Apart from the fact that many interesting and necessary changes at their infant and inchoate starting point might seem rather unattainable and unrealistic, our previous reflections make obvious that the criteria are rather naïve in the face of complexity, unclarity, and the inevitable knowledge deficiency, unless the criteria are interpreted in a trivial sense or are applied to insignificant change initiatives. We submit that for significant change initiatives, the SMART criteria cannot be applied meaningfully in the creative phase of change. Yet, doing so involves the danger of reification: data associated with the criteria become an assumed future reality that unjustifiably and unproductively dominates current activities. Pseudo certainties and questionable data, often documented in a 'business case,' express the message of certainty and understanding, while such message inherently *cannot* be given: a serious form of 'epistemic arrogance' (Taleb 2010). Nonetheless, through various practices, among which is the practice of 'business case management,' the SMART approach becomes an institutionalized ritual.

IT Demand-Supply Management

In Sect. 1.4.1 the lingering problem of business and IT alignment was discussed. Some ineffective approaches to solve this issue were reviewed. Within the planning and control perspective, the so-called demand-supply pattern can often be observed in an attempt to establish business and IT alignment and avoid the costly and unproductive forms of misalignment. Within this thinking, alignment follows from properly managing the business demand for IT services (functionalities) on the one hand and the supply of these services on the other hand. How the term ‘management’ must be understood in the case remains vague. Nonetheless, the idea is that ‘the business’ (the customer) has a clearly defined demand that the supplier of the IT services can respond to with an offer or proposal outlining the approach for satisfying the demand. Our previous reflections indicate that such clearly defined demand often does not exist. As Sect. 1.4.1 outlined, such clarity can only be obtained through designing the organizational context wherein the design of informational services is an integral part. Clarity is thus obtained after the inquisitive process is completed, a process in which an IT supplier should logically participate. Defining demand at the start of the inquisitive process is impossible. Nonetheless, this impossibility is not seldom formalized in contracts that define the demand-supply relationship.

Understandably, the assumption of a clearly defined demand is likely to turn into a serious misconception, as our reflection about SMART criteria indicates. Supplier proposals are nonetheless like ‘business cases’ based on this assumption and hence are based on the illusion of completeness, correctness, and concreteness, if not based on wishful thinking. Mismatches between actual demand and actual supply are thus likely to occur. Contractual debates will thus arise. Note that the whole approach neatly fits the mechanistic view on governance. Rather than producing alignment, the opposite is created since the demand-supply relationship is formalized and the multidisciplinary inquisitive process and the various cooperative relationships, necessary within the creative phase of change, are not, or inadequately, established.

3.2.11 Summary of Main Points

1. Enterprise change involves two phases: the creative and algorithmic phase. These phases must be clearly distinguished.
2. Any enterprise change initiative of a nontrivial nature is always characterized by inherent complexity and initial unclarity about how to successfully realize the initiative.
3. The creative phase of change concerns finding out how to realize the intended change. This phase is shaped by the inquisitive process wherein design is an essential aspect. Within the inquisitive process, all (emerging) issues associated with the intended change are addressed, such as stakeholder concerns, consequences of change, or conflicting viewpoints. Meaning and knowledge about change emerge through the inquisitive process, gradually reducing the initial knowledge deficiency and unclarity. The outcome of the inquisitive process is emergent: the conceptual realization of change.

4. Building or implementing is the algorithmic phase of change whereby the physical realization of the intended change is produced according to a predefined set of instructions, operations, and steps, shortly identified as a plan. Devising a plan is based on the known outcome: building the design which turns the conceptual realization into reality. Planning is reductionistic: producing a plan based on the known outcome. Building is deterministic: producing the inevitable, known outcome. A project refers to executing the planned activities and thus also has a known outcome.
5. To emphasize the previous points, planning or executing a project can never produce a creative outcome. Rather, planning and a project are based on the already known emerging outcome of the creative phase. Enterprise renewal, adaptation, and innovation can never be the outcome of planning. Activities in the inquisitive process and the creative phase can never be a project.
6. According the Law of Requisite Variety, the variety of change regulation must match the variety of enterprise change contingencies. Put differently, variety in change regulation must match enterprise variety necessitating change. Enterprise governance, the competence concerning enterprise change must be arranged such that the law is satisfied. In view of the previous points, there is a serious mismatch between the minimum variety (virtually zero) of the planning and control approach to enterprise change (strategic planning) and the enormous variety in enterprise phenomena that necessitate change.
7. An important facet of the enterprise governance competence, seen as distributed governance, is the central enterprise governance function. This function is concerned with both phases of enterprise change: the creative and algorithmic phase. Establishing the central enterprise governance function that can address all multidisciplinary aspects of enterprise change is the first step in creating the enterprise governance competence and is the basis for gradually developing its maturity.
8. Various approaches to enterprise change are fundamentally flawed. In essence, they are all based on planning and control thinking. Notions like project portfolio management, the SMART requirement, and demand-supply management manifest an unproductive ignorance about the nature of change.

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Chapter 4
Poietical Foundation

4.1 Introduction

The poietical foundation of enterprise design is formed by two pillars: (1) an adequate enterprise governance competence as outlined in the previous chapter and (2) the theories, methodology, and methods of enterprise engineering to be used within the enterprise governance competence, thereby essentially contributing to the competence. Both pillars will be further exemplified by the case illustration in the next chapter. In order to appreciate the importance of the poietical foundation, we will start by reiterating significant challenges faced by enterprises and the need to have a holistic, enterprise-wide focus for addressing the challenges.

4.1.1 The Challenges

The introductory chapter portrayed the modern enterprise context. Various developments have led to a very dynamic context. Recall the revolutionary (information) technology progress—informatization, information infrastructure, the Internet of things, social media, blockchain, digital ledger—that stimulated new collaborative business and organizational relationships and hence stimulated new ways of business conduct and organizing. Networks of interacting actors (customers, employees, business partners, and suppliers), with various ways of access, operate over increased 'extendedness' whereby diffusion of traditional business and organizational boundaries is manifest, such as through offering complementary services to basic products or entering new business domains. Performance disruptions no longer have a local effect but might affect the whole network or end-to-end chain. Identified as 'platform-enterprises,' another type of enterprises emerges, having a disruptive effect on traditional incumbents. Adding to this is the need for increased flexibility

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and the ability to change quickly as well as the requirement to comply with (corporate governance) rules and legislation. Enterprises thus face considerable challenges. Moreover, they face enormous variety created by external and internal emerging phenomena, thereby creating the necessity for emerging organizing. Among other things, this formed a core reason to strongly argue employee involvement and practicing the employee-centric theory of organization, as well as argue the importance of distributed management and distributed governance.

Several paradigm shifts expressed in Table 1.1 summarize the developments sketched in the introductory chapter. These paradigm shifts have to do with different ways of working and different norms and values. Put another way, changes have to do with a different arrangement (design) of the enterprise. Traditional ways of organizing—the legacy of the industrial revolution—do not fit very well with what the paradigm shifts indicate. In summary, important challenges are:

- Avoiding enterprise mechanization and hence acknowledging the dynamic, complex, and thus uncertain enterprise context, which makes the mechanistic approach an anachronism that excludes employee involvement and the employee-centric way of organizing. In view of the deeply ingrained mechanistic worldview, this is a major challenge.
- Creating conditions for emerging organizing for the ability to address emerging operational phenomena. Since this ability critically depends on employee involvement, the conditions for emerging organizing critically depend on the proper behavior context.
- Ensuring adequate enterprise performance pertinent to productivity, quality, service, enterprise learning, and innovation. All these performance areas also critically depend on the involvement of employees.
- Effectively addressing the common causes of poor enterprise performance. These common causes underlie virtually all instances of poor enterprise performance and are the inevitable consequences of enterprise arrangement and operation.
- Create performance possibilities for employees by acknowledging that, alongside the previous point, employees are intrinsically motivated to perform. Questioning the performance willingness of employees through the mechanistic practices of employee control (performance targets, contracts, and assessments) distrusts employees and makes them implicitly responsible for the common causes of poor enterprise performance. Employee cynicism and disaffiliation are detrimental effects.
- Satisfying the Law of Requisite Variety operationally for safeguarding enterprise operational performance (distributed management) through emerging organizing and for enabling enterprise strategic learning and adaptation (distributed governance). Satisfying the Law of Requisite variety critically depends on employee involvement.
- Establishing the inquisitive process of strategy development and subsequent implementation as part of the distributed enterprise governance competence.
- Practicing the employee-centric theory of organization which is, apart from an ethical imperative, a direct consequence of the need to create employee

involvement, as mentioned in previous points. Central to practicing this theory is the challenge to operationalize the concept of meaningful work as a crucial aspect of creating an adequate behavior context.

- Avoiding the primary reason for failing strategic initiatives—lack of enterprise unity and integration—hence ensuring enterprise coherence and consistency enterprise-wide and for multidimensional aspects.
- After decades of misalignment, creating 'business and IT alignment' and realizing IT value by first establishing an enterprise-wide organizational focus.
- Effectively integrating and utilizing new (information) technology developments—Internet of information, Internet of things, social media, blockchain, digital ledger, etc.—and the increased informatization in new ways of organizing.
- Avoiding the bleak nature of much of the current enterprise reality as exemplified by unproductive management accounting, ineffective employee performance management and appraisal, dehumanized workplaces, fruitless bureaucratization and juridicalization, and the mechanization of IT deployment.
- Ensuring enterprise health as the opposite of a bleak nature. The unitarist perspective on employee and enterprise interests and practicing the employee-centric theory of organization are conditional for enterprise health. Key design aspects for enterprise health are given below.

4.1.2 Holistic, Enterprise-wide Focus

The previous chapters argued and emphasized the necessity of an overarching focus on the development and arrangement of the enterprise as a whole. Underlying considerations can be reiterated as follows:

- Challenges mentioned in the previous paragraph cannot be effectively addressed by having a fragmented, nonholistic focus because of the inevitable incoherence and inconsistency thereby created. Such condition not only jeopardizes enterprise performance (lack of unity and integration) but also breeds employee cynicism and disaffiliation which further influence enterprise operational and strategic performance negatively.
- Successful utilization of functionality provided by information systems critically depends on unity and integration between the functionality provided by these systems and the enterprise context where the functionality is used. Information systems and their possible functionalities must thus be considered in unity with the enterprise organizational context. Issues concerning alleged underperformance of information systems cannot be resolved at the level of these systems: the level of analysis needs to be 'higher.' This 'higher' level concerns the enterprise in its totality. As argued in the introductory chapter, the issue of 'business and IT alignment' demands first and foremost an enterprise-wide organizational focus.

- Compliance (the adherence to rules and legislation concerning corporate governance) is based on enterprise organizational arrangements that already play a role because of enterprise operational performance requirements. Ensuring compliance is thus an integral part of enterprise-wide organizational arrangements.
- Financial reporting following from compliance requirements leads inevitably to an enterprise-wide focus since enterprise-wide IT systems contain financial data, while events that might have a financial impact occur in enterprise-wide processes, as well as in operational and informational systems. Moreover, financial reporting must be based on the same underlying data used for managing the enterprise operationally and realizing enterprise performance.
- Adding to the previous point, the internal control aspect of compliance requirements necessitates a focus on processes and their execution and, within these processes, a focus on tasks, authorizations, and responsibilities. Hence, internal control needs an enterprise-wide attention to operational, support, information, and documentation processes.
- The broad perspective on corporate governance contends that shareholders are best served by an adequate strategy and its implementation. Hence, attention must be given to enterprise strategy development and the arrangement of the enterprise in a way that encompasses the enterprise in all its facets, such that the strategy is operationalized successfully.
- In view of corporate governance, information systems have an essential function regarding gathering, documenting, and handling (financial) data for governing the enterprise and rendering accountability. This implies a strong relationship between corporate governance and IT governance which requires the overarching enterprise governance focus to compose the relationship.
- Emerging, incremental information system developments should progress with the dynamics enterprises experience. As such, these developments have a shared, collaborative, iterative, and concurrent character, fully embedded within enterprise (strategic) developments. For that, an enterprise-wide focus is essential wherein information system developments are an integral part. The value of these systems can thus only be defined and achieved within the overall enterprise-wide context.
- The percentage of successful strategic initiatives is low: the majority fails. We have argued that failing is not so much the inevitable result of an inherently poor strategy but the avoidable consequence of a poor enterprise arrangement, as is manifest in lack of unity and integration. Avoiding failure requires focusing on the enterprise as a whole.
- Enterprise incoherence and inconsistency breed employee cynicism, which is detrimental to enterprise performance and inhibits successful enterprise change. Avoiding enterprise incoherence and inconsistency necessitates an enterprise-wide focus.

4.1.3 Brief Outline of This Chapter

In view of the argued enterprise-wide focus and the challenges that must be addressed, we will start with summarizing the reasons and requisites for enterprise design. Specifically the multifaceted aspects of enterprises will be outlined to emphasize the necessity of a comprehensive enterprise design theory and methods.

Subsequently, important concepts for design are discussed from the perspective of designing a system. We will use a relatively simple system 'car' to illustrate the various concepts. Two frameworks for supporting design activities are introduced: the *generic requirements and architecture framework* and the *generic system development framework*. We will first explain and illustrate these frameworks by using the car as the system example. In later paragraphs, we will use the same frameworks in case the system to be designed is an enterprise. As with the car, the frameworks express the essential concepts for enterprise design.

As the previous chapter outlined, design is a creative, nonalgorithmic process that therefore cannot be 'mechanized.' It is the in-depth knowledge of designers that fuel the design process. Nonetheless, the concepts of the generic system or enterprise development framework aid in organizing design activities. The outcome of design in the form of artifacts is the basis for implementation. Developing artifacts for implementation is thus an important aspect of design. Examples of artifacts are documents detailing the implications of the meaning and purpose(s) of the enterprise and the enterprise units, performance criteria, job profiles, information systems and their purposes and functions, models, or culture and behavior characteristics, and so on. For enterprise design, developing essential models will be outlined as the starting point for enterprise (re)design. Based on these models, subsequent design can take place in order to devise models that can be implemented.

Given the complexity and multifaceted aspects of enterprises, the question might arise whether all aspects of enterprises can be intentionally designed. This is a valid question since, as will be discussed, certain important enterprise aspects are difficult to address directly through design activities, such as behavioral aspects and culture (norms and values). Precisely these aspects are rather important as our discussion about the foundational topics showed (Hoogervorst 2018). Important insights from the foundational social and organization sciences will be shown to provide the needed linkage between enterprise aspects that can be directly addressed through design on the one hand and the behavioral and cultural aspects that are affected indirectly on the other hand. So, all multifaceted aspects of enterprises must be, either directly or indirectly, included in the design scope. The linkage between direct and indirect design aspects is expressed through concepts outlined in this chapter. In addition to the examples provided, the case illustration in the next chapter will further illustrate the governance processes and how the concepts for design are used.

4.2 Enterprise Design: Reasons and Requisites

4.2.1 Reasons for Enterprise Design

The Argued Design Focus

Section 1.4.3 mentioned the uncomfortable fact that the majority of strategic initiatives fail and that a key contributing factor for these failures, as expressed by the congruence theorem, is the lack of enterprise coherence and consistency which prevents the enterprise from operating as a unified and integrated whole and also leads to poor enterprise performance. Ensuring enterprise unity and integration is likely to become more complicated since enterprises are exposed to increased business extendedness and dynamics, growing informatization, increased technology influence, and the subsequent need to create different ways of organizing.

Not only are enterprise incoherence and inconsistency sources of poor enterprise performance and strategic failures, they are also sources of negative employee feelings and behavior. Recall from Sect. 2.4.11 that enterprise incoherence and inconsistency fuels employee apathy, distrust, disaffiliation, and cynicism. These detrimental consequences have a multiplier effect and additionally contribute to poor enterprise performance and strategic failures, which further breed the aforementioned employee feelings and behavior.

We have argued that enterprise unity and integration does not develop spontaneously; rather, the opposite develops like that. Enterprise unity and integration must thus be intentionally created as necessary, though difficult to realize, conditions for realizing strategic initiatives successfully. This intentional creation is identified as *enterprise design*. Since enterprises are organized complexities, as mentioned in Sect. 2.3.9, the creation of enterprise unity and integration is no easy task. Nonetheless, the task of designing enterprises is not only important in view of realizing strategic initiatives successfully but is also important because inadequate enterprise performance mainly results from 'common causes': the inherent consequences of the way an enterprise is arranged and operates. Inadequate performance is thus predominantly the inevitable outcome of inadequate enterprise design (cf. Sect. 1.4.3). Additionally, enterprise design is important for creating 'business and IT alignment' and for satisfying corporate governance requirements (cf. Sects. 1.4.1 and 1.4.2). Finally, only through enterprise design can the various ideological concerns be addressed, specifically those regarding employee involvement, the creation of meaningful work, and the overall concern for employee-centric organizing. Remember the focus on enterprise design stressed by a McKinsey study: "most corporate leaders overlook a golden opportunity to create durable competitive advantage and generate high returns for less money and less risks: making organizational design the heart of strategy" (Bryan and Joyce 2007, p. 21).

Some organizational theories discussed in Chap. 3 have stressed the importance of enterprise design. As Urwick has stated, "lack of design is illogical, cruel, wasteful, and inefficient" (1947, p. 38). "It is illogical because in good engineering practice design must come first. Similarly, in good social practice design should come first" (ibid.). Lack of an adequate design focus is also cruel and wasteful "because the main sufferers from lack of design in organization are the individuals who work in the undertaking" (ibid.). Similarly, Simon stresses that "the theory of administration is concerned with how an organization should be constructed and operated in order to accomplish its work efficiently" (1997, p. 45). Recall from Sects. 1.1.1 and 1.5.2 that design concerns devising "courses of action aimed at changing existing [enterprise] conditions into preferred ones" (Simon 1969, p. 55). Design is thus the crucial hinge point between strategic intentions and their ultimate realization as argued in Sect. 1.1.1 and Chap. 3. Again, we repeat an essential truth stressed before: strategic desirables, such as improving customer satisfaction or employee motivation, reducing employee absenteeism or cynicism, reducing quality deficiencies, enhancing compliance or security, eliminating process inefficiencies, reducing product failures, or productively using new technology (to name but a few issues), will not be successfully realized by merely stating their desirability, by writing a 'business case,' or by formulating a 'strategic plan.' On the contrary, for all these desirables, design must take place for turning them into reality.

In Search of a Design Theory

Unfortunately, Sect. 1.5 outlined that many approaches to the arrangement of enterprises qualify as total nonsense or dangerous half-truths, but they continue to be widely applied. Moreover, business school education developed into a proliferation of different viewpoints without any cohesion and an overarching integrating theoretical perspective. Business schools did not provide an antidote to the nonsensical approaches but largely contributed to their widespread proliferation. Many serious consequences have been reported (Adler 2002; Ghoshal 2005; Hayes and Abernathy 2007; Khurana 2007; Foroohar 2011; Lutz 2011; Wooldridge 2011).

An alternative to the questionable business school theories is therefore a strongly voiced desire. We showed that enterprise unity and integration are necessary, though difficult to realize, conditions for realizing strategic initiatives successfully. This begs the question about how success can be ensured. Put another way, which theories, methodology, and methods offer an effective approach for realizing strategic initiatives successfully and establish adequate enterprise performance? Various publications have addressed the importance of design in relation to enterprises (Urwick 1947; Hammer and Champy 1993; Johansson et al. 1993; Martin 1995; Nadler and Tushman 1997; Simon 1997; Bryan and Joyce 2007). However, inadequate attention appears to be paid to formal theories, methodology, and methods for design. We mentioned in Sect. 2.3.9 that a major problem facing modern science is developing such theory for addressing organized complexity. Enterprises are systems that are highly organized and very complex. Yet, enterprise management is often only interested in the functional perspective and the objectives of strategic desirables: *what* the enterprise should realize is the focus of attention, not *how* that is achieved. As Ciborra observes, "the management agenda is largely irrelevant for action since it does not deal with the key transaction between having a nice vision and producing that vision" (2001, p. 34). This disparity is not without danger since the required unity and integration and the successful operationalization of strategic desirables first and foremost necessitate the enterprise design perspective that regards the key transaction identified by Ciborra. Since enterprise design forms the crucial hinge point between strategic desirables and their successful operationalization, we submit that an adequate enterprise design theory, identified as *enterprise engineering*, should be the central, sought-after business school theory. Such a design-focused theory is essential for the professional school concerned with organization and management theory: "the professional schools will resume their professional responsibilities just to the degree that they can discover a science of design, a body of intellectually tough, analytic, partly empirical, teachable doctrine about the design process" (Simon 1969, p. 58). In view of these professional responsibilities, this chapter presents theories and concepts for enterprise design. Based on the insights of the philosophical foundation, the next paragraph will briefly restate that the theories and concepts used for designing enterprises critically depend on the way enterprises are conceptualized. Hence, the conceptualization of enterprises must be such that their multifaceted complexity can be adequately addressed.

4.2.2 Conceptualizing Enterprises: The Requisites

Avoiding Theoretical Incompleteness

Enterprises manifest themselves in various ways. The question of what an enterprise *is* will thus provoke different answers depending on the perspective chosen. Morgan has described various images of enterprises, such as enterprises as machines, organisms, cultures, political systems, or even psychic prisons (2006). These images have merit since they express how enterprises might be experienced. Recall from our discussion of the philosophical foundation that the way the world is perceived depends on the concepts used. Hence, there can be no theory-neutral way of observing. This idealist or nominalist perspective likewise holds in the case of enterprises. This means that the ideas and concepts about enterprises determine how they are perceived. Ideas, concepts, and theories thus define 'the language' with which enterprise phenomena are recognized, articulated, and addressed. For properly understanding and designing enterprises, the ideas, concepts, and theories used must thus be necessary and sufficient to articulate and address the multifaceted aspects of enterprises. Otherwise stated, the language of design must be rich enough to bring the multifaceted aspects of enterprises into a unified and integrated design. This requirement refers to theoretical and methodological completeness of the enterprise engineering design science.

Within the context of scientific research, "theories represent a systematic view of phenomena by specifying relations among variables using a set of interrelated constructs/variables, definitions and propositions" (Creswell 1994, p. 82). Comparably, a theory is defined as "a system of constructs and relationships between those constructs that collectively present a logical, systematic, and coherent explanation of a phenomenon of interest" (Recker 2013, p. 46). In case of enterprises, the 'coherent explanation of phenomena' requires comprehensive attention to the specifics of the components that make up the morphogenic enterprise conceptual system model introduced in Sect. 2.3.9. In view of the importance of enterprise coherence and consistency, the theoretical and methodological completeness of enterprise engineering is an obvious requirement. It is hardly conceivable that a conceptually incomplete and incoherent set of concepts for design would methodically lead to a unified and integrated enterprise design. In case of enterprise design, however, the current practices concerning 'the systematic view' are dominated by structural functionalism and virtually ignore the interpretive, symbolic-interactionist aspects within enterprises, as summarized in Chap. 2. Put differently, the current practices almost exclusively focus on structures and systems and ignore culture, management behavior, and employee behavior as crucial determinants of enterprise performance and successful enterprise change. Recall from our discussion in Chap. 2 that precisely these latter aspects are crucial for enhancing enterprise performance and establishing successful enterprise change (cf. Sects. 2.4.8 and 2.4.11). The exclusive structural functionalistic way to conceptualize enterprises entails the danger of a focus on stability and conservancy and runs the risk of disregarding essential sources for enterprise development and change. We might observe that various organization theories of the social sciences cannot be applied properly within the structural functionalistic viewpoint only. Arguably, the structural functionalistic viewpoint is inherently theoretically incomplete and consequently does not enable holistic, unified, and integrated enterprise design.

Addressing Multiple Facets for Enterprise Health

In view of the above observations, it seems inevitable that the dominant focus on structures and systems for enterprise design induces mechanistic thinking, precisely the thinking that excludes employee-centric organizing. As mentioned in Sect. 2.4.8, employee-centric organizing is conditional for creating a 'healthy' enterprise, able to continuously and successfully exist. A broad, holistic, and multidisciplinary nature of enterprise engineering is required since multiple facets for enterprise health must be addressed. The morphogenic enterprise conceptual system model introduced in Sect. 2.3.9 provides a first indication of those multifaceted enterprise aspects. When the employee-centric way of organizing is pursued, as argued in Chap. 2, the four components of the morphogenic enterprise conceptual system model must have associated characteristics. Table 4.1 resumes key characteristics associated with the four components of the morphogenic enterprise conceptual system model (cf. Sect. 4.7.9*). Note that the traditional language of design that induces a focus on structures and systems only is incapable of properly addressing the other aspects of the morphogenic conceptual system components.

Employee-centric organizing results from addressing the four components of the morphogenic model coherently and consistently through enterprise design. Anticipating our discussion later in this chapter, enterprise design takes place such that certain topics are addressed and satisfied. These topics are *design aspects*: areas of attention that, as will be outlined later, enterprise design should formally address, such as the ones mentioned in Table 4.1. Additionally, several design aspects are given in Table 4.2, based on considerations about enterprise health conditions and

Table 4.1 Morphogenic enterprise conceptual system model: components and key aspects

Morphogenic enterprise conceptual system model components	
Management behavior	Employee behavior
Integrity, consistency, sincerity Consideration, compassion, empathy Building confidence, empowering employees Consulting, leading by being led Guiding Communication	Self-efficacious Taking initiative, creative Involved, committed Mission, norms, and values oriented
Structures and systems	Culture
Processes and operational rules Working arrangements Means, methods Finance and administration Information supply Reporting	Assurance, trust Norms and values Belonging, oneness Teamwork, interdependency, relationships Commitment, involvement, loyalty Resourcefulness, continuous improvement

Table 4.2 Key design aspects for enterprise health and employee-centric organizing

Employee-centric organizing: key design aspects	
Direction	Employee motivation
Mission, vision, purpose, meaning Clarity of strategy and reason for existence Long-term perspective	Meaningful work, individual contribution Autonomy, empowerment, self-efficacy Achievement, personal development Recognition, respect, rewards Caring environment, belonging to a team
Human capabilities development	Clarity of individual contribution
Personal and team competences Training Building confidence Continuous improvement	Purpose of contribution Place in the team and organization Contribution to team and enterprise end product Team or unit performance criteria
Adaptability	Enterprise regulating variety
Enterprise learning and innovation Knowledge sharing Incorporating new ideas Enabling and addressing emergent developments	Employee involvement Employee agency Employees as creative sources (distributed governance) Employee enablement
External sensitivity	Enterprise unity and integration
Customer, stakeholder focus Addressing external developments Long-term relationships Social responsibility	Coherence and consistency Everyone directed to the common goal Avoiding organizational conflicts

considerations about employee-centric organizing (op. cit.). Design aspects of those two categories are partly overlapping since, as we mentioned above, enterprise health conditions are largely determined by the conditions for employee-centric organizing. Once again, also Table 4.2 shows the importance of a comprehensive language of design. None of the aspects listed can be properly addressed by focusing on structures and systems only.

The Integrative Role of Design

Designing a system brings together and integrates the various disciplines relevant for the system to function properly. For example, car design regards aspects such as mechanics, aerodynamics, hydraulics, electronics, esthetics, human behavior, and ergonomics. Hence, topics from electrical engineering, mechanical engineering, chemical engineering, industrial design, safety and reliability engineering, and psychology are addressed when designing a car. This integrative perspective likewise holds for enterprise design. Our previous discussion showed that enterprises are multifaceted entities. Indeed, a multitude of topics plays a role, such as the ones mentioned in Tables 4.1 and 4.2. Despite their different natures, these topics must be treated in a coherent and consistent manner in order for the enterprise to operate as a unified and integrated whole. Enterprise engineering has thus inherently a multidisciplinary perspective, whereby all the topics must be coherently and consistently addressed. For example, legal topics about contracts and compliance with financial regulations have not merely a bearing within processes of a legal department but rather have a bearing on operational processes wherein these topics must be embodied and effectuated. Likewise, legal topics have financial and administrative implications, as well as implications for the design of information systems. Comparably, the International Financial Reporting Standards (IFRS) dictates that financial reporting must be based on the same data as is used for running the enterprise operationally. Intricate relationships between operational process design and the design of financial reporting must thus be acknowledged. As a final example of the multidisciplinary perspective, motivated employees are not created through financial incentives but on the contrary through employee development, recognition, involvement, and autonomy—in short, by creating meaningful work. Addressing these aspects effectively requires adequate attention to the various aspects of the behavior context, like those mentioned in Table 4.1.

The above examples illustrate that a unified and integrated enterprise requires a concurrently exercised multidisciplinary perspective. Yet, such perspective is all too often not manifest. We have mentioned theoretical fragmentation in Sect. 1.6.3. Different topics are treated from within different disciplines if addressed at all. The different disciplines have also led to similarly different functional entities within enterprises, which treat their topics in isolation. Fragmentation rather than unity and integration is the inevitable result. As Sect. 1.4.4 mentioned, there is considerable fragmentation in the study of enterprises. Lupton sees “lack of integration as the key obstacle to the wider application of the social sciences in management” (In: Thomas 2003, p. 85). Not only is there a “lack of integration between the social sciences disciplines,” but consequently “a lack of fit between the problems addressed by these disciplines and the problems encountered by management practitioners” (op. cit., p. 86). A serious problem is thus the provisioning of partial solutions for problems that require an integral approach. These partial solutions are not conducive to enterprise coherence and consistency. Arguably, the integrative effect of enterprise design can only be effectuated if the enterprise engineering theory and methods can incorporate the theoretical knowledge of the various foundational disciplines such that a unified and integrated approach for enterprise design is possible.

Design Science: Firm Rooting in the Foundational Sciences
Section 1.5.2 introduced the concept of *design science*, defined as the coherent and consistent scientifically valid body of knowledge (theory, methodology, methods) based on foundational sciences and used to create artifacts with the goal of solving practical problems of general interest. Recall that the foundational sciences are concerned with understanding and explaining why phenomena manifest themselves as they do: it is about how and why things *are*. In the case of enterprises, the social and behavioral foundational sciences are of specific importance since they seek to understand, explain, and predict organizational and human phenomena. Hence, these sciences are important for the enterprise engineering design science. In order to qualify as an enterprise design science, three conditions must be satisfied concerning the body of knowledge: the body of knowledge must be (1) based on the associated foundational sciences, (2) based on rigorous research, and (3) generally applicable for the design of enterprises.

Hence, the relationships between an adequate enterprise design science and the associated foundational sciences must be rather close for (1) being able to address the multifaceted aspects of enterprises and (2) for being able to explain why an enterprise design is (in)effective. Stated otherwise, the foundational sciences provide the theories and their justification, which form the basis for design. Conversely, the evaluation about the design is input for (further) theory development, justification, and possible adaptation. Enterprise engineering must thus have an adequate theory base provided by the foundational sciences. In view of our observations given above, we submit that this condition is all too often not satisfied. Approaches to the arrangement of enterprises can be witnessed that have no sound basis in the foundational sciences or can even be qualified as 'witch doctor' approaches, as mentioned in Sect. 1.5.1.

4.2.3 *Macro-level and Micro-level Enterprise Design Aspects*

Section 2.3.7 argued that social entities are characterized by macro-level and micro-level aspects or phenomena. The position of ontological dualism was taken to express the reality of both macro-level and micro-level aspects, as well as for understanding the reciprocal relationship between the two aspects. Said distinction is likewise valid in case of enterprises and is manifest in the different organization theories (cf. Sects. 2.3.10 through 2.3.15). The morphogenic enterprise conceptual system model introduced in Sect. 2.3.9 acknowledges both macro-level and micro-level aspects, which are thus aspects for design considerations. Specifically the reciprocal relationship between both aspects is of interest since micro-level aspects, such as individual behavior, are determined by macro-level conditions. In view of

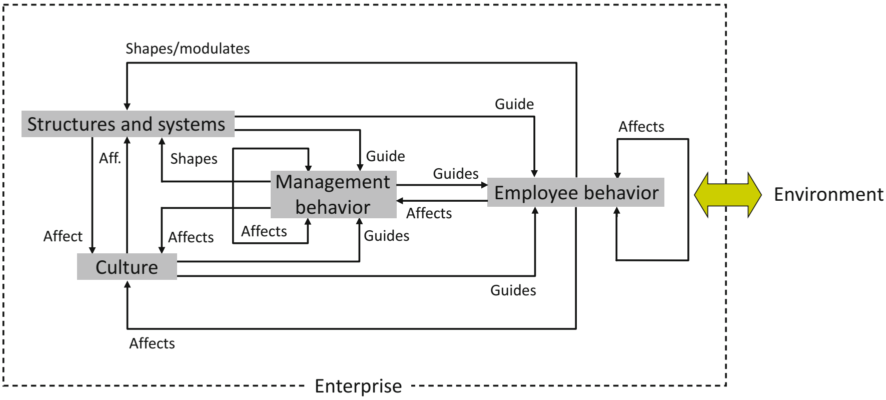


Fig. 4.1 Enterprise metamodel

employee-centric organizing and the key design aspects mentioned in Table 4.2, understanding the reciprocal relationship also from the perspective of design is of critical importance. This understanding is provided by the foundational social sciences. This chapter and the case illustration in the next chapter will clarify how the macro-level and micro-level aspects and their relationship are formally addressed through design.

In Fig. 4.1, we have used the morphogenic enterprise conceptual system model to symbolically present an enterprise metamodel that acknowledges the reciprocal relationships of the enterprise with its environment. The relationships with the environment have various forms, such as the relationships of employees with customers, business partners, or suppliers. Also there are relationships with certain facets of enterprise structures and systems, like in the case of using a web interface. Obviously, more detailed models are needed for making the relationships with the environment specific and for making the internal way of organizing specific. These models are developed through the process of enterprise design. We will start our discussion about enterprise design by focusing on the relationship with the environment first.

4.2.4 *Theoretical Basis of Enterprise Engineering*

As we have seen, enterprise design is an important facet of the enterprise governance competence discussed before. Design is the creative hinge point between what is being desired or intended on the one hand and the realization thereof on the other hand. This creative hinge point is operationalized within the inquisitive process of the enterprise governance competence discussed in Chap. 3. Enterprise engineering represents the theories, methodology, and methods for enterprise design. This body of knowledge and practices is based on theoretical insights and summarized below with reference to some key aspects of enterprise engineering (Dietz and Hoogervorst 2012, 2013). In doing so, the firm basis of the enterprise engineering design science in the foundational sciences is reiterated.

System Perspective on Enterprises and Rigorous Distinction Between Enterprise Function and Construction

Based on the (social) system theory, the system perspective on enterprises acknowledges the necessary holistic perspective and the focus on the relationships between the constituting components of the system. Because of the holistic perspective, the meaning and purpose of the constituting components follow from the meaning and purpose of the enterprise as a whole. Central to the system perspective on enterprises and their subsystems, such as IT systems, is the function-construction distinction, which is based on teleological and ontological philosophical viewpoints respectively. The incommensurability between the two perspectives make it impossible to define the system's construction in a deterministic, algorithmic way based on the functional perspective. This is understandable by noting that numerous different constructions can deliver the same function. This fundamental insight has consequences for the perspective on enterprise governance as outlined in Chap. 3. Note that much of the discourse about enterprises is only functional in nature with little or no attention to the construction that brings the function forward.

Function as a Relationship, Construction as a Property

Essentially, the teleological perspective is concerned with purpose and goals. Philosophical insights teach that this perspective involves a relationship formed by the meaning of the purpose and goals for a human being. As will be further outlined in subsequent paragraphs, within enterprise engineering, a function is likewise considered a relationship between a user, such as a human individual, and a provider, such as an artifact or natural resource. The key distinction based on the philosophical insights is that a function (teleological perspective) is not a system property but a relationship, whereas the construction (ontological perspective) is a system property. One and the same construction can thus have multiple functions. For enterprises, this fundamental insight necessitates an adequate focus on the relationships of an enterprise with its environment (its functions), which subsequently define its properties (its construction).

Performance Through Social Interaction

Enterprises are social entities; hence, the theories of society provide insights about how social entities function and develop through social interaction. These insights were outlined when discussing the ontological foundation, such as Weber's theory of social action. With reference to the philosophical foundation, specifically the viewpoints of the philosophy of language, the speech act theory, and the theory of communication are used to model essential social (inter)action patterns between human individuals in enterprises. These models are the starting point for enterprise engineering efforts.

Integrating Macro-level and Micro-level Enterprise Aspects
As discussions about the ontological foundations have clarified, for enterprises both macro-level and micro-level aspects play a crucial role, also because of the relationships between the two aspects. The philosophical viewpoints of existential phenomenology are essential for understanding the relationship. Of the theories of society, structural functionalism, social system theory, and the macro-level aspects of culture define the macro-level perspective of enterprise engineering, while symbolic interactionism defines the micro-level, interpretive, and individual behavioral aspects. Integrating the various aspects is key which is based on the morphogenic social system theory. On this theory, the morphogenic enterprise conceptual system perspective is based.

Diligent Use of Design Guidance
Design concerns the transition from current ways of organizing to new, preferred ways of organizing. But how does the design process outlined in Chap. 3 proceed? For a large part, the creative design process is an emerging process. But some answers to the aforementioned question can be given in the form of design prescripts, which guide the creative process of design. So, a strategic concern for customer satisfaction, employee motivation, or information security can only be taken care of properly if design guidance is provided that addresses these concerns. For enterprises, design guidance comes in the form of requirements and principles, respectively identified as *enterprise requirements* and *enterprise architecture* of which the difference will be outlined later. The need for design guidance also follows from ideological considerations, such as the imperative to adopt the employee-centric theory of organization, and the insight that it is impossible to proceed algorithmically from what is desired to the conceptual realization. The ensuing design freedom should thus be addressed. Various frameworks will be provided for aiding the design process.

Discrete System Design and Normalized Systems
These are specialized topics valuable for the design of IT systems. Discrete (event) systems have a finite (countable) number of states, for example, defined by the momentary situation (the state) at discrete moments in time. Certain events, such as a customer order, trigger state changes. Concepts and their precise meaning, like 'fact,' 'event,' 'state,' and 'process,' play an important role for the precise modeling and design of these systems.

The ontological foundation identified the need for enterprises to quickly change and adapt. Unfortunately, IT systems have been known for their relative inability to change and adapt quickly, thereby seriously hampering enterprise flexibility and agility. For a large part, that inability is due to fact that a desired change in an IT system leads to an avalanche of necessary subsequent changes: the so-called combinatorial effects (Mannaert et al. 2016). For complex systems, these combinatorial effects have been shown to grow exponentially over time, thereby making it increasingly harder to carry out IT system changes expeditiously. Under the label 'normalized systems theory,' a new approach to IT system design had been developed that avoids combinatorial effects and hence enables expedient system change (op. cit.). In a normalized system, the impact of a change only depends on the nature of that change itself, without any further impact due to the absence of combinatorial effects. Although initially developed for IT systems, the idea of avoiding combinatorial effects is generally applicable. The normalized systems approach can thus have an enterprise-wide perspective (op. cit). Appreciably, design principles underlying normalized systems are aspects of enterprise architecture. Discussion about discrete systems and the normalized systems theory exceeds our current scope.

Rigorous Distinction Between Design and Implementation
We have discussed this distinction in the previous chapter, which is based on philosophical and ontological insights about the difference between emerging and deterministic phenomena. Recall that the difference is fundamental since design is a creative, nonalgorithmic process that *cannot* be planned and has an emerging outcome, whereas implementation is a deterministic algorithmic process that *can* be planned and has a known outcome. Implementation may only commence when a design, outlining the implementation, is available. Enterprise engineering concerns the creative phase of change, while implementation concerns the algorithmic phase. The rigorous distinction must be made since measures applicable for implementation are inapplicable for design. As outlined in Chap. 3, this distinction determines our view on enterprise governance.

Adopting the Employee-Centric Theory of Organization and the Unitarist Perspective on Enterprises
The philosophical, ontological, and ideological foundations have provided numerous arguments for adopting the employee-centric theory of organization, which thereby determines the scope of enterprise engineering, that is, determines the variety of multidisciplinary aspects that enterprise engineering must be able to address through design. Of the philosophical foundation, we specifically mention the viewpoints of existential phenomenology that focuses on the essence of human existence and offers the ability to integrate macro-level and micro-level enterprise aspects. Important aspects of the ontological foundation are the theories of symbolic interaction, social and emerging organizing, satisfying the Law of Requisite Variety, and the organization theory that sees organizing and sensemaking as highly intertwined. The ideological foundation offers theories about the purpose of enterprises and the moral implications of organizing. Typical in this respect are the viewpoints about the affordance of meaningful work and management as leadership. Finally, the employee-centric theory of organization is based on the unitarist perspective on enterprises that harmonizes employee and enterprise interests.

4.3 The Functional Perspective

Enterprises are specific instances of social institutions. Section 2.3.2 defined a social institution as a social entity that offers a certain function to society. Well-known functions are economic, financial, educational, or religious functions. Next to intended or manifest functions, also so-called latent functions are associated with social institutions. These are unintended consequences of having established the intended function or functions. For example, the intended functions of a prison are executing a legal sentence and, in various cases, preparing for returning to society. The latent and unintended functions are the learning of criminal activities from fellow prisoners and the (renewed) acquaintances with criminal people.

The functional perspective is almost naturally associated with the macro-level perspective of an enterprise as a social institution. Moreover, the functional perspective is associated with the enterprise purpose since functions of the enterprise effectuate the purpose. In view of our later discussions, it is important to outline the notion of 'function' precisely which will be done by first discussing the concept of 'affordance.'

4.3.1 The Notion of Affordance

Gibson introduced the term 'affordance' to identify the provisioning of certain goods or utilities by nature for human or animal welfare (1979). Following Chemero (2003), we argue that an affordance is neither an attribute of the subject using an environmental facility nor an attribute of the environment but a *relationship* between an object in the environment with a property or properties and, in our case, a human subject with a certain need or purpose. The affordance relationship $\mathcal{R}$ might be briefly expressed as:

$$\mathcal{A}\ (\text{affordance}) : \textit{Subject}\ (\text{need, purpose})\ \mathcal{R}\ \textit{Object}(\text{properties}). \tag{4.1}$$

As the relationship 'smaller than' is neither an attribute of objects being compared, also an affordance is, as indicated, neither an attribute of the human subject nor the environmental object. Figure 4.2 gives some examples of affordances

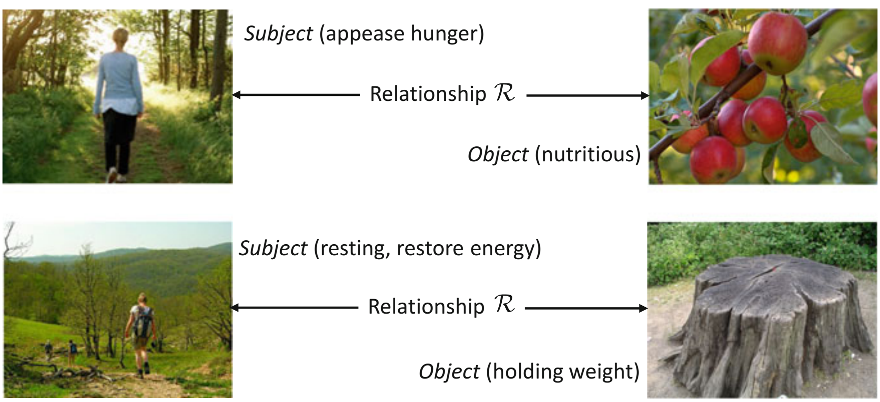


Fig. 4.2 Examples of environmental affordances

provided by nature. In the upper part, the affordance of ‘nutriment’ is provided to a hungry person by a natural object ‘apple’ having the property of being ‘nutritious.’ Using expression (4.1) we can write:

$$\mathcal{A}\ (\text{nutriment}) : \mathit{Subject}(\text{appease hunger})\ \mathcal{R}\ \mathit{Apple}(\text{nutritious}).$$

Regarding the lower part of Fig. 4.2, the object of a tree stump with the property of ‘holding weight’ provides the affordance of ‘support’ for a person with a need to rest. In short:

$$\mathcal{A}\ (\text{support}) : \mathit{Subject}(\text{resting, restore energy})\ \mathcal{R}\ \mathit{Tree\ stump}(\text{holding weight}).$$

The object with a certain property can also be an artifact, a system *S*, such as an umbrella. A possible affordance provided by the umbrella is protection against sunlight and rain, but the umbrella can also be used for hitting a person or concealing a weapon. Figure 4.3 shows the examples.

For the rain protection affordance of an umbrella, we have:

$$\mathcal{A}\ (\text{rain protection}) : \mathit{Subject}(\text{stay dry})\ \mathcal{R}\ \mathit{Umbrella}(\text{rain shield}).$$

The subjective, relational character of an affordance can additionally be appreciated by observing that an affordance for a specific person might not be so for another person. For example, for a person with an allergic reaction to certain types of food, this food will not offer a nutritious affordance. Since an affordance is a relationship,

Fig. 4.3 Some affordances of an umbrella

the affordance changes as either the subject or the object or both change. So, in our umbrella example, the affordance for concealing a weapon is lost in case the umbrella canopy material is transparent. Also various contextual conditions might play a role for the ability to use an affordance. Severe wind may prevent the use of an umbrella for some of the affordances mentioned.

As the examples show, affordances are not 'objectively' given but a *subjective* appreciation of something *objectively* given. That what is objectively given refers to the material manifestation of an object. Such reference is not without difficulties. Section 2.2.7 of the philosophical foundation outlined the difference between teleological language, which expresses the purpose of an object, and ontological language, which expresses what an object is. Describing what an object 'objectively' is assumes using only 'objective' language terms. Oftentimes, this is rather difficult since descriptive terms are associated with how objects are used. For example, describing the property of a tree stump by 'holding weight' already involves ideas about usage and utility. Moreover, one might argue that 'objective' terms do not express the properties adequately. For example, expressing the properties of the tree stump in terms of its molecular structure seems inadequate from the perspective of the affordance of resting. As we will further illustrate below, properties of an object are thus formulated in terms that make sense from the perspective of the affordance. Nonetheless, the distinction should be made between the objective properties of an object on the one hand and the possible subjectively defined affordances that these properties might offer on the other hand. Affordances have a contingent nature but properties are (relatively) stationary.

4.3.2 The Notion of Function and Functional Language

Function as an Affordance

An affordance offered to a person by an artifact (a system S) is commonly identified as a system *function*. A function is thus a *relationship* between a person with a need or purpose and a system S with certain properties. There are as many system functions as there are affordances offered to persons by S. Identifying a function with $\mathcal{F}$, expression (4.1) changes into:

$$\mathcal{F}\ (\text{function}) : \mathit{Subject}(\text{need, purpose})\ \mathcal{R}\ \mathit{System}(\text{properties}). \tag{4.2}$$

Examples of system functions are:

$$\begin{gathered}
\mathcal{F}\ (\text{drilling}) : \mathit{Subject}(\text{make a hole})\ \mathcal{R}\ \mathit{Drill}(\text{powerful rotations}) \\
\mathcal{F}\ (\text{transporting}) : \mathit{Subject}(\text{travel})\ \mathcal{R}\ \mathit{Car}(\text{moving weight}) \\
\mathcal{F}\ (\text{cleaning}) : \mathit{Subject}(\text{remove dirt})\ \mathcal{R}\ \mathit{Vacuum\ cleaner}(\text{sucking power}) \\
\mathcal{F}\ (\text{sawing}) : \mathit{Subject}(\text{cut wood})\ \mathcal{R}\ \mathit{Saw}(\text{sharp teeth}) \\
\mathcal{F}\ (\text{producing sound}) : \mathit{Subject}(\text{make music})\ \mathcal{R}\ \mathit{Saw}(\text{thin blade}).
\end{gathered}$$

Fig. 4.4 Possible functions of a saw

In the examples given above, two affordances (functions) of a saw are indicated, as depicted in Fig. 4.4. These examples indicate that, formally speaking, the saw *has* no function, but a function is manifest as a relationship between the human being (with a need) and the saw (with properties). One might argue that the manufacturer of a system has a certain intended function in mind, that is, has an affordance in mind that an intended user group will value because of their common need. In the case of a saw, that intended function would probably be 'sawing' in view of the perceived common need to cut wood and not 'making music.' So, one is tempted to say that the saw *has* the *intended* function of sawing and speak of *the* function of a saw. Adding to this is the somewhat problematic fact that artifacts are virtually always identified by their functional name. So, people using the affordance of a saw to make music still speak of a 'saw.'

As the examples above show, like with affordance, also the system properties are formulated in terms that make sense from the perspective of the functional relationship. Hence, the functionally oriented language in which the system properties are described might involve the danger of interpreting a system function as a system property. We stress that seeing the function of a system as an affordance—hence as a relationship between a person with a certain need or purpose and a system with certain properties—has the following advantages:

- It avoids seeing a system function as a system *property*. Even in case of an intended user group, always the relationships between the users and the system play a role. Someone absolutely unaware about what a certain object (or system) is used for, if used at all, could not come up with a function but can speak about system properties. He or she might guess about a function, but that can only be done insofar as there is some resemblance to *known* functions, put differently, insofar as there is knowledge about the use of a known function by a human subject, hence knowledge about the functional relationship between a human being and an object (system).

- Seeing a function as a system property has the danger of a system-centric perspective whereby system functions are defined without properly considering the needs of the human subjects for which the functions are intended. The system-centric perspective induces the 'about you but without you' mentality. Specifically in the case of enterprises, such a limited perspective is detrimental for properly serving customers or treating employees.
- The danger of a system-centric perspective is likewise present if the system is designed to create functional relationships with another system whereby the needs and purpose of that other system are not properly addressed. All too often, this danger is manifest in the design of IT systems that aim to serve enterprises.
- The relationship perspective enforces a comprehensive view about possible relationships (affordances) between human beings and the system. It might also stimulate unforeseen system usage or might preclude unwanted system usage.
- The relationship perspective takes the human subject's need into account. This enables thinking about alternative affordances (functions) for a certain need. For example, the need for making a hole might lead to thinking about a device other than a drill.

In case the system S is an enterprise, multiple functions (affordances) can be offered. Put differently, an enterprise can have multiple functional relationships with human subjects. These subjects include stakeholders of various kinds. Additionally, an enterprise has various physical relationships with its environment, such as concerning the handling of nature's resources, waste, and other milieu issues. Restricting ourselves to stakeholders, individual human beings are involved but also groups of human beings, such as shareholders, society at large, communities, and other enterprises. The latter can be business partners, suppliers, institutions, or government. In these cases, the concept of a functional relationship is extended to a macro-level social entity with needs and purposes. In the case of enterprises, expression (4.2) can thus be rewritten as:

$$\mathcal{F}\ (\text{function}) : \mathit{Subject}(\text{need, purpose})\ \mathcal{R}\ \mathit{Enterprise}(\text{properties}) \tag{4.3}$$

or as

$$\mathcal{F}\ (\text{function}) : \mathit{Social\ entity}(\text{need, purpose})\ \mathcal{R}\ \mathit{Enterprise}(\text{properties}). \tag{4.4}$$

Many functional relationships can be identified, such as:

$$\begin{gathered}
\mathcal{F}\ (\text{earning income}) : \mathit{Employee}(\text{survival})\ \mathcal{R}\ \mathit{Enterprise}(\text{paid jobs}) \\
\mathcal{F}\ (\text{meaningful work}) : \mathit{Employee}(\text{development})\ \mathcal{R}\ \mathit{Enterprise}(\text{interesting jobs}) \\
\mathcal{F}\ (\text{making money}) : \mathit{Shareholder}(\text{getting rich})\ \mathcal{R}\ \mathit{Enterprise}(\text{profit}) \\
\mathcal{F}\ (\text{employment}) : \mathit{Society}(\text{prosperity})\ \mathcal{R}\ \mathit{Enterprise}(\text{paid jobs}) \\
\mathcal{F}\ (\text{tax income}) : \mathit{Government}(\text{money})\ \mathcal{R}\ \mathit{Enterprise}(\text{turnover, income})
\end{gathered}$$

$$\mathcal{F}\ (\text{product function}) : \mathit{Customer}(\text{need})\ \mathcal{R}\ \mathit{Product}(\text{property})$$
$$\mathcal{F}\ (\text{service}) : \mathit{Customer}(\text{need})\ \mathcal{R}\ \mathit{Enterprise}(\text{employee competences}).$$

Functional relationships of an enterprise should not be exclusively conceived in terms of the external environment, such as illustrated by the relationships of an individual employee with the enterprise. This might seem strange since employees are part of the enterprise. However, this again illustrates the importance of both the macro-level and micro-level perspectives on enterprises, which concurrently play a role, as summarized in Sect. 2.3.7. The individual employee (micro-level) has wants and needs which the enterprise with certain properties can address. Hence, the functional relationship concerns the relationship between micro-level aspects (wants and needs) and macro-level aspects (enterprise properties). Again, note the necessity to adopt the perspective of ontological dualism discussed in Sect. 2.3.7 since the macro-level properties of an enterprise as well as the subjective (micro-level) wants and needs are elements of the functional relationship.

Generalization: Using System and Provisioning System

As the previous examples indicate, expressions (4.3) and (4.4) can be generalized into:

$$\mathcal{F}\ (\text{function}) : \mathit{System}\ S_1(\text{need, purpose})\ \mathcal{R}\ \mathit{System}\ S_2(\text{properties}). \tag{4.5}$$

We will identify the system S_1 as the *using system* that uses the properties of S_2. Therefore, the system S_2 is labeled as the *provisioning system*. Using these terms, expression (4.5) can be written as:

$$\mathcal{F}\ (\text{function}) : \mathit{Using\ system}(\text{need})\ \mathcal{R}\ \mathit{Provisioning\ system}(\text{properties}). \tag{4.6}$$

An example is:

$$\mathcal{F}(\text{e-energy supply}) : \mathit{Car}(\text{electrical energy})\ \mathcal{R}\ \mathit{Generator}(\text{generating energy}),$$

whereby the car is the using system and the generator the provisioning system. In the case of an enterprise, we might have:

$$\mathcal{F}\ (\text{obtaining parts}) : \mathit{Enterprise}(\text{parts})\ \mathcal{R}\ \mathit{Supplier}(\text{selling parts}),$$

with the enterprise as the using system and the supplier the provisioning system.

Function-Construction Distinction: Black-Box and White-Box Perspective

Section 4.3.1 introduced the fundamental distinction between an affordance (relationship between a subject and an object) and the objective properties of the object whereupon the affordance relationship is based. In the case of an artifact, this translates to the fundamental distinction between a system *function* —the relationship between a subject or a system (the *using system*) and the properties of another system (the *provisioning system*) whereupon the functional relationship is based. The properties of the provisioning system are defined by the system's *construction*.

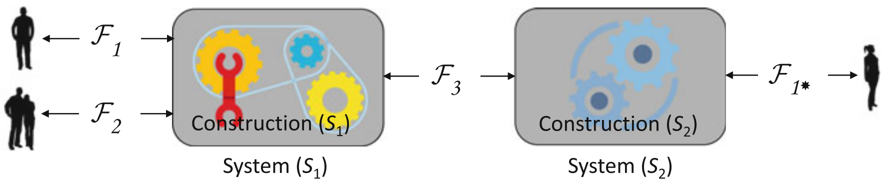


Fig. 4.5 Function-construction distinction

In view of our earlier remarks, the system function concerns the purposive or *teleological* aspects of a system, whereas the system construction concerns the *ontological* aspects of a system, that what the system *is* (being). There can be multiple functions for a given system, such as the ones in the umbrella example, but there is only one construction.

The system S_1 in Fig. 4.5 is the provisioning system for the functional relationships F_1 and F_2. The human subjects represent using systems. At the same time, the system S_1 is the using system of the functional relationship F_3, whereby the system S_2 is the provisioning system. This latter system is also the provisioning system for affording the same functional relationship F_1. Figure 4.5 symbolically expresses the notion that one system can provide multiple functions, while conversely, the same function can be enabled by a different system construction. The functional system perspective is sometimes identified as the *black-box* perspective since knowledge about the system's 'inside' plays no role. Alternatively, the constructional perspective is identified as the *white-box* perspective, whereby knowledge of the system's 'inside' is crucial. As indicated before, when talking about the properties of a system from the perspective of a function, the language used must make sense in terms of the functional relationship. Hence, these are terms associated with the black-box perspective. Indeed, language associated with the white-box (construction) perspective seems inadequate. This is a direct consequence of the incommensurability of functional (teleological) and constructional (ontological) language discussed in Sect. 2.2.7 and Chap. 3. The key point is that the system's black-box properties relevant to the functional relationship are brought forward by the system's construction. The fact that different constructions can bring forward the same functional properties is likewise a direct consequence of the function-construction distinction and aforementioned incommensurability.

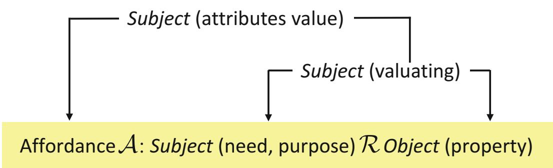
The Function-Construction Distinction Is Often Ignored

Two closely related social theories underlie the macro-level perspective on enterprises: structural functionalism and social system theory. In view of the system perspective given in Sect. 2.3.2, enterprises are conceptualized as systems. Chapter 2 summarized various organizational theories based on the system concept: enterprises as open systems, viable systems, or living systems. Despite the fact that all these theories have the system concept in common, they do not seem to address the important and crucial distinction that holds for any system, namely, the distinction between *function* and *construction*. Also the organizational praxis shows a similar lack of attention for the important distinction. Organizational charts merely list functional departments or units: sales, marketing, finance, production, maintenance, and so on. Also organizational intentions are merely expressed in functional terms, like increasing sales or reducing production costs. One might submit that lack of attention to the question as to *how* an enterprise has to be arranged (designed) has satisfied organizational practitioners with merely functional perspectives only. As will become clear throughout this chapter, enterprises design (also) necessitates the constructional perspective, since it is the enterprise construction that defines the properties that enable the various functions.

4.3.3 Value and Valuating

For a human being, an affordance concerns a perceived relationship involving the human being itself and an object in nature, an artifact, or an enterprise. Affordance as a relationship involves valuating (or valuing)—a subjective act of a human being considering two aspects: (1) his/her needs or purposes and (2) the properties of the object or system in view of the needs or purposes. Hence, the subjective act of valuating amounts to assessing or appraising an affordance which results in attributing a value to an affordance. One might observe that the notion of value expresses a worth in usefulness or enjoyment for a certain subject in using an affordance. Figure 4.6 depicts the ideas graphically. The subjective act of valuating means that various affordances can be envisioned by different subjects in view of their different needs and purposes and the perceived properties of an object. As indicated, in the case of a system, an affordance is called a function. From a system design perspective, the notion of 'value' does not seem to play a direct role in system design. Design is concerned with the intended system functions and the system properties that ultimately constitute, or enable, the system functional relationships. Of course, research among an intended group of system users might identify various values associated with functions of yet-to-be-developed products and services. But, as is the case with the notion of 'function,' also the notion of 'value' is *not* a system property. We might observe that objects with certain properties might be valued (or not valued) at a certain point in time or under certain circumstances, but this valuation could change if time or circumstances change. Hence, the attributed value changes while the properties of a system remain the same. Again, this is a crucial point since design can ultimately only be concerned with system properties. Certainly, it might be the case that—in view of the value attributed to certain system functions—the system properties have to be created in view of the desired functions; however, the

Fig. 4.6 Valuating the value of an affordance



design itself cannot be concerned with value but only with the properties of the artifact to be created.

4.3.4 Functional Design, Decomposition, and Functional Design Domains

Functional Design in Case of a Given Provisioning System

Expressions (4.5) and (4.6) show that a system function concerns a relationship between a system with a need or purpose and a system with certain properties:

$$\mathcal{F}\ (\text{function}) : \mathit{System}\ S_1(\text{need, purpose})\ \mathcal{R}\ \mathit{System}\ S_2(\text{properties})$$
$$\mathcal{F}\ (\text{function}) : \mathit{Using\ system}(\text{need})\ \mathcal{R}\ \mathit{Provisioning\ system}(\text{properties}).$$

The notion of 'relationship' implies that the function is only adequate if the two aspects of the relationship $\mathcal{R}$ are properly addressed: (1) the need or purpose of the using system and (2) the properties of the provisioning system. As mentioned before, the system properties that define the functional relationship $\mathcal{R}$ are formulated as black-box properties which are brought forward by the white-box properties of the system's construction.

In various cases, the black-box properties of the provisioning system are already given. Take the fueling function of a car:

$$\mathcal{F}\ (\text{fuelling}) : \mathit{Car}(\text{fuel})\ \mathcal{R}\ \mathit{Gas\ station}(\text{fuel supply}),$$

whereby the black-box properties of the gas station (provisioning system) are given. Relevant black-box properties are the fuel type and the fuel nozzle dimensions. Evidently, *constructional* knowledge of the car is then required to adapt the car to these black-box properties of gas stations. Stated otherwise, the functional design of the car creates the fuelling function such that the black-box properties of the gas station can be used. Another example is a computer (using system) that needs electrical power. Such powering is provisioned by an electrical network (provisioning system). The black-box properties of the latter system regard, for example, voltage, frequency, current maximum, and plug dimensions. Again, knowledge about the computer's *construction* is essential for the ability to utilize the black-box properties of the electrical network.

Similar consideration plays a role in the case of an enterprise. For example, the functional relationship like:

$$\mathcal{F}\ (\text{purchasing}) : \mathit{Enterprise}(\text{parts})\ \mathcal{R}\ \mathit{Supplier}(\text{selling parts})$$

will presumably be based on the already existing black-box properties of the supplier. In this case, the construction of the enterprise must be known for designing the proper functional relationship with the supplier. In all these examples, using system constructional knowledge is essential. This does not necessarily mean knowledge about all aspects of the using system construction but such detailed knowledge about relevant constructional aspects for ensuring adequate use of the black-box properties of the provisioning system.

Functional Design and Provisioning System Design

In numerous cases, the provisioning system S_2 must be designed in order to establish a functional relationship with the using system S_1. Hence, a functional relationship is to be created between a system S_1 with certain needs and purpose and a system S_2 to be designed with certain properties for addressing the needs and purpose of S_1. Sometimes, the provisioning system is called the *object system*: the object of system design. The S_2 system designers must have a proper picture about the wants, needs, and purpose of S_1 in order to make functional relationships useful. Only under this condition are the relationships adequate and fruitful. As before, that proper picture is provided by insight in the *construction* of the using system S_1 since it is the construction of S_1 that defines the wants, needs, and purpose that the black-box properties of the provisioning system S_2 must satisfy. Figure 4.7 expresses this fundamental insight: the fundamental functional design law. Initially focusing on S_2 is thus fundamentally inadequate. Design proceeds from S_1 to S_2. When S_1 is an enterprise and S_2 is an information system, expressions (4.5) and (4.6) can be written as:

$$\mathcal{F}\ (\text{function}) : \mathit{Enterprise}(\text{need, purpose})\ \mathcal{R}\ \mathit{Information\ system}(\text{properties}).$$

We repeat: the properties of the provisioning system S_2 are expressed as black-box properties since from the perspective of the using system S_1, the construction of S_2 is not known nor relevant. Given the fundamental functional design law, the informational wants, needs, and purpose are defined by the organizational construction of the enterprise (white-box perspective), such as informational support for employee-centric organizing. Subsequently, this is the basis for defining the needed black-box properties of the information system that afford the desired functional relationships. Recall that this is precisely the insight that was discussed in Sect. 1.4.1 about business and IT alignment.

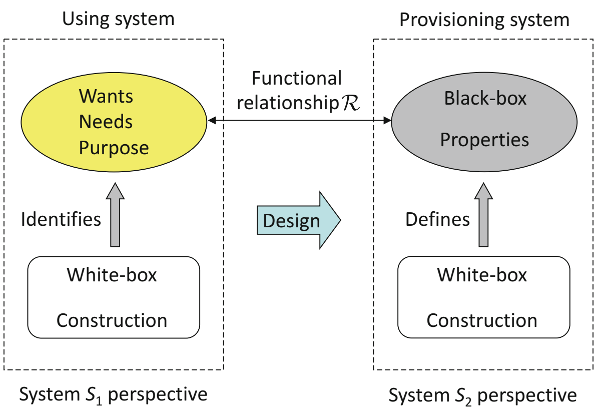


Fig. 4.7 Illustrating the functional design law

Functional Decomposition and Functional Design Domains

Two important concepts will be introduced: (1) functional decomposition and (2) functional design domains. These concepts are essential for operationalizing the functional relationships, as well as for operationalizing the notions of 'requirement' and 'architecture' as key concepts within system (and enterprise) engineering. In the next paragraph, comparable concepts are introduced from the constructional perspective. Functional design concerns creating the functional relationships between the using system and the provisioning system or object system. Chapter 3 outlined that design is a creative, nonalgorithmic process. Hence, we can define the notion of 'design' or 'designing' as:

- *Design or designing* Intentional, creative, and nonalgorithmic courses of action aimed at creating an artifact or parts thereof.

The result of designing is 'a design':

- *A design* The *conceptual* realization of an artifact or parts thereof such as models, drawings, operational and production rules, behavior descriptions, quality and service criteria, norms and values outline, etc.

Recall from the previous chapter that a design enables defining a detailed scheme of activities (the plan) for building/implementing the artifact which is the *physical* realization of the artifact.

As stressed above, the intended functional relationships have to be designed. The associated activities can be identified as functional design, which is defined as:

- *Functional design* Creating the functional relationships into the desired form.

A functional relationship is often initially expressed in a high-level manner, such as operating a car or using a washing machine. In order to enable functional design, the functional relationship must be detailed. In other words, functional decomposition has to be performed, which we will define as:

- *Functional decomposition* The breakdown of a generic functional relationship into detailed functional relationships such that specific functional design can be accomplished.

Figure 4.8 shows the functional decomposition (not necessarily exhaustive) of a car into detailed functional relationships associated with operating a car (provisioning system). In this case, the using system of consideration can be drivers and passengers. As the breakdown indicates, functional design takes place pertinent to certain functional design domains that operationalize a detailed functional relationship. For example, the functional relationship 'powering' defines the functional design domain 'powering' which, through functional design, operationalizes the powering function. Thus, 'powering' is one of the black-box properties the system 'car' must have. Further detailing is required, leading to more detailed functional relationships like 'starting,' 'regulating,' and 'fuelling' and thus lead to defining

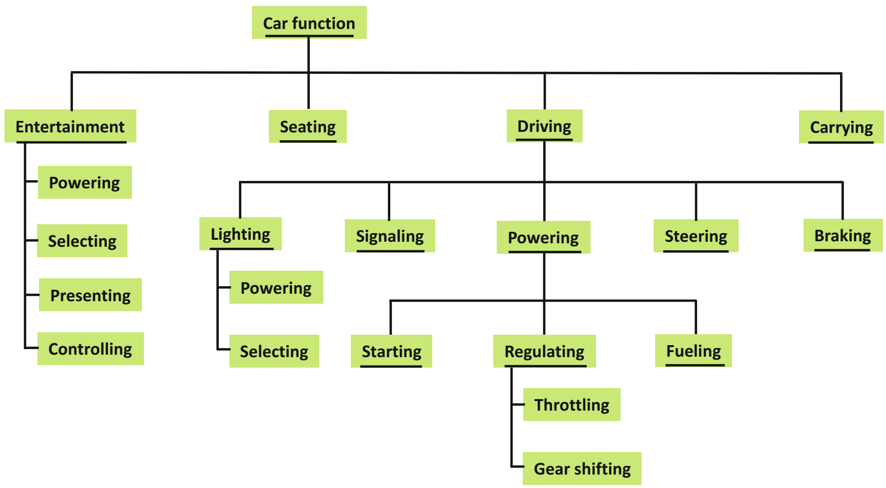


Fig. 4.8 Functional decomposition of a car

functional design domains with these names. Thus, a detailed functional relationship following from a functional decomposition is directly associated with a functional design domain where functional design must take place that shapes the detailed functional relationship. Put differently, the functional design domains represent the black-box properties that the system to be designed must manifest. In view of these observations, we define:

- *Functional design domain* A functional facet manifesting a black-box system property which functional design must develop.

Since a detailed functional relationship is always associated with a functional design domain, the notion of functional decomposition can also be interpreted as the breakdown of the overall functional design domain into detailed functional design domains. Hence, functional decomposition can also be defined as:

- *Functional decomposition* The breakdown of the main functional design domain in a complete, necessary and sufficient, set of detailed functional design domains (manifesting black-box system properties) that enable comprehensive functional design.

We will briefly identify the functional decomposition as $\mathcal{FD}$ and the set of functional design domains as $\mathcal{V}_f$. In this short notation, we have:

$$\mathcal{FD} \rightarrow \mathcal{V}_f = \{\text{functional design domains}\}.$$

When recalling the umbrella example, the following functional decomposition can be made for the rain protecting function of the umbrella:

$$\textit{Umbrella rain protecting } \mathcal{FD} \rightarrow \mathcal{V}_f = \{\text{deploying, holding, retracting, folding}\}.$$

For using a car the initial functional decomposition looks like:

$$\textit{Car usage } \mathcal{FD} \rightarrow \mathcal{V}_f = \{\text{fuelling, powering, steering, lighting, braking, heating}\}.$$

A functional decomposition can always be made pertinent to certain subfunctions. For example, the function 'entertainment' (in a car) introduces additional elements of a functional decomposition and thus entails additional functional design domains:

$$\textit{Car entertainment } \mathcal{FD} \rightarrow \mathcal{V}_f = \{\text{selection, control, powering, presentation}\}.$$

Understandably, a functional decomposition can be made down to a level expressing functional relationships that need no further breakdown because the level of detail is necessary and sufficient for designing the detailed functional relationship, hence for designing the detailed black-box system properties. So generally, a functional decomposition results in a tree-like presentation of functional relationships (functional design domains), as is illustrated in Fig. 4.8. Note that if the car is disassembled, the functional relationships vanish: nothing depicted in Fig. 4.8 remains. What remains are constructional parts, which are topics of the constructional perspective discussed in the next section.

Completeness

Arguably, for designing the functional part of a system comprehensively, the set of functional design domains must be *complete*: necessary and sufficient for functional design, otherwise stated, necessary and sufficient for defining black-box system properties comprehensively. For creating such a necessary and sufficient set in case the system users are human subjects, the intended human subjects with needs and purposes must always be involved since, as stressed once again, the functions of a system concern relationships with those human subjects. As stated before, this fundamental insight is often ignored, whereby system functions are seen as system properties leading to a system-centric functional design focus, subsequently leading to functional relationships that are not valued by human beings since their needs and purposes are not adequately addressed. Further, as will become clear further in this chapter, the necessary and sufficient set of functional design domains is crucial for defining functional requirements and functional architecture, as well as for adequately addressing functional areas of concern, such as usability, safety, or comfort.

4.4 The Constructional Perspective

4.4.1 Construction: The Basis for System Properties

We mentioned that, in contrast to subjectively defined functional relationships, the objectively given aspect of a system *S* is identified as the *construction* of *S*. The construction determines the objective properties of a system which determine, or bring forward, the black-box system properties and thus ultimately enable the functional relationships of the system with its users. This perspective assumes that the system properties can be expressed in terms of the system construction. Besides earlier remarks, we will illustrate below that such expression is not always easy because our language is predominantly determined by functional terms.

The construction concerns the ontological aspects of a system, that what the system *is*. 'What the system is' is revealed by the white-box perspective. As we have mentioned, there can be multiple functions for a given system, but there is only one construction. Recall the umbrella as the system *S*. Various functional relationships between an umbrella and human beings were identified for one and the same umbrella. Put differently, all different functional relationships are based on the objectively given construction of the umbrella. Figure 4.9 shows the umbrella system and the two different property types associated with the two different perspectives expressed by two different types of language. These languages are incommensurable (cf. Chap. 3). Thus, the white-box language is incapable of properly expressing the black-box properties that are relevant for the functional relationship, while the black-box language cannot express the white-box properties of the construction.

Seeing the system construction as the objectively given system aspect needs further clarification. When summarizing the philosophical foundation in Chap. 2, we argued that concepts and theory are of our own making. This 'language' defines how we see 'reality' and defines the interpretations that give our experiences meaning. So, the concept of ontology—that what is considered existing—is always relative: it depends on the language used. Hence, the notion of 'objectively given' must be understood as persons using the same 'language' (theory, concepts) will come up with the same description of the system's construction. Especially with

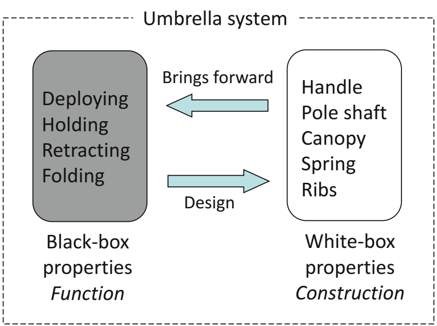


Fig. 4.9 Two different system perspectives and property types

enterprises, this is a crucial point. For example, a person with a structural functionalist concept of an enterprise will use a different language than a person who observes an enterprise using concepts of interpretivism. They will thus come up with different 'realities' of an enterprise. In any case, viewpoints about the system construction form the basis for the perceived system's properties: the attributes of, and predicates about, the system. Ideally, one should have the possibility to express system properties in language that refers to the construction only. But that would assume that we could speak about an object or system as it 'really' is. In addition to the conceptual language issue mentioned above, describing how a system 'really' is seems problematic since the language developed by human beings in social interaction already contains interpretations about objects, and these interpretations often include functional use. So, interpretations about objects are also (if not virtually always) driven by the social use of objects. Take the construction of an electrical system for houses as an example. Constructional parts are lamps, lamp holders, switches, outlets, wiring, wiring conduits, fasteners, and so on. As the example shows, the names of these constructional parts often express the functional use of the parts. Hence, it is sometimes difficult to express the properties of an object or system in 'pure' constructional terms.

With enterprises, the difficulty of expressing enterprise properties in terms of the enterprise construction is even more profound because of the predominant use of functional language induced by structural functionalism (cf. Sect. 2.3.2). Nonetheless, the main point to remember is that, despite the occasional difficulty of 'pure' constructional language in some cases, the description of a system's construction does not refer to a relationship but refers to what the system *is*: its manifestation of existence.

4.4.2 Constructional Decomposition and Constructional Design Domains

Expression (4.2) shows that a system function concerns a relationship between a human subject with a need or purpose and a system with certain properties:

$$\mathcal{F}\ (\text{function}) : \mathit{Subject}(\text{need, purpose})\ \mathcal{R}\ \mathit{System}(\text{properties}).$$

Similarly, expressions (4.5) and (4.6) give the functional relationship between two systems:

$$\mathcal{F}\ (\text{function}) : \mathit{System}\ S_1(\text{need, purpose})\ \mathcal{R}\ \mathit{System}\ S_2(\text{properties})$$
$$\mathcal{F}\ (\text{function}) : \mathit{Using\ system}(\text{need})\ \mathcal{R}\ \mathit{Provisioning\ system}(\text{properties}).$$

We stressed that the functional relationship is only adequate if the two aspects of the relationship $\mathcal{R}$ are properly addressed: (1) need or purpose of the human subject or system S_1 and (2) the black-box system properties of S_2. The functional relationship is addressed through functional design, discussed in the previous paragraph. Subsequent design needs to ensure that the required black-box properties are provided by the system's construction, as Fig. 4.7 shows. Alternatively, as Sect. 4.3.4 outlined, the construction of the using system must be created in case the provisioning system is given. In both cases, *constructional design* needs to take place. With reference to the general definitions of design and designing given previously, we define constructional design as:

- *Constructional design* The creation of white-box system properties such that the construction brings forward or enables the use of black-box properties in view of the intended functional relationships.

Obviously, the notion of 'construction' needs further detailing to accomplish complete constructional design. As in the functional case, constructional decomposition must take place, which we define as:

- *Constructional decomposition* The breakdown of the main constructional design domain in a complete, necessary and sufficient, set of detailed constructional design domains that enables comprehensive constructional design.

A constructional design domain is defined as:

- *Constructional design domain* A concrete constructional facet of a system for which constructional design must take place.

The outcome of the constructional decomposition, identified as $\mathcal{CD}$, is a set $\mathcal{V}_c$ of constructional design domains. Briefly denoted, we can write:

$$\mathcal{CD} \rightarrow \mathcal{V}_c = \{\text{constructional design domains}\}.$$

For an umbrella, the constructional decomposition looks like:

$$\textit{Umbrella}\ \mathcal{CD} \rightarrow \mathcal{V}_c = \{\text{handle, pole shaft, canopy, top/bottom spring, ribs}\}.$$

For a car, the (not exhaustive) constructional decomposition gives:

$$\textit{Car}\ \mathcal{CD} \rightarrow \mathcal{V}_c = \{\text{chassis, wheels, engine, lamps, brakes, seats, wiring}\}.$$

When the entertainment function in a car is considered, additional constructional aspects play a role. Hence, in addition to the previous constructional aspects, we have:

$$\textit{Car}\ \mathcal{CD} \rightarrow \mathcal{V}_c = \{\text{speakers, amplifier, tuner, player}\}.$$

As before, also the constructional decomposition can be depicted in a tree-like presentation of constructional design domains. For the car, this presentation is (not exhaustive) given in Fig. 4.10. Likewise as in the functional case, also the

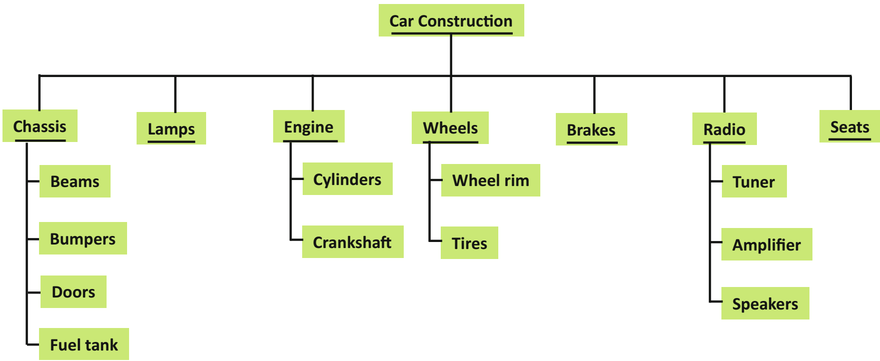


Fig. 4.10 Constructional decomposition of a car

constructional decomposition must be extended down to a level whereby, given the specific constructional perspective, further decomposition is not required. So, from the constructional perspective of the car, there is no need to go into the constructional details of a component, such as a generator.

Arguably, for a system to be designed comprehensively, the set of constructional design domains must be *complete*: necessary and sufficient for constructional design. As can be understood, the actual decomposition is contingent upon multiple factors, such as the technology used. An electricity-driven car is likely to differ in its constructional decomposition from a fuel-driven car. This observation illustrates once more the fundamental difference between function and construction since similar car *functional* relationships are provided by a different *construction*. Again, an adequate constructional decomposition is important because, as we will show, defining constructional requirements and architecture depends on this decomposition. Adequate decomposition is thus crucial for adequately addressing areas of concern, such as safety or fuel efficiency.

In case of a technical system like a car, constructional decomposition is relatively easy. This seems hardly the case for a social system like an enterprise. Figure 4.1 in Sect. 4.2.3 shows the high-level enterprise metamodel, whereby structures and systems, culture, management behavior, and employee behavior define the enterprise system properties. Hence, in view of expressions (4.3) and (4.4), the four components of the morphogenic enterprise conceptual system model define the white-box properties of the enterprise construction, which determine the black-box properties and thereby the adequacy of the various functional relationships of the enterprise. In view of our previous discussion, it is thus a crucial issue how to actually operationalize the notion of constructional decomposition in the case of enterprises such that design can take place in a way that addresses all four components of the morphogenic enterprise conceptual system model. We will return to this issue in later paragraphs.

4.5 Linking System Desirables with System Design Concepts

4.5.1 System Context, Design Aspects, and Areas of Concern

System design concerns the intentional creation of an artifact with some intended functional relationships with its environment. That environment can be a human subject or another system (artifact). Recall the general expressions (4.5) and (4.6) stating the functional relationship in a concise manner as:

$$\mathcal{F}\text{ (function)} : \textit{System } S_1(\text{need, purpose})\ \mathcal{R}\ \textit{System } S_2(\text{properties})$$
$$\mathcal{F}\text{ (function)} : \textit{Using system}(\text{need})\ \mathcal{R}\ \textit{Provisioning system}(\text{properties}).$$

Functional design concerns creating the functional relationship based on the white-box need of the using system and the black-box properties of the provisioning system. As Sect. 4.3.4 outlined, constructional design concerns the creation of the provisioning system, such as an IT system, in case the using system is given, such as an enterprise, or alternatively, the creation of the using system, such as an IT system, when the provisioning system is given, such as those provided by external service providers.

Obviously, system creation is by its very nature not 'incidental.' The nonincidental character means that the inquisitive process outlined in Sect. 3.2.4 should commence. The starting point is the system context, defined as:

- *System context* The aspects and conditions for creating the system, such as defined by system's intended purpose(s), the intended customers and users of the system, and the stakeholders that might have a concern pertinent to system development. Also certain maxims might play a role based on, for example, societal, economical, environmental, technological, or political considerations.

Taking the car as an example, the system context concerns the strategic considerations for developing the car. This context is the starting point for further development through the formulation of design aspects, defined as:

- *Design aspects* A comprehensive set of initial and preliminary attention areas for design, which are formulated based on the system context. The design aspects could be aspects of the system context but also other aspects based on reasoning about the system context.

In case of a car, examples of such preliminary attention areas for design are customers, drivers, passengers, other road users, economy, image, esthetics, pollution, safety, power, comfort, and operability. For enterprises, Tables 4.1 and 4.2 mention several enterprise design aspects. Since the design aspects are initial and preparative attention areas for design, they must be translated into formal and explicit statements. The first explicit statements in this respect are so-called areas of concern, defined as:

- *Area of concern* A generic characteristic that the black-box and/or white-box system properties must manifest.

Taking the car as our system of design, areas of concern might be safety, reliability, maintainability, efficiency, comfort, elegancy, and so on. As the examples show, areas of concern are not themselves system design domains but are desirables that should be realized through design within certain functional and constructional system design domains. As stressed before, the decomposition into a *comprehensive* set of functional and constructional system design domains is important. This can additionally be argued in view of properly addressing areas of concern. For example, the concern for car safety will not be completely addressed if the constructional design domain 'fuel lines' is not identified. In addition to the definition of areas of concern, two other concepts are crucial for design: (1) functional and constructional requirements and (2) functional and constructional architecture. These concepts are discussed in the next paragraph. Recall that the notion of 'functional' refers to the black-box system properties and 'construction' to white-box properties.

4.5.2 Requirements and Architecture

Understandably, the nonincidental character of system creation inevitably raises questions about the nature of the functional and constructional system properties. Not addressing these questions seems an inconsistent position: it denies the intentional character of system creation (while that was the starting point in the first place) and leaves its coming into being to spontaneous, incidental, ungoverned processes. Answers to aforementioned questions come in two fundamental concepts: (1) *requirements* and (2) *architecture*. These concepts are important aspects of the design language and are outlined below. In view of the fundamental distinction between function and construction, requirements and architecture are likewise defined pertinent to function and construction, respectively.

Requirements

In view of the intended functional relationships and the properties of the system construction, it is likely that the intended system users, and system stakeholders in general, have certain requirements. System users will evidently have functional requirements, such as regarding specific functions or certain areas of concern. Constructional requirements regard system white-box properties in view of, for example, system safety, reliability, or maintainability. So, we can briefly define:

- *Requirements* A coherent and consistent set of functional or constructional wants and needs that are addressed through design in certain functional and/or constructional design domains. Requirements express *what* is wanted and needed, hence *what* the system must manifest.

Requirements are most likely based on, or indicated by, areas of concern. For example, the concern for car safety might indicate the requirement for a maximum braking distance at a certain speed. Conversely, the concrete formulation of a requirement deals with the area of concern, since the requirement is addressed through design in certain design domains. Likewise, the requirement that the car mass may not exceed a certain value follows from the concern for fuel efficiency or a concern for limiting the amount of governmental taxes. During design, requirements are addressed in one or more design domains, while conversely, the design domains operationalize the requirements: that's where the rubber hits the road.

Arguably, the formulation of requirements is relatively easy since it merely expresses what the various stakeholders who are involved with system development want and need. Specific knowledge about system design is not required. As it turns out, such relative easiness is absent in the case of architecture.

Architecture

Functional and constructional properties that are expressed in the form of requirements merely state *what* is wanted and needed but leave open *how* the functional and constructional properties are designed. Addressing this latter issue is essentially *normative*. Hence, answers to questions about *how* the system is to be designed provide normative guidance for design: the answers indicate *how* the design must be realized. We fully agree in this sense with Ulrich's critical system heuristic, arguing that the normative aspects of system design must be made explicit (In: Jackson 2003). Architecture, in our view, provides the answers to aforementioned design question and makes the normative aspects of system design explicit.

Normative design guidance is thus the essential purpose of architecture. Conceptually, architecture can be considered as the normative restriction of design freedom (Dietz 2008). Practically, architecture is defined as follows:

- *Architecture* A coherent and consistent set of principles that guide system design.

A principle can be seen as a rule or standard for design. Examples of architecture are given below. In view of the normative nature, architecture is essentially a *prescriptive* concept that expresses *ex ante* how systems must *become*, rather than a *descriptive* concept that depicts *ex post* how systems *are* (Hoogervorst 2004a, b; Hoogervorst and Dietz 2005; Dietz and Hoogervorst 2007). We acknowledge that the architecture concept is often used in a descriptive sense, whereby high-level designs, with labels such as 'blueprint,' 'city plan,' or 'organization' are identified as 'architecture.' For example: "the architecture of an enterprise is the basic overall organization within which work takes place" (Martin 1995, p. 56). The question is, however, how did the designs come about? What were the underlying guiding principles? All too often, answers to these questions remain absent, making the adequacy of the design process dubious. The often referenced IEEE definition of software architecture contains both the descriptive and the prescriptive perspectives on architecture: "architecture is the fundamental organization of a system embodied in its components, their relationships to each other and the environment, and the principles guiding its design and evolution" (IEEE 2000).

Since the normative aspects of system design cannot be ignored, the descriptive use of the architecture concept seems of little value. The descriptive notion is essentially passive and—in view of the description after the fact—cannot provide active design guidance, while such guidance is essential in view of the question as to *how* the system is to be designed. The two views on architecture can be related to two philosophical characteristics about conducting science formulated by Windelband and identified as the nomothetic and idiographic character of science (In: Nagel 1961). Within the nomothetic view, science is about generally applicable knowledge and the search for laws that generally hold. The nomothetic approach to science is thus, in the literal meaning of the word, 'law giving.' On the other hand, within the idiographic perspective, science is about understanding and describing phenomena viewed as unique and not guided by underlying general principles. One might argue that the normative, prescriptive view on architecture fits the nomothetic perspective on conducting science (cf. Sect. 3.2.1*)[1].

In light of the high failure rate of strategic enterprise initiatives and the underlying causes, as mentioned in Sect. 1.4.3, the nomothetic perspective is very relevant for—to quote Kuhn (1962)—establishing the 'normal' science concerning the design of enterprises, with enterprise architecture as the essential guiding concept. Therefore, attention is not given primarily to case studies (ideographic perspective) but to generally applicable design knowledge and design principles.

The Purposes of Architecture

A key system characteristic is unity and integration: the parts of a system must work harmoniously together. This characteristic is an essential requirement for enterprises since lack of unity and integration was identified in the introductory chapter as a prime reason for strategic failure (cf. Sect. 1.4.3). We have seen however that unity and integration does not come naturally. Especially for enterprises being organized complexities, the condition of unity and integration must be intentionally designed. For this important condition, design guidance is evidently needed. Hence, an important purpose of architecture is ensuring system unity and integration. Obviously, unity and integration can only be created if governance of architecture is effectuated at the overall level for which unity and integration must established: the enterprise as a whole. Further, during system design, various areas of concern must be addressed. Formulating areas of concern for a car like safety, fuel efficiency, or comfort does not amount to much if concrete principles addressing these concerns are not defined, and it thus remains unclear *how* a specific area of concern is addressed. What is needed are principles that explicitly state *how* a concern must be taken care of during design.

These considerations likewise hold in the case of enterprises. Section 4.2.1 summarized important reasons for enterprises design. Two important purposes of architecture therefore are (1) ensuring system (enterprise) unity and integration and (2) addressing areas of concern.

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[1]An asterisk (*) identifies a reference in *Foundations of Enterprise Governance and Enterprise Engineering* (Hoogervorst 2018).

Note that since architecture is a prescriptive concept that gives answers to the question as to *how* the system needs to be designed, in-depth system knowledge is essential. Obviously, one cannot reasonably define adequate principles for design guidance without proper knowledge about the system for which the principles are intended. Herein lies one of the difficulties, especially for social systems like enterprises, for defining architecture. Comprehensive knowledge about the foundational sciences is thus crucial (Hoogervorst 2018).

4.5.3 Functional Requirements

In view of the requirements definition, a functional requirement expresses certain wants and needs that the functional relationships between system users and a system must fulfill; hence, the black-box properties must manifest. Recall that the functional relationship $\mathcal{R}$ is expressed by:

$$\mathcal{F}\ (\text{function}) : \textit{Subject}(\text{need, purpose})\ \mathcal{R}\ \textit{System}(\text{properties})$$

or generally by

$$\mathcal{F}\ (\text{function}) : \textit{Using system}(\text{need, purpose})\ \mathcal{R}\ \textit{Object system}(\text{properties}).$$

Requirements are thus defined by the system user or user group(s) having a certain need or purpose. In general, functional requirements are defined by the using system: it concerns *what* the provisioning system must provide. Subsequently, the provisioning system must obtain the black-box properties, such that the function can be provided. A few examples will illustrate the notion of functional requirements.

Taking the rain protection function of an umbrella, we might formulate the following functional requirements:

- *Useable up to 15 m/s wind speed*.
- *Single-hand deployment*.

As mentioned, a function concerns a subjective relationship between a person and an artifact, or a relationship between systems. That relationship determines the functional requirements. Seen from the perspective of hiding a weapon, a likely functional requirement for the umbrella is:

- *Handgun concealment*.

All these umbrella requirements are formulated pertinent to an *area of concern* that can be labeled as ‘usability.’ Other areas of concern for an umbrella might be ‘reliability’ or ‘elegancy.’ Consequently, requirements for such areas of concern need to be defined. Further, the functional design domains where the requirements need to be dealt with are the ones given by the functional decomposition before:

$$\mathcal{V}_f = \{\text{deploying, holding, retracting, folding}\}.$$

For a car, functional requirements can be:

- *Power-assist braking.*
- *Power-assist steering.*
- *Braking distance <12 m at 50 km/h.*
- *Acceleration > 100 km/h within 8 s.*
- *Key-less starting.*
- *Lockable fuel filling point.*
- *Adjustable steering wheel.*
- *Voice-controlled music selection.*

These car functional requirements are formulated pertinent to the areas of concern: ‘safety,’ ‘usability,’ ‘comfort,’ and ‘performance.’ A requirement might be based on more than one concern. With reference to the functional decomposition given in Fig. 4.8, the design domains involved for these requirements are ‘braking,’ ‘steering,’ and ‘entertainment.’

4.5.4 Constructional Requirements

In view of the fundamental relationship:

$$\mathcal{F}\ (\text{function}) : \textit{Subject}(\text{need, purpose})\ \mathcal{R}\ \textit{System}(\text{properties}),$$

or

$$\mathcal{F}\ (\text{function}) : \textit{Using system}(\text{need, purpose})\ \mathcal{R}\ \textit{Provisioning system}(\text{properties}),$$

the black-box and white-box system properties must be such that the intended functional relationships are established. Further, system properties must also be such that areas of concern are properly addressed. White-box system properties refer to the system construction. Again, both requirements and architecture play a role in shaping the system properties. Such shaping results from constructional design pertinent to constructional design domains, guided by constructional architecture. For the system ‘car,’ the constructional decomposition in constructional design domains is given in Fig. 4.10. As stressed before, for adequate constructional design, hence for adequately shaping the white-box system properties, the set of constructional design domains must be complete: necessary and sufficient for comprehensive constructional design.

A constructional requirement expresses certain wants and needs that the system construction must fulfill in view of the intended black-box properties and certain areas of concern. Requirements are defined by the system user or user group(s). It concerns *what* the system construction must provide or manifest. For an umbrella, we might have:

- *Mass < 1 kg.*
- *Useable up to 15 m/s wind speed.*

These constructional requirements are formulated pertinent to the areas of concern 'usability' and 'comfort.' Examples of constructional requirements for a car are:

- *Mass < 1500 kg.*
- *Side impact protection in doors.*
- *Stiffness up to 60 km/h collision speed.*

These requirements are formulated pertinent to the areas of concern 'fuel efficiency' and 'safety.' The design domains involved are 'chassis,' 'bumpers,' and 'doors.'

4.5.5 Functional Architecture

Next to functional requirements, also functional architecture must be defined. As mentioned before, architecture concerns the normative restriction of design freedom. Practically, architecture is a coherent and consistent set of design principles that guide system design. Recall the two main objectives of architecture: (1) ensuring system unity and integration and (2) addressing areas of concern. Within the perspective of the system's function(s), functional architecture guides functional design. Whereas functional requirements express *what* is desired with respect to the functional relationship, functional architecture prescribes *how* functional design must proceed, that is, prescribes *how* the functional relationship takes shape. For a simple system such as an umbrella, not much functional architecture plays a role. We might think of the following principles:

- *The handle must be anatomically shaped.*
- *Canopy folding must use Velcro tape.*

These formulations of functional architecture point to a problem since the formulation refers to something of the umbrella's construction: the handle and the Velcro tape. However, we must remember that (in this case) the function concerns the *relationship* between a subject with a need or purpose and an object with properties. Functional architecture thus concerns the subject-object relationship whereby some of the object's aspects relevant for that relationship need to be expressed. It is thus sometimes difficult formulating functional statements from a truly black-box perspective, that is, formulating functional statements that do not already assume some constructional, white-box, knowledge. If, in the case of the umbrella, we were to speak in truly black-box terms, we should somewhat cumbersomely speak of 'holding means' instead of 'handle,' while 'rain shielding means' would be the alternative for 'canopy.' Rather than debating the precise wording, the importance is recognizing the conceptual essence of functional architecture: it concerns guiding the design of the functional relationship. Let's again use the car for further illustrating the notion of functional architecture. Some examples are:

- *Digital speed indication must be used.*
- *Steering wheel adjustment must be inhibited while driving.*
- *Warning signals must be both visible and audible.*
- *Power assist steering must reduce with increasing speed.*
- *Traffic information must override entertainment.*

As the examples show, the functional architecture principles address various areas of concern like 'comfort,' 'usability,' and 'safety.' A principle might address more than one concern and might guide design in more than one design domain. Involved design domains are 'steering,' 'powering,' 'warning,' and 'entertainment.'

4.5.6 Constructional Architecture

White-box system properties result from the system's construction. Guidance for constructional design is given by constructional architecture. As in the functional case, areas of concern and constructional design domains play a role for defining constructional architecture principles. For an umbrella, such principles could be:

- *The canopy material must be textile.*
- *The pole shaft must be of composite material.*

As said earlier, the actual manifestation of the construction depends on the function(s) the system must provide. So, if an umbrella function must also conceal a weapon, a relevant architecture principle is:

- *The canopy material must be nontransparent.*

In a society where umbrellas are used to conceal weapons, a more likely constructional architecture principle would be:

- *The canopy material must be transparent.*

Such a principle is likely defined and enforced by the government of a country where the weapon-concealment function of an umbrella is popular. The concern addressed is evidently 'safety.' Some examples of constructional architecture principles for a car are:

- *Bumpers must be made of composite material.*
- *Dual hydraulic brake system.*
- *Rear wheels must use both brake systems.*

Concerns addressed are 'fuel efficiency' and 'safety.' Constructional design domains involved are 'bumpers,' 'hydraulic system,' 'wheels,' and 'brakes.'

4.5.7 Difference Between Requirements and Architecture

Both requirements and architecture influence design, respectively, by indicating *what* is wanted or needed from design and by indicating *how* design must proceed. As stressed in Chap. 3, it is impossible to proceed algorithmically from *what* is wanted to *how* that is realized. That transition concerns the creative process of design. As the examples given above have illustrated, requirements do not, generally speaking, give specific design guidance since they merely express what is wanted or needed. Of course, it is possible that system stakeholders formulate requirements that do give design guidance. If adequate, such requirements may be adopted as architecture principles. Nonetheless, the distinction between requirements and architecture is relevant and can be further understood as follows.

System Instance Versus System Class

Various stakeholders are involved with the development of a technical system or an enterprise, such as customers, employees, management, or civilians. They formulate requirements: the wants and needs that a system or an enterprise must fulfill. Next, there are design activities that lead to the conceptual realization of the system or enterprise. The term 'next' should not be misinterpreted. As we have extensively argued in the previous chapter, the development activities that address *what* is desired and *how* that is realized are highly iterative, concurrent, and convoluted. Nonetheless, conceptually and also practically, we must distinguish between the two aspects of development: formulating *what* is needed or wanted on the one hand and *how* the needs and wants are realized on the other hand. By applying architecture in design domains, design is guided and areas of concern are addressed. These concerns are of a general nature. That is, areas of concern are not restricted to a specific system or enterprise. For example, safety, fuel efficiency, reliability, and maintainability are generally relevant for the class of cars. Similarly, areas of concern like customer loyalty, employee motivation, flexibility, or compliance with rules and regulations are concerns relevant for every enterprise. Consequently, design principles addressing these concerns are likewise relevant for the design of every car or enterprise, respectively. Hence, one might say that architecture applies to a system *class*. The notion of a system class can be recognized in many instances. For an enterprise, IT architecture provides normative design guidance for the class of IT systems within an enterprise. It is, however, certainly conceivable that IT architecture can be defined industry-wide, hence for a far larger class of IT systems. Then, IT system design guidance concerns generally applicable principles and standards that are defined from the perspective of IT professionalism itself, independent of a specific enterprise point of view. The fact that IT system design—or the design of technical systems in general—is the subject of general education and research actually expresses that notion. IT architecture then holds for the class of IT systems in general. Similar considerations can be given for enterprise architecture. Enterprise architecture for a specific enterprise refers to the system class with only one element: the enterprise in question. In the case of a holding with various 'business units' for which enterprise architecture gives design guidance, one can refer to a class of sociotechnical systems. Comparably as before, the fact that organization science is a topic of general education and research essentially implies the possibility of a general theory about enterprise design (enterprise engineering). Hence, it implies the possibility of enterprise architecture that is valid (in principle) for the class of enterprises. This refers to the possibility of universally applicable theories about enterprises (Hoogervorst 2018). Obviously, this is one of the foundations for the ability to speak generally about developing enterprises: there are design principles that are generally applicable for addressing certain concerns. It might very well be that governmental ruling enforces certain design principles for enterprise design in light of, for example, concerns for safety, pollution reduction, and so on. Such ruling can be noticed in various other areas, such government-defined architecture for the design of electrical systems in buildings. Architecture can also be defined by governance institutions of certain industry sectors. Well-known examples are the Air Transport Association and the International Air Transport Association. While requirements might differ for different systems or enterprises, the design principles (architecture) are considered uniformly applicable. Hence, we might say that, generally speaking, requirements pertain to a specific instance of a system, whereas architecture applies to a system class. Our previous reflections are summarized in Table 4.3.

To somewhat complicate matters, we observe that some requirements are also generally applicable. Examples are government-enforced safety requirements, such as the maximum time for evacuating a building in case of emergency, or requirements for fire-resistant doors. Nonetheless, the characteristics given in Table 4.3 clarify the differences between requirements and architecture.

Since architecture is normative, it must be defined (or adopted) and enforced by a governance capacity. For enterprises, such governance comes from the enterprise governance competence discussed in the previous chapter that defines or adopts general enterprise requirements and enterprise architecture for designing the enterprise in a unified and integrated manner while addressing areas of concern. We stress again that the definition and enforcement of general requirements and architecture always assumes the existence of an adequate governance capacity at some overarching level: within an enterprise, industry sector, or government.

Table 4.3 Distinction between requirements and architecture

Requirements	Architecture
Concerns *what* is wanted or needed	Concerns *how* realization must proceed
Express functional or constructional wants and needs for a specific system	Express functional and constructional design guidance that hold for a system class
Are defined pertinent to functional and constructional design domains and express or deal with certain areas of concern	Is defined/used pertinent to functional and constructional design domains and addresses one or more areas of concern
Defined by the system users and/or system owners, or a governance capacity	Defined by a certain (internal or external) governance capacity
Knowledge about the system's construction and operation is not conditional	Knowledge about the system's construction and operation is crucial

Architecturing and Enterprise Governance

Establishing architecture can be labeled as *architecturing*. Architecturing must be distinguished clearly from designing. Since architecture serves as a guidance for design, its definition must logically precede design. The class of systems—for example, the class of IT systems in an enterprise or the class of IT systems in general—is the reference for defining architecture, which is used subsequently when designing a specific system in the system class. The process of architecturing is thus fundamentally different from the process of designing. Moreover, since architecture holds for a class of systems, the process of architecturing is not (generally) related to the design of a specific system. Also in this sense, the processes of architecturing and designing are decoupled. Architecturing can thus take place relatively independently from designing. Moreover, since architecture holds for a system class, the process of using architecture in a specific case of system design means adopting the architecture that has already been defined for the given system class, such as adopting IT architecture for the design of an IT system.

In view of the nature and purpose of architecture mentioned above, the use of architecture needs to be enforced. As mentioned before, in the case of enterprises, such enforcement is necessarily associated with enterprise governance. Recall from the introductory chapter and the previous chapter that we have defined enterprise governance as the enterprise competence (the unified and integrated whole of skills, knowledge, culture, and means) for continuously inciting enterprise adaptive and reshaping initiatives and their unified and integrated operationalization through enterprise (re)design and subsequent implementation. The enterprise change activities, incited by the enterprise governance competence, deal with requirements and are guided by architecture. The latter aspect implies the essential role of the central governance function discussed in Sect. 3.2.9. Without this central role, the process of architecturing (defining and/or adopting architecture) and the subsequent utilization of architecture in enterprise (re)design activities will be inadequate.

4.5.8 Generic Requirements and Architecture Framework

The Framework

As our previous discussion outlined, requirements are wants and needs that a system must provide, while architecture prescribes how design must proceed. Requirements are dealt with during design, while architecture is *applied* during design. As said, formulating requirements is relatively easy, but defining architecture is rather difficult since in-depth knowledge about the system to be designed is essential. When architecture must be defined or adopted, the questions are: What architecture is needed? Which set of principles must be used? How does the architect know for which areas architecture is relevant? These questions are essential for the process of architecturing, while their answer—certainly for the enterprise as a system—is far from easy. Naturally, in specific cases, principles will be adopted that have already been defined in a general sense for the particular system class, but

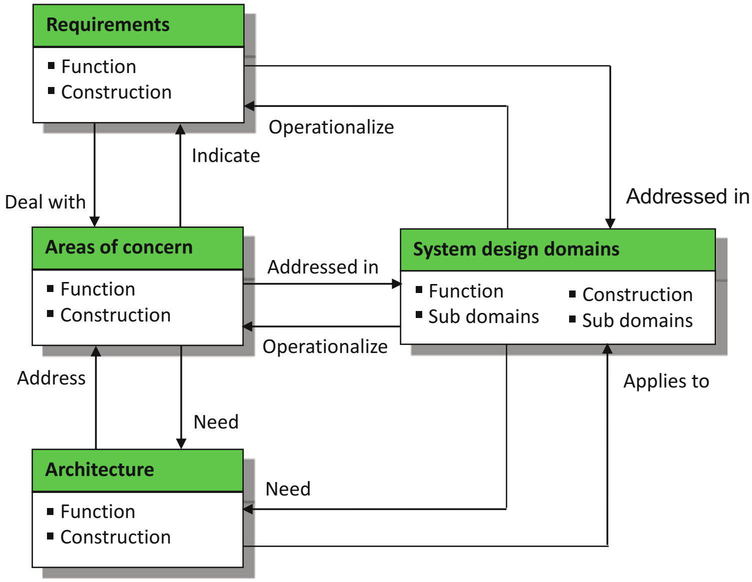


Fig. 4.11 Generic requirements and architecture framework

this adoption still assumes the competence to assess the appropriateness of the design principles. In this paragraph, we will introduce the framework depicted in Fig. 4.11 that aids in the definition of requirements and architecture and their relationships with system design domains.

For every system, the fundamental distinction to be made is that between function (relationships between system stakeholders and the system) and construction (the objective manifestation of the system). Through the inquisitive process outlined in Chap. 3, functional and constructional requirements are defined. Most likely, the system's stakeholders will formulate functional requirements. The nature of requirements is indicated by areas of concern, while conversely, a requirement deals with an area of concern. So, in the case of a car, a concern for safety might indicate a requirement for brake assistance, while this requirement deals with safety in the sense that when the requirement is addressed through design, it contributes to car safety. Design thus operationalizes a requirement.

However, an area of concern might indicate requirements, but nothing is formulated yet that gives any guidance as to how to address the various areas of concern. Hence, an area of concern needs associated architecture principles; otherwise, it remains elusive *how* the concern is addressed. Architecture is used during design and applied in design domains. Based on the function-construction distinction, there are two broad classes of architecture: functional architecture that guides functional design and constructional architecture that guides constructional design. Every design domain identified in the decomposition must have (ideally) architecture associated with it in order to guide design within a specific design domain. Again, this points to the importance of decomposition into a *comprehensive* set of functional

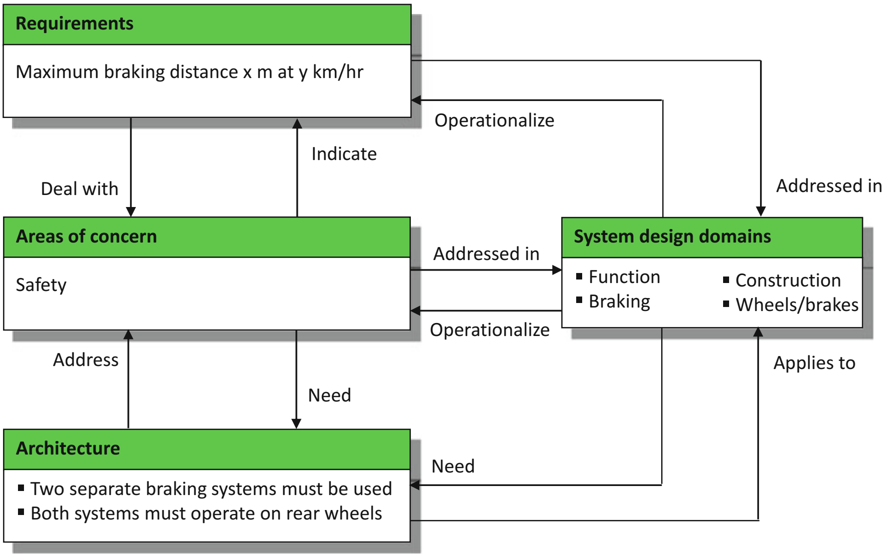


Fig. 4.12 Requirement and architecture example

and constructional system design domains, since these domains are the reference for defining architecture principles and applying them.

We can illustrate the schematic of Fig. 4.11 when the system to be designed is a car. In the first example, shown in Fig. 4.12, the area of concern is safety. This concern indicates (leads to) a functional requirement for the braking function. Conversely, the requirement deals with the concern: it concretizes the concern through design. For addressing the safety concern, architecture is needed. In this example, the concern for safety is addressed by two constructional architecture principles that are applied during design in the design domains 'wheels' and 'brakes.'

In the second example, shown in Fig. 4.13, the starting point is the concern for comfort. This concern indicates (leads to) the requirement for power-assist steering. Conversely, the requirement deals with the concern for comfort by making it concrete. Again, architecture is needed for actually addressing the concern. Two principles are defined: one functional principle and one constructional principle. The functional architecture principle is applied in the functional design domain 'steering,' whereas the constructional architecture principle is applied in the constructional design domain 'steer shaft.'

As our previous examples indicate, there are three aspects relevant for the formulation of requirements and architecture: (1) the system that is to be designed; (2) the functional and constructional design domains that serve as a reference for formulating requirements and architecture, hence where the requirements must be operationalized through design guided by architecture; and (3) the areas of concern that requirements deal with and architecture must address.

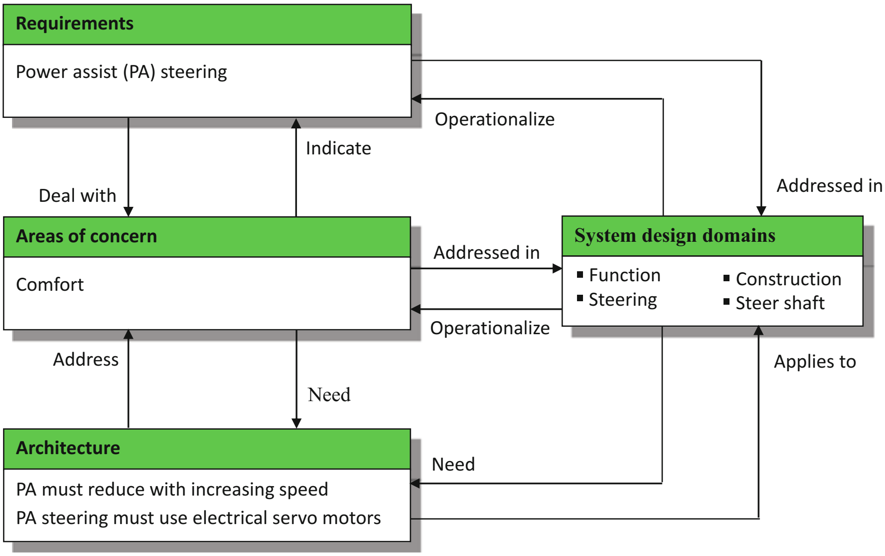


Fig. 4.13 Requirement and architecture example

Briefly stated, the formulation of requirements and architecture is based on a certain system type *S*, functional and constructional design domains *D*, and areas of concern *A*. We might consider the ordered elements <*S*,*D*,*A*> as a conceptual structure for the development of requirements and architecture. Table 4.4 resumes some of the examples given for the system 'car.'

Architecture, Requirements, and Design Domains: Completeness and Specialization

Functional and constructional decompositions yield the sets of functional and constructional design domains. For proper design, the sets must be *complete*: necessary and sufficient for the design to be undertaken. As said, the conceptual structure <*S*,*D*, *A*> forms the reference for defining requirements and architecture by devoting explicit formal attention to (1) the system type *S* for which requirements and architecture must be defined, (2) the necessary and sufficient set of design domains *D* where requirements are dealt with and architecture must be applied, and (3) the areas of concern

Table 4.4 The conceptual structure <*S*,*D*,*A*> for defining requirements and architecture

	System type *S*	Design domains *D*	Areas of concern *A*
	Car	Wheels, brakes	Safety
Requirement	Maximum braking distance of *x* m at *y* km/h		
Architecture	Two separate hydraulic brake systems must be used Both brake systems must operate on the rear wheels		

A that requirements deal with and architecture addresses. It is most likely that when a design domain is observed in more detail, also more detailed or specialized design domains will play a role. For example, from the perspective of a car as a whole, the functional design domain 'entertainment' is identified. But design of the entertainment function necessitates further specialization, hence detailing of design domains, like the ones given in Fig. 4.8. Similar consideration holds for constructional design domains. So, the design domain 'chassis' needs further specialization through the detailed design domains mentioned in Fig. 4.10. This process continues until a level is reached whereby further breakdown is not warranted. We will show later that the same notion holds for enterprise design domains.

As the examples show, the specialization of design domains is associated with more detailed observations. Such specialization thus creates a certain order whereby a more detailed design domain is subordinated under the next higher design domain. Since requirements and architecture pertain to one or more design domains, aforementioned order holds likewise for requirements and architecture. For example, a principle or standard a_j may not be in conflict with principle or standard a_i if design domain D_j is a detail of design domain D_i. Thus, $D_j \subset D_i$. Such a condition holds similarly if S_j is a subsystem of S_i. Similar considerations hold for requirements. Notably, this logical or hierarchical ordering of design domains and their associated architecture and requirements is an important condition for safeguarding coherence and consistency, which has been emphasized previously as an important purpose of architecture. Establishing unity and integration requires that requirements and architecture form coherent and consistent sets. Specifically the set of architecture principles must be *complete*: necessary and sufficient to design the system comprehensively and address the areas of concern adequately. Since architecture is defined with reference to design domains, the completeness of architecture refers to the completeness of the design domains, as mentioned above. For complex systems, such as an enterprise, establishing the completeness of design domains and architecture is far from easy. Knowledge and experience concerning the system type in question is obviously crucial. Further, the set of design domains might change over time: what was previously viewed as a necessary and sufficient set of design domains might be considered as inadequate at a given moment in time. Additional or other design domains could be required due to new technology or new areas of concern or opinions about existing ones. So, for example, introducing 'entertainment' within a people transport system will introduce new design domains not present before. This holds comparably for enterprises. Devoting attention to the notion of societal-conscience business conduct, for example, will likely introduce still undefined design domains. What was previously considered necessary and sufficient thus requires amendment. Hence, new requirements and architecture need to be developed. Nevertheless, all this fits within the scope of the generic requirements and architecture framework given above.

Confusion and Inadequate Approaches

Much confusion exists about the notion of architecture. We have already mentioned in Sect. 4.5.2 the descriptive use of the architecture concept whereby high-level designs are identified as 'architecture.' In these cases, it remains unclear on what formal design guidance the designs are based, if guided at all. Moreover, so-called 'architecture frameworks' are published in the literature whereby it is totally unclear to what system type *S* the framework applies (Perks and Beveridge 2003). One might observe that while the 'enterprise architecture' label is used, in fact IT architecture for the whole enterprise is meant. Despite the 'enterprise' label, the system type is apparently not an enterprise but the 'IT system' of an enterprise. Even then, frameworks are not concerned with defining a complete, necessary and sufficient, set of functional and constructional design domains. Frequently, the 'business' design domain is added to IT-related design domains, in view of the business processes that IT systems are supporting. It seems evident that 'business' cannot be a design domain in case the system type *S* is the enterprise IT system. One might, alternatively, take the system type *S* to be an enterprise, but in that case, considerably more design domains than just 'business' are relevant. In short, all too often, it remains totally unclear which system type the 'architecture framework' represents, while for a given (or supposed) system type, the set of design domains is not complete (Dietz and Hoogervorst 2011). Hence, it remains unclear how in these cases a complete, coherent, and consistent set of architecture principles can be defined.

4.5.9 Publication of Requirements and Architecture

Publication Structure

Requirements are dealt with during system design, while architecture is used to guide system design. Put differently, system design must be architecture compliant while also satisfying requirements. Evidently, for requirements to be dealt with and architecture to be used as design guidance, they must be published formally. A fruitful publication structure is given in Table 4.5 and outlined below.

Table 4.5 Publication structure for requirements and architecture

Requirements		Architecture	
1	Requirement statement	1	Principle statement
2	Rationale for the requirement	2	Rationale for the principle
3	Implications of the requirements	3	Implications of the principle
4	Key actions for effectuating the requirement	4	Key actions for effectuating the principle

Requirement and Design Principle Statement

In view of the distinction between requirements and architecture discussed before, the statement expressing a requirement identifies *what* is wanted and needed and hence identifies *what* the system must manifest. The statement expressing an architecture principle identifies a rule, standard, or prescript for design and hence identifies design guidance. As stressed earlier, formulating requirements is relatively easy, but defining architecture is a totally different matter. As a manifestation of this difficulty, all too often, statements are presented as architecture principles that are in fact merely requirements. For example, statements like 'the car must be fuel efficient,' 'IT applications must work together,' or 'our financial information must be transparent' are, in our view, requirements and not architecture principles since they do not give useful design guidance. Various aspects play a role concerning the proper formulation of principles (Lindström 2006). We feel requirements and principles should be:

- Understandable for the designers who must deal with requirements and apply the principles. Specifically, architecture principles must be critically assessed for providing adequate design guidance.
- Unambiguous, excluding multiple or even erroneous interpretations.
- Mutually coherent and consistent.
- Applicable to one or more system design domains.
- Traceable to areas of concern deemed relevant for the system.

The process of defining requirements and architecture should ensure that these characteristics are satisfied. This will greatly enhance the acceptance of requirements, but more importantly, the acceptance of architecture.

Rationale: Linkage with Strategic Desirables

Basically, the rationale provides the answer to the question as to why the requirement or principle has been defined. Both requirements and architecture must be traceable to one or more (strategic) desirables or concerns which provide the rationale for the requirement and principle and explain why they contribute to the desired system behavior as expressed by the desirables and concerns. In this way, the rationale for requirements and architecture enables a clear linkage between the 'language' of design with the 'language' of strategic intentions and desirables. Put differently, the rationale for requirements and architecture provides the first formal foundation for the successful operationalization of strategic desirables and concerns.

Implications

The implications of requirements and architecture can be manifold. An obvious implication of an architecture principle is its restriction of design freedom. But, when publishing requirements and architecture, the notion of 'implications' is understood in a broader sense and aims to express the consequences of a requirement and design principle for the relevant system stakeholders. Through the inquisitive process, in which stakeholders participate, important implications are indicated.

Implications have a widely varying nature. For example, the introduction of technology standards has (life cycle) implications for the thereby created off-standard technology and the staff involved with using, operating, or maintaining the technology. Likewise, introducing architecture for secure network access has implications for employees, customers, business partners, and suppliers currently using noncompliant access methods.

Key Actions for Effectuating Requirements and Architecture

Unfortunately, various publications about requirements and architecture do not address this important aspect. Defining key actions is essential because:

- Requirements can most likely not be directly dealt with through design activities but need prior preparation or assessment activities in the form of feasibility studies or impact analyses.
- Not all architecture principles can be applied immediately but can only be used under certain conditions. The key actions ensure these conditions, such that the architecture principles can be followed.
- Key actions provide another formal linkage between strategic desirables and subsequent (design) activities.

Key actions come in various forms. First, key actions might be needed for addressing certain implications of a requirement or architecture principle. Second, key actions can establish conditions for architecture compliance. For example, a principle stating that 'data transmission over public lines must be encrypted' can only be followed if an encryption service is available. Investigating the encryption service is thus an important key action. Further, a key action may take the form of a pilot study to verify the feasibility of a requirement or an architecture principle.

It is important to note that key actions define the initial activity portfolio. Later activities follow from the design process itself. All these activities are developed and operationalized within the inquisitive, creative process of design (cf. Chap. 3). The discussion about and publication of requirements and architecture ensures they are coherent and consistent. Subsequently, that ensures the formal portfolio of activities is coherent and consistent. Unlike this perspective, some publications advance the idea of 'portfolio management' as a relatively autonomous activity for defining or selecting projects to be executed. Presumably, such 'management' of a project portfolio would safeguard the coherence and consistency of the portfolio and would ultimately lead to successfully operationalizing strategic desirables and areas of concern, as well as would lead to a unified and integrated system design. We fail to see how this notion of 'portfolio management' can be justified and have criticized the idea of project portfolio management in Sect. 3.2.10.

Chapter 3 outlined that enterprise change activities are incited by the enterprise governance competence with an essential role for the central governance function discussed in Sect. 3.2.9. Part of this role is ensuring the definition and publication of requirements and architecture. As such, this publication is an important aspect of enterprise governance. Some publication examples are given below.

Publication Examples

An example of a requirement publication is given in Fig. 4.14, while Fig. 4.15 presents an example of an architecture principle publication. Note how key actions define subsequent activities.

Requirement statement
Car mass must be lower than 1200 kg

Rationale
Fuel prices, hence car fuel consumption is of increasing concern. Moreover, also from environmental perspectives the public opinion becomes sensitive to fuel consumption issues. These issues have been identified as one of the core strategic attention areas.

Implications
Changes in car-body construction.
Introduction of new materials.

Key actions
Investigate consequences of car mass reduction.
Investigate areas where light-weight materials can be used.
Investigate impact on collision protection features.
Investigate engineering and production competences concerning light-weight materials.

Fig. 4.14 Example of a car constructional requirement publication

Principle statement
Two separate brake systems must operate on the rear wheels.

Rationale
Our car brand has always been known for its attention to safety. Recently, concern for safety has been identified as one of the core strategic attention areas. Moreover, our new engine types deliver more power (hence speed), thereby requiring additional breaking power.

Implications
The car weight will slightly increase.
Fuel consumption will slightly increase.

Key actions
Investigate consequences of the dual braking system for the hydraulic system and the rear wheels.
Investigate possibilities for compensating the weight and fuel consumption increase.
Reengineer the current hydraulic braking system.
Reengineer the construction of rear wheel brakes.

Fig. 4.15 Example of construction architecture publication

4.6 Generic System Development

4.6.1 Generic System Development Framework

The previously discussed topics and their logical relationships are depicted in the generic system development framework of Fig. 4.16. The starting point for system development is the system context, which we introduced in Sect. 4.5.1 as the contextual aspects and conditions for creating the system, such as defined by system's intended purpose(s), the intended customers and users of the system, and the stakeholders that might have a concern pertinent to system development. Also certain maxims might play a role based on, for example, societal, economical,

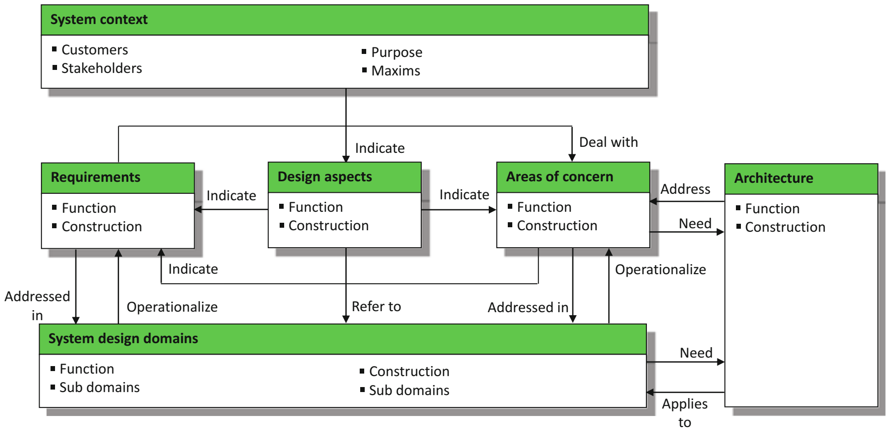


Fig. 4.16 Generic system development framework

environmental, technological, or political considerations. This context is the basis for defining the set of design aspects, which Sect. 4.5.1 defined as a comprehensive set of initial and preliminary attention areas for design. Hence, system contextual conditions indicate the initial topics that system design should address. The design aspects could be aspects of the system context, such as the use of certain modern technology, but also other aspects based on reasoning about the system context. Through the inquisitive process outlined in the previous chapter, the design aspects are identified.

Since design aspects are merely initial and preliminary attention areas for design, they must be formalized in (1) functional and constructional requirements and/or (2) areas of concern. Put differently, the design aspects form the basis for indicating requirements and areas of concern. For example, for the car as a system, a system context of rising fuel prices might indicate 'car weight' as a design aspect which subsequently indicates a constructional requirement about the car's mass and 'fuel efficiency' as an area of concern. Similarly, the 'Internet of things' as a system contextual aspect might indicate 'Internet usage' as a design aspect and might subsequently indicate 'Internet radio' as a functional requirement. Requirements and areas of concern are addressed in system design domains through system design. Conversely, through design pertinent to system design domains, requirements and areas of concern are operationalized as outlined when introducing the generic requirements and architecture framework of Fig. 4.11.

We outlined that architecture—the coherent and consistent set of principles that guide system design—holds for the system class (cf. Sect. 4.5.7). Hence, for a specific instance of a system, design is guided by (in principle) already defined architecture. Recall from our previous discussion that architecture addresses areas of concern and applies to certain system design domains, while conversely, system design domains and areas of concern need architecture as design guidance. Note that the generic system development framework incorporates the generic requirements and architecture framework.

When the system is an enterprise, we will use the framework introduced in this paragraph to structure the activities concerning enterprise design.

4.6.2 Generic System Development Process

The generic process of system design is depicted in Fig. 4.17 which is the slightly adapted version of the one presented by Dietz (2006). Conforming to the terminology used before, the system to be designed is denoted as the *provisioning system*, also identified as the *object system*: the object of design. This system has a functional relationship with certain aspects or elements of its environment which is the *using system* that requires the functional relationship with the provisioning system. Such a situation is often the case, as expressed by Fig. 4.7 in Sect. 4.3.4. For example, for the design of a car engine (provisioning system) the car is the using system. Likewise, an enterprise is the using system for an IT inventory planning system. When designing a car (provisioning system), we might consider the totality of arrangements for personalized road transport as the using system.

Recall that a function concerns a relationship of a subject or system with certain wants and needs on the one hand and a system with certain properties on the other hand. As we have done earlier, the notion of 'subject' is generalized into the notion of 'using system' which might be a human subject or an artifact. We reiterate that for properly defining the functional relationship, the wants and needs of the using system must be precisely known. This knowledge can only be obtained through insight in 'the makeup' of the using system. Stated otherwise, for properly designing the functional relationship with the provisioning system (black-box model), the

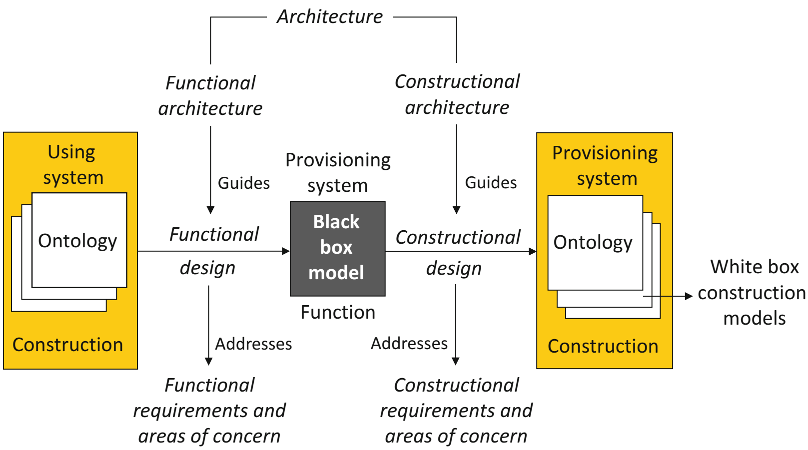


Fig. 4.17 Generic system development process

construction (white-box model) of the using system must be known. Indeed, it seems pointless to design a car engine without knowledge of the car's construction. Similarly, for properly defining functional relationships of an IT system, the construction of the using system—the organization of the enterprise—must be known. This insight refers to the fundamental functional design law discussed in Sect. 4.3.4 and, as mentioned before, points to the argument presented in Sect. 1.4.1 for establishing 'business and IT alignment.' In case the provisioning system is an enterprise, the environment with which the enterprise has functional relationships is the using system. In terms of this paragraph, for properly defining the functional relationships, the 'construction' of the environment must be known. Indeed, through investigations about customers, markets, economics, and so on, the characteristics of the environment's construction are established. In the generic system development framework, these characteristics are identified as the system context.

After the functional design of the provisioning system is completed, its constructional design can be accomplished. Both functional and constructional design are guided by their respective architecture while addressing the functional and constructional requirements and areas of concern. In view of the hierarchy in design domains mentioned earlier, a hierarchy of different construction models can be envisioned. Various constructional models detail the design such that it can be implemented. The 'highest' constructional model of the provisioning system shows the essence of the system, fully independent of the actual implementation. It is customary to call this implementation-independent model the 'ontological model' or essential model. When discussing enterprise design, examples of essential models will be given. Finally, Fig. 4.17 portrays the function and constructional design as sequential phases. Most likely, however, iterations will take place because constructional issues might affect functional design, and vice versa.

4.6.3 Prelude to Enterprise Design

The generic system development framework and the generic system development process contain the concepts that will be used in the case the system type of concern is an enterprise. Hence, the notions of enterprise strategic context, design aspects, areas of concern, enterprise design domains, functional and constructional decomposition, requirements, and architecture will be applied and illustrated in the case of enterprises. These notions will provide the crucial link between enterprise strategic desirables and their successful operationalization through enterprise design.

Based on the definitions given before, we can define enterprise design as:

- *Enterprise design* The intentional, creative, and nonalgorithmic courses of action aimed at creating an enterprise or parts thereof.

The result of designing is ‘an enterprise design’:

- *An enterprise design* The *conceptual* realization of an enterprise or parts thereof as reflected in or expressed by artifacts such as schematics, drawings, prescripts, (job) profiles, or other formal documents.

Recall from the previous chapter that a design enables the definition of a detailed scheme of activities (the plan) for building/implementing the design which is the *physical* realization of an enterprise or parts thereof. In terms of the generic system design process depicted in Figs. 4.7 and 4.17, a design is expressed through white-box construction models. Hence, the term ‘model’ is our generic way to identify an artifact expressing a facet of enterprise design.

We will start our discussion about enterprise design in the next section with so-called essential modeling, which aims to define an enterprise construction model fully independent of its possible implementation. This type of modeling falls well within the scope of the structural functionalist perspective on enterprises and thus entails the danger of the exclusive structural functionalist viewpoint on enterprises as mentioned in Sect. 4.2.2. Nonetheless, defining the essential models is crucial, for it enables a comprehensive perspective on the foundational ‘skeleton’ of an enterprise.

4.7 Essential Construction Models

4.7.1 What Is a Model?

Models are important constructs for many (scientific) practices. Indeed, “modeling is one of the most fundamental processes of the human mind” (Rothenberg 1989, p. 75). When drawing a map, we might say that a geographical situation is modeled. A map is thus a symbolic model of the objective geographical situation. In order to make a symbolic model, concepts designated by symbols are needed, in this case, concepts and their associated symbols like ‘street,’ ‘building,’ ‘river,’ and so on. As outlined in Chap. 2, when summarizing the philosophical foundation, concepts are needed to interpret, understand, articulate, and make sense of the world. This insight refers to the so-called ‘meaning triangle’ consisting of (1) ideas or concepts, (2) symbols, and (3) the object (Hoogervorst 2018). Ideas and concepts are needed for referring to an object in the world (say a geographical situation) and designating signs or symbols (such as for roads and rivers) of the symbolic model (map) whereby the symbolic model (map) denotes the object (geographical situation). Hence, the symbolic model indicates the object symbolically. As the example illustrates, modeling aids our ability to make sense of the world, to communicate, and to use language in the form of signs and symbols. Clearly, a model serves a purpose.

Various models can be identified, depending on the purpose. For example, a distinction is made between descriptive and prescriptive models (Rothenberg 1989). Descriptive models are used for describing or explaining the world, such as creating a geographical map. Prescriptive models present certain solutions to issues, like a democratic model as an arrangement to emulate. For our discussion, the notion of conceptual model is relevant which can be seen as a composition of concepts that shape and aid our thinking about certain topics. Many types of conceptual models can be envisioned. For example, a set of mathematical equations that express the behavior of a technical system or express economic developments serve as a conceptual model. Other models are symbolic models that denote an object. Also physical models play a role, such as scale models used for investigating the properties of a physical entity, like a building or airplane. The object to which a conceptual model refers or that a symbolic model denotes is identified as the 'referent' of the model (op. cit.).

In view of the system definitions given in Sect. 2.3.2, a system is a set of interrelated elements with a certain purpose. The notion of model thus closely associates with the system notion. Hence, one might speak about a conceptual system or a symbolic system. In Fig. 4.18, the concrete system 'flashlight' can be conceptualized through a conceptual system. Hence, the concepts of the conceptual system refer to the flashlight and enable to form a conceptual model. The same concepts designate the symbols for formulating the symbolic model of the flashlight: the drawings that represent or describe (certain aspects of) the flashlight. Conversely, the symbolic model aids in interpreting the concepts of the conceptual model and denotes or symbolizes the flashlight.

The issue of what a model *is* stirs considerable debate. The idea that a model represents or imitates what is modeled (the referent) in an analogous way is often mentioned, but this idea runs into the same problems as the referential and propositional theory of meaning (op. cit.): analogy is a problematic concept. Various authors have proposed a pragmatic idea about what a model and modeling is. For

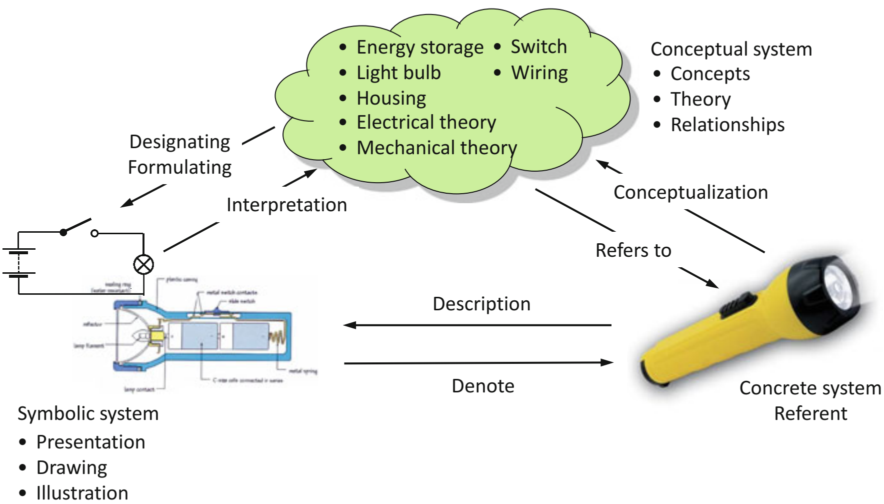


Fig. 4.18 Illustration of the notion of 'model'

example, “modeling in its broadest sense is the cost-effective use of something in place of something else for some cognitive purpose” (Rothenberg 1989, p. 75). To model is “to represent a particular referent cost-effectively for a particular cognitive purpose” (op. cit., p. 78). Using the system terminology, a system *M* is considered a model of a system *S* when *M* is used to obtain information and knowledge about *S* and to reason about *S* (Apostel 1960). Put differently, *M* is used to understand *S* or aspects of *S*. In this sense, the morphogenic enterprise conceptual system model is a model of an enterprise. The pragmatic view on what a model is does not require that the model *M* corresponds to or represents *S* in all possible aspects. “Since a model cannot be identical to its referent, it is always an *abstraction* of its referent in the sense that it can never be completely faithful to it” (Rothenberg 1989, p. 80). Often, the complexity of *S* is such that a specific model only addresses certain aspects. Multiple models might thus be used for modeling the various aspects of *S*. We will see that this is inevitably the situation with enterprises.

The mentioned inherent limitations of a model point to the crucial issue of understanding the purpose of modeling and the usage of a certain type of model. Since, as said, no model can adequately represent all aspects of the referent that is modeled (e.g., an enterprise), the intended purpose and limitations of a model must be clearly identified in order to avoid the danger of using a model for purposes for which it is highly inappropriate. Rightly, “the use of inappropriate models (or the inappropriate use of modeling itself) is responsible for countless disasters of personal, technological, and historical proportions” (op. cit., p. 75). The use of inappropriate mathematical models for decision-making is a case in point. Also, modeling an enterprise based on mechanistic concepts is oftentimes inappropriate.

4.7.2 Introducing the Notion of Essential Model

Think of an electrical installation in a building whereby a switch at the entrance of a hallway (or staircase) can switch on a light and which can be switched off at the end of the hallway (or staircase), and vice versa. The essence of this electrical installation is shown on Fig. 4.19. In terms of the previous paragraph, Fig. 4.19 presents the essential symbolic model, in short, the essential model of the electrical installation (the referent). Four concepts define the conceptual model: wire, switch, light, and electrical energy source. Note that the essential model enables reasoning and understanding about the essential properties of the electrical circuit.

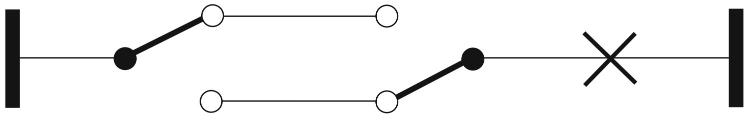


Fig. 4.19 Essential model of a hallway electrical installation

An interesting feature of the essential model is that it is completely independent of any actual implementation. This model holds for any hallway or staircase of whatever shape or form. Precisely this feature makes essential modeling important. Obviously, the essential model cannot be used for actually implementing an electrical system, since the essential model contains no information relevant for implementation. Subsequent design is thus necessary.

Taking the generic system development framework of Fig. 4.16 as a reference for designing this relatively simple electrical system, the starting point is the system context. For this system, the context refers to, for example, the type of users, the ambient conditions wherein the system has to operate, such as normal or humid conditions, or conditions where electrical sparks can lead to explosions. This context indicates design aspects, the set of initial and preliminary attention areas for design which are formulated based on the system context. We can think of design aspects like the light intensity, the sort of light, the type and location of switches (or more functionally formulated, the type of on/off devices), etc. These design aspects are translated into functional and constructional requirements and areas of concern. Likely concerns are safety and usability. Table 4.6 gives some examples of requirements.

Table 4.6 Electrical system requirements

Functional requirements	Constructional requirements
Light intensity 1500 Lumen	Built-in switches
Tumble switches	Wire conduits out of view
Indicator lights in switches	Only vertical wire conduits in walls

The areas of concern are addressed by architecture: design principles for electrical systems in buildings. In most cases, these design principles are defined by governmental authorities and cover functional and constructional aspects. For example, functional architecture concerns the number of electrical outlets that have to be installed. Constructional architecture specifies the spacing of conduit fasteners, the allowed number of wires per conduit, the cross section or wires, or the type of switches and lamp holders in view of the ambient conditions. These principles demonstrate that architecture applies to a class of systems, in this case the class of electrical systems in buildings. Finally, the functional design domains involved are lights and on/off devices, while the constructional design domains are wiring, switches, conduits, lamp holders, etc.

In terms of the generic system development process of Fig. 4.17, the electrical system is the provisioning system, and the building or house and the people in it are the using system. In order to define the functional relationships of the provisioning system with the using system, the construction of the using system must be known. This construction is expressed by the characteristics of the system context, as mentioned above. The essential model of Fig. 4.19 is the first (the 'highest') of the construction models in Fig. 4.17. Subsequent design, guided by architecture and addressing requirements will yield construction models that can be used for planning

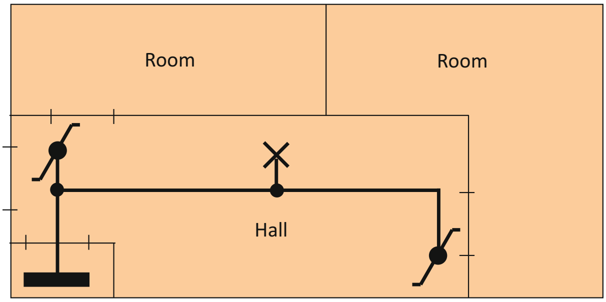


Fig. 4.20 Construction model that can be implemented

a project that actually implements (builds) the electrical system (cf. Chap. 3). Figure 4.20 gives an example of such a construction model.

As the example of the electrical system illustrates, after defining the system context (the construction of the using system), the system design aspects (the set of initial and preliminary attention areas for design), the functional and constructional requirements, and the functional and constructional architecture, the first construction model to be developed is the essential model which is the basis for developing construction models that can be implemented. Then and only then when it is precisely known through these latter models *how* the electrical system must be built, the building activities can be planned and a project can be defined to carry out the building activities. Exactly the same perspective holds in the case of enterprises. We will therefore start by introducing essential modeling in case of enterprises.

4.8 Enterprise Essential Modeling

4.8.1 The Theory

The Purpose of a Model

The introductory chapter defined enterprises as purposeful social entities designed as deliberately organized activity systems. As we have amply discussed, the structural functionalist perspective is rather dominant in thinking about enterprises and hence likewise dominant in enterprise modeling. We might thus observe the tendency in enterprise modeling to address the aspects mentioned in the lower-left quadrant of Table 4.1. Yet, as the other aspects of Table 4.1 and those of Table 4.2 indicate, the key design aspects extend well beyond the narrow interpretation of structural functionalism. Regarding the previous discussion about modeling and models, we must be critically aware about inherent limitations of a model and understand the purpose of modeling and the type of model used. This awareness is certainly relevant for enterprise essential modeling. Since such a model cannot adequately represent all aspects of an enterprise, such as the other design aspects mentioned in Tables 4.1 and

4.2, the intended purpose and limitations of essential models must be clearly identified in order to avoid the danger of using a model for purposes for which it is highly inappropriate. As indicated earlier, the danger of exclusively modeling an enterprise based on mechanistic concepts is not imaginary. Nonetheless, for reasons further outlined below, devising enterprise essential models is important in light of expressing the basic 'skeleton' of enterprise operational activities. In discussing these models, we will discuss to what extent essential models can address other organizational issues beyond the narrow structural functionalist perspective.

Communication for Action: Transactions

Based on the view that enterprises are goal-directed social entities designed as deliberately structured and coordinated activity systems, certain interaction patterns necessarily exist between human actors for realizing the enterprise purpose and for affording the functional relationships. So, in line with the social perspective on enterprises summarized in Chap. 2, enterprise performance is ultimately the result of social interaction between human actors. This is the core conviction of the PSI-theory: performance through social interaction (Dietz 2006). The basic premise of this theory is that interaction between human actors takes place through communication. Unlike the basic tenet of Shannon's information theory whereby communication is viewed as the transmission of information, within enterprises, communication is understood as coordination of human actions (Espejo and Reyes 2011). In line with an objectivist and positivist flavor, communication between human actors is structured or categorized according to some taxonomy. Hence, communication is viewed as a pattern of *communicative acts* or *speech acts*. Section 2.2.9 mentioned some speech act categorizations which are more extensively discussed in (Hoogervorst 2018). With essential enterprise modeling, the speech act categorization given by Habermas is used, specifically the categories 'constatives,' 'regulatives,' and 'expressives.' Thus, organizational cooperation between human actors takes place through communication that is conceived in certain patterns, identified as speech acts. These notions form the basis for the so-called speech/act theory, or the language/action perspective on the design of cooperative work (Winograd and Flores 1987). Language is seen "as the primary dimension of human cooperative activity" (Winograd 1988). Within this perspective, the focus is on communicative patterns that constitute the mutual coordination since people act through language. Under the 'conversations for action' label, four basic conversational activities are defined that relate to coordination (Winograd 1988): (1) actor A makes a *request* to actor B, (2) actor B *accepts* the request, (3) actor B *reports* that the request is fulfilled, and finally (4) actor A *declares* that the fulfillment is satisfactory. Dietz (2006) considers the same basic pattern with slightly different labels: (1) the actor called the *initiator* makes a *request* to an actor labeled as *executor*; (2) the executor *promises* to fulfill or honor the request and *produce* the requested result; (3) after having produced the requested result, the executor *states* that the result is produced; and finally (4) the initiator *accepts* the result. The pattern just described is called a *transaction* of which the basic form is graphically portrayed in Fig. 4.21.

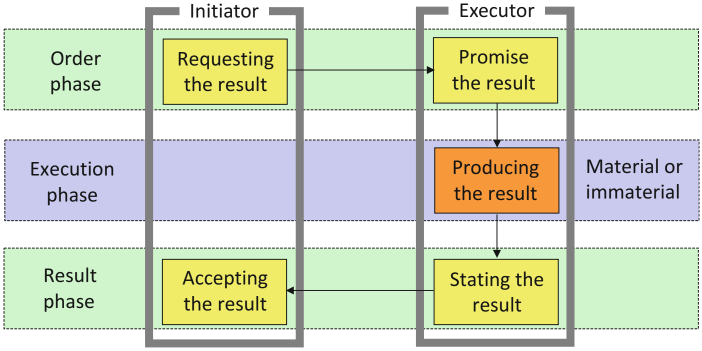


Fig. 4.21 Basic transaction pattern

Basic Transaction Pattern

The basic transaction pattern is manifest in numerous cases. For example, a customer (initiator) requesting a hamburger in a restaurant will be promised by the waiter or sales person (executor) who will ensure that the requested meal is produced and will state, either explicitly or implicitly, that the hamburger has been produced after which the customer accepts the result. In this case, a material result is produced. Production activities can yield a material or immaterial result. Material production has to do with manufacturing, storage, or the transport of goods for example. Immaterial production concerns decision-making, granting something, sentencing a person by a judge, appointing a person to a function, and so on. As Fig. 4.21 illustrates, a transaction comprises three phases: the order phase, execution or production phase, and result phase (Dietz 2006).

Note that the four communicative acts of the basic transaction pattern—request, promise, state, and accept—are part of Habermas' speech act categorization (Hoogervorst 2018). With these speech acts are so-called validity claims associated that relate to the objective, social, and subjective world (cf. Sect. 2.2.9). A request and a promise are regulatives that refer to the social world and concern the rightness of requesting or promising something. It is about the appropriateness of an initiator to request and the executor to promise an action. An actor not authorized for these speech acts in certain cases thus violates the rightness validity claim. Stating that a requested result is produced concerns a constative speech act: it is about the truth of something in the objective world. Finally, accepting a stated result expresses a subjective condition and concerns the truthfulness of the personal attitude expressed. The request and promise speech acts express *commitments* between the initiator and the executor: delivering the requested result and accepting it. One might say that ultimately enterprise activities concern the fulfillment of commitments. The enterprise is then seen as a "network of commitments" (Winograd and Flores 1987, p. 150).

The basic transaction pattern indicates that individuals within enterprises fulfill actor roles, whereby two types of activities are performed: (1) production activities in the execution phase and (2) coordination activities that are structured by speech acts in the order and result phase. Coordination activities concern the communicative actions mentioned above pertinent to entering into commitments about production activities. Coordination activities are therefore always associated with production activities. Communicative actions can be explicit or implicit. For example, the delivery of ordered goods can be seen as the implicit statement about their production. The coordination and production activities are the basic elements of a transaction.

The Symbolic Model

The conceptual model for the basic transaction consists of the concepts discussed previously: actors, speech acts or coordination acts, production acts and order, execution, and result phases. The pattern depicted in Fig. 4.21 is a symbolic model of the basic transaction pattern. A more concise way of modeling is suggested (Dietz 2006). As the pattern of Fig. 4.21 indicates, four speech acts or *coordination acts* play a role. These acts are identified by a white box. Performing a speech act, hence carrying out a coordination act, leads to a *coordination fact*: the objective state that a specific type of speech act or coordination act has taken place. These coordination facts are identified by a white circle. The white box with a circle enclosed symbolizes that a coordination act always leads to a coordination fact. Similar considerations hold for production acts, symbolized by a gray box. A production act subsequently entails a *production fact*, indicated by a gray diamond. Using these symbols, the pattern of Fig. 4.21 can be concisely depicted as Fig. 4.22 shows.

Actor X is the initiator of transaction T01, and actor Y is the executor or producer. The actor role is identified with a rectangle having the name of the actor role. An actor role either performs only coordination activities (the initiator) or also production activities (the executor). Actors constitute coordination facts and production facts. Associated with an actor role is the *authority* to perform the related activities. Rather than referring to an actor, the notion of actor role conveys the message that one actor might perform more than one actor role or that an actor role is performed collectively by more than one person. Coordination activities have to do with the *responsibility* an actor role has. Carrying out production activities presumes the *competence* of the actor to carry out the activities adequately and to realize the production fact.

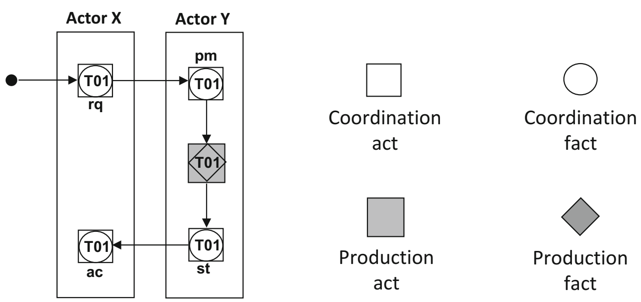


Fig. 4.22 Basic transaction pattern

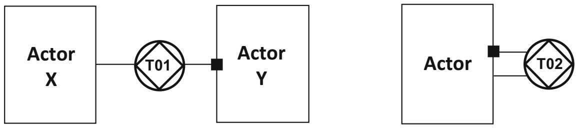


Fig. 4.23 Concise notation of a transaction

The symbolic model of a transaction can be compressed even further. The left-hand side of Fig. 4.23 gives the concise notation for the transaction pattern (Dietz 2006). In accordance with the notation convention mentioned earlier, the circle indicates the coordination facts of the transaction and the diamond the production facts. Actor (role) X initiates the transaction. The little black square indicates the actor (role) performing the production activities.

A special case of a transaction pattern is the situation where actor (role) X and actor (role) Y are the same. In that case, one refers to self-activation, whereby an actor role carries out production activities autonomously. Such self-activation might occur for example if an actor role handles periodic activities, such as maintaining an adequate stock level of material supplies. The self-activating transaction notation is shown on the right-hand side of Fig. 4.23.

Deviations from the Basic Transaction Pattern

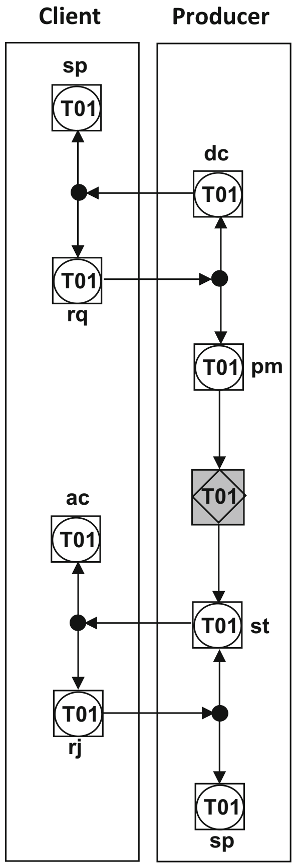
The transaction pattern depicted above presumes the normal execution of a transaction. However, a request can be denied or the product can be refused. Including these options makes the pattern more extensive, but the basic notion remains the same, as Fig. 4.24 shows, which can be explained as follows. The producing actor receiving the request from the client can (ultimately) either accept the request by promising (pm) the requested production or decline (dc) to produce what is requested. For example, car rental might be declined for not presenting a valid driver's license. The considerations pertinent to these two options are symbolized by the black dot. Now, the client who made the initial request can refrain from further action and stop (sp), or maintain the request. Ultimately, either the promise (pm) or stop (sp) state will end the order phase.

A mirrored situation occurs when the production fact is stated (st) by the producer. Then, the client might accept (ac) or reject (rj) the result produced. In the latter case, the producer might agree with the rejection and stop (sp), or try to gain acceptance. Within our car rental example, rejection of the result produced might be caused by the car's untidiness. In the end, the result phase ends with either the acceptance or the stop state.

Finally, cancellation patterns must be mentioned, since all coordination actions can be revoked. Also these patterns can be modeled formally (Dietz 2006).

Figure 4.25 shows the complete transaction pattern, including the cancellations. The client who made the initial request might afterwards regret the request and cancel it (cl/rq). Since the request must have occurred, the dotted arrow indicates the conditional link, as well as indicates some elapsed time between the request and the cancellation. If the producer allows the cancellation, the client stops (sp) further action pertinent to this transaction. Subsequently, another transaction could be

Fig. 4.24 Transaction pattern with decline and reject actions



initiated. However, the producer might refuse the cancellation, for example, because production has already begun. Formally then, the request state remains in force.

A comparable pattern follows when the producer cancels the promise (cl/pm), such as due to an out-of-stock situation discovered later. If the client agrees, then the situation becomes similar to the decline state (dc) discussed earlier (cf. Fig. 4.24). Since the client allows the promised cancellation, this would logically lead to the stopping of further action (sp) regarding this transaction. The client might initiate another transaction subsequently. Refusing the cancellation by the client implies that the promise state remains the case, with which the producer has to comply.

If the producer cancels the production statement (cl/st) in view of perceived inadequacies, the client is likely to allow the cancellation, in which case a new production activity is initiated. Should the client be willing to accept the product, the cancellation is refused and evidently followed by the formal acceptance action.

Finally, after the transaction has been completed, the client might feel unhappy about the product and regret its acceptance. This might lead to cancelling the acceptance act (cl/ac). When the producer allows the cancellation, the situation

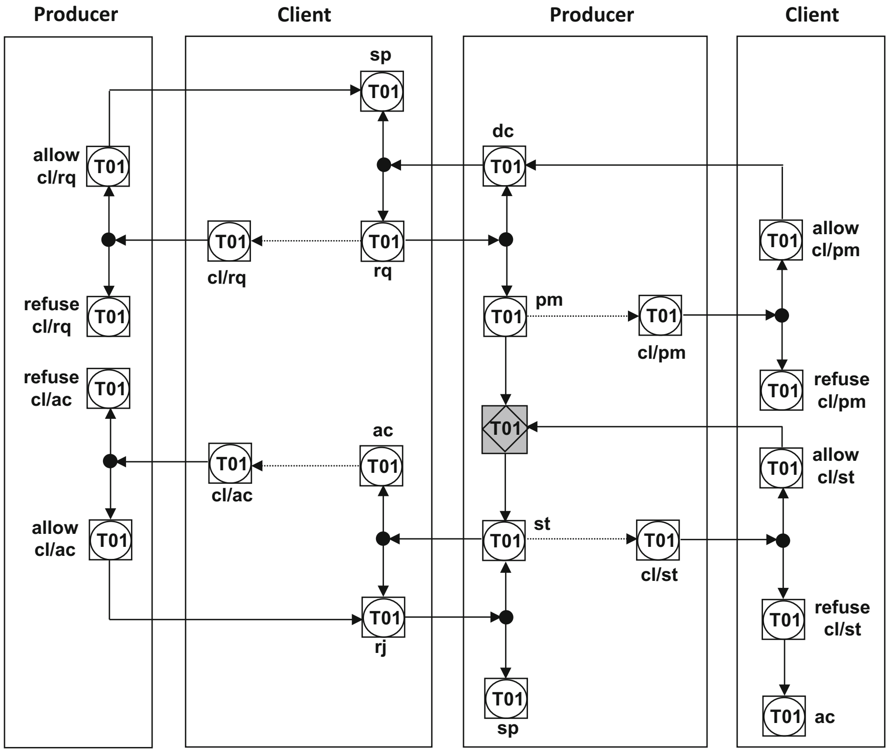


Fig. 4.25 Transaction pattern including cancellations

becomes analogous to the reject state (rj) discussed above (cf. Fig. 4.24). This would then lead logically to stopping (sp) further action by the producer. Should the producer refuse the cancellation, the accepted condition remains the case.

Enterprise State, Event, and Transition

A large number of transactions play a role within an enterprise, such as purchasing, payment, the physical or legal transfer of goods, decision-making, authorizing, and so on. For all transactions, the four coordination activities (including possible deviations from the normal pattern) and the production activity play a role. Hence, the totality of transactions creates *coordination facts* and *production facts*. In view of our later discussions, we introduce the following concepts:

- *Enterprise state* The totality of coordination and production facts at (or created up to) a certain moment in time.
- *State space* The totality of lawful states the enterprise can be in.
- *Transition* A change in the enterprise state caused by a new coordination or production fact.
- *Event* The occurrence of a transition at a certain moment in time.
- *Act* The creation of a coordination or production fact, hence the causing of an event and transition.

It is important, for example for satisfying a corporate governance transparency requirement, that coordination facts and production facts become explicit and cannot be annihilated. Revoking a coordination activity does not mean that the coordination fact associated with coordination activities never existed. It means that a new coordination fact is created that cancels out the effect of the previous one. Although created facts come into being 'forever'—because they *have* occurred—in practice enterprises keep track of facts only for a limited period, such as defined by legal requirements. Clearly, such a formal approach to coordination and production facts provides a valuable guarantee that, for example, financial transactions are transparent and reflect the actual state of affairs.

Essential Partitioning: Fundamental Transaction Types

Activities in enterprises can be categorized into three fundamental transaction types (Dietz 2006). First, there are coordination and production activities that concern the realization of new, original material or immaterial production facts, such as related to producing a car or passing a sentence. Such transactions and the associated activities relate to the primary function of an enterprise: its business. Put another way, these transactions have to do with the very essence of the enterprise: its 'being.' For that reason, one refers to these transactions as 'original' or 'ontological' transactions. An important second type, subordinated to the first one, is that of activities concerning collecting and providing information for carrying out the coordination and production activities of the ontological transactions. Hence, one refers to the 'infological' transactions, dealing with addressing and handling the content of information. Finally, the third type of transactions refers to activities that support the infological transactions and concern the form of information (data). These so-called 'datalogical' (or documental) transactions have to do with the transmission, transformation, or storage of data, for example (not necessarily electronically). Table 4.7 summarizes activities associated with the three transaction types.

The three activity categories are also identified as 'aspect organizations': O-organization, I-organization, and D-organization (Dietz 2006). An enterprise is then considered the collective of these organizations. This suggests that such 'organizations' can be readily identified in enterprises. That is not always easy. The distinction between I and D activities is sometimes problematic. Noticeably, the use of information technology has blurred the distinction in practical contexts.

Table 4.7 Activities associated with the three transaction types

Ontological	Infological	Datalogical
Creating novel, new facts Making, producing Deciding	Remembering facts Recalling facts Calculating Recording facts Interpreting, verifying Creating documents	Transporting documents Storing documents Copying documents Retrieving documents Destroying documents

The Three Basic Activity Types in Perspective

As we have seen, transactions are about the realization of a requested result. It is plausible that a result can be requested through each of the three basic transaction types. So in order to realize the requested production at the ontological level, some informational product might be requested (infological transaction) which in turn might be requested to have a certain form (datalogical transaction). A simple example may illustrate the formal distinction between the three transaction types and their respective production facts. Suppose a real estate agency receives a request to assess the economic value of a house. Producing this economic value creates an ontological production fact. For carrying out the value assessment, various information must be gathered, such as recent sales prices in the local area. Formally, we might envision the actor role engaged in value assessment requesting the desired information. Its production creates an infological production fact. Finally, it might be requested that the information or the final value assessment is presented in a formal document. Such a document is the production fact of a datalogical transaction.

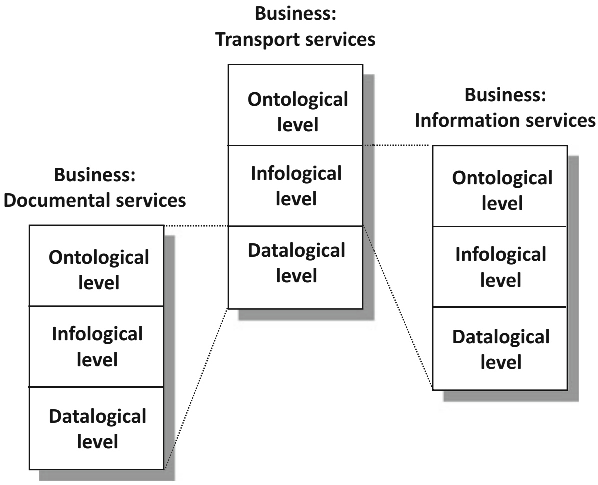
Notably, in this example three activities types were sketched, performed by three actor roles carrying out ontological, infological, and datalogical transactions respectively. As mentioned previously, these different actor roles do not necessarily imply different human actors. Different actor roles might be performed by one human actor. However, it is important to distinguish the various actor roles, for example, in view of the overall organizational efficiency and effectiveness and the associated competences, authorizations, and responsibilities.

To complicate matters somewhat, infological and datalogical transactions might themselves subsequently involve infological and datalogical aspects. In the example given, this might be information concerning the gathering of local sales data or information for producing the assessment document. The form in which this information is presented implies subsequent datalogical aspects.

Within the enterprise ontological perspective, the three fundamental transaction types are defined with reference to the business (the function) of the enterprise. One might question whether these fundamental transaction types are manifest in every enterprise. What if providing information or making documents *is* the very business of an enterprise? Since the ontological level addresses the very essence of an enterprise, the provisioning of information (e.g., a requested telephone number or weather information), or the production of an information 'carrier' (booklet, brochure, CD, etc.), must be considered as ontological production facts: these are the services and products the particular enterprise produces. The infological level aspects in this case concern information for producing the requested information or information 'carrier.' Understandably, this holds similarly for datalogical transactions. So all three fundamental transaction types are manifest in every enterprise or units thereof whereby their precise meaning is contingent upon the (ontological) nature of the enterprise.

Figure 4.26 presents the observations given above. The enterprise in the center needs infological services that are provided by another enterprise (or unit within the first enterprise). As shown, for providing these services, the enterprise or enterprise unit involved has its own three-tier structure: it is in the business of providing

Fig. 4.26 Three activity types in perspective



information services. Similarly, for the enterprise providing the datalogical services—seen from the viewpoint of the center enterprise—the provisioning of these services (say printing services) is the very business. Again, the enterprise in the business of documental services also has its three-tier activity structure and associated transaction.

Basic Axioms

In Sect. 1.1.1, enterprises are identified as intentionally created (designed) social entities directed towards a certain goal or purpose. Put another way, enterprises are directed towards enabling certain functional relationships that aim to address certain wants and needs of societal members or society at large. Inherently associated with the goal or purpose orientation is the fact that enterprises are driven by "rationality endeavor" (Lammers 1987, p. 25). Enterprises thus strive for rational behavior in view of realizing the goal or purpose. Rationality endeavor implies that increased organizational complexity will be mastered through functional specialization: a person or group of persons carry out specific tasks or task complexes. Evidently, *functionalization* necessitates *coordination*, since the various functional specializations must synchronize and harmonize their activities mutually in view of the enterprise goal. This refers to the interaction patterns between actors within an enterprise. Three characteristics are therefore inherent in enterprises (Lammers 1987, p. 27):

• *Functionalization or differentiation*	Creation of specific tasks or task complexes.
• *Coordination or integration*	Realization of unity in task execution.
• *Rational finalization*	Ensuring that the totality of interaction patterns is directed towards the ultimate goal or purpose.

As we have seen, the rationality endeavor has led to essentially different organizational arrangements, based on different organization theories. Recall that comparable distinctions as the ones presented above have been provided by the theory of structural functionalism referring to social institutions within society (cf. Sect. 2.3.2). In society, there is functional *differentiation* (division of labor) which refers to the different functions of social institutions and functional *integration* which express the condition whereby the different functions work harmoniously together for society as a whole (cf. Sect. 2.3.5). The contingency theory summarized in Sect. 2.3.13 likewise presents the same distinction.

The transaction pattern discussed above distinguishes between two types of activities: coordination activities and production activities. Arguably, the notion of functionalization or differentiation refers to production activities, because the different 'functional entities' within an enterprise provide or enable the different functions. Seen from the perspective of essential modeling, functionalization or differentiation refers to *production acts*, while coordination or integration refers to *coordination acts*. These considerations are expressed by the following axioms (Dietz 2006):

- *Operation axiom* The enterprise operation is defined by coordination and production acts.
- *Transaction axiom* Coordination and production acts are performed in universal patterns called transactions.

4.8.2 Interaction Model

Ontological Transactions

As the name indicates, the theory and methodology of enterprise essential modeling focuses on the essence of an enterprise, fully independent of its actual or possible implementation. The first step of the methodology is focusing initially on the ontological transactions of the enterprise. Understandably, this will reduce the modeling complexity greatly. Hence, the difficulty of comprehending enterprises is initially reduced by focusing on the structural functionalistic 'skeleton' of the ontological transactions only. The models to be devised are based on the DEMO[2] methodology (Dietz 2006). Several enterprise essential aspect models are defined within this methodology as shown in Fig. 4.27 and discussed briefly below, starting with the interaction model.

The interaction model specifies the ontological transactions (without the details of the transaction pattern) and the associated actor roles. In light of the transaction pattern described earlier, executing a transaction implies carrying out coordination and production activities. Within the interaction model, the result of every

[2]Design and Engineering Methodology for Organizations

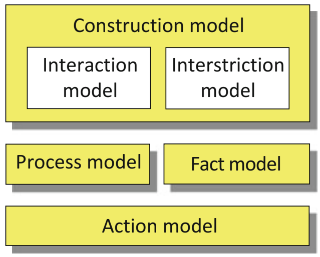


Fig. 4.27 Enterprise aspect models

transaction is specified precisely. Put another way, the production fact created is precisely specified and summarized in a transaction-result table. The precise information pertinent to production facts is thus likewise defined. This is important in view of establishing alignment with information systems, as well as for defining the fact model discussed below.

As an illustration, Fig. 4.28 shows the interaction model of an enterprise, or part thereof, called 'Firm.' Three transactions play a role. In accordance with the notation mentioned earlier, the circle indicates the coordination facts and activities of the transaction, and the diamond the production facts and activities. The external actor 'client' initiates transaction T01 for obtaining something (e.g., placing an order in a restaurant or requesting a house value assessment), which is handled by an actor labeled as the 'order handler' (e.g., the restaurant waiter or the secretarial/administrative function of the real estate agency). Subsequently, transaction T03 is required to fulfill the order, hence actually producing what was ordered. This production is done by an actor labeled as 'producer' (e.g., the restaurant's chef or the value assessor). Finally, transaction T02 concerns payment. The actor roles 'order handler' and 'producer' are called *elementary actor* roles, since they execute one transaction type. Put another way, an elementary actor produces one production fact. When more transactions are executed, the actor role is identified as a *composite actor* role symbolized by a gray box. Because we generally have no information about the nature of external actors, they are symbolized as composite actors.

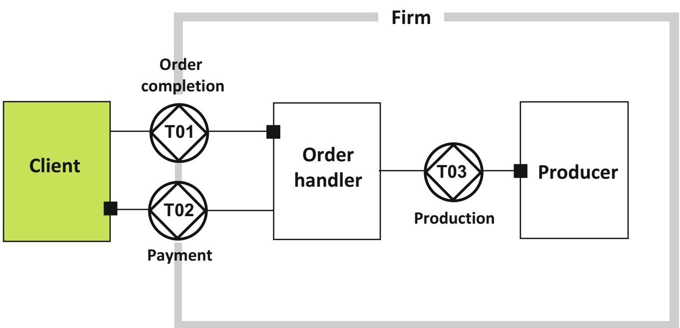


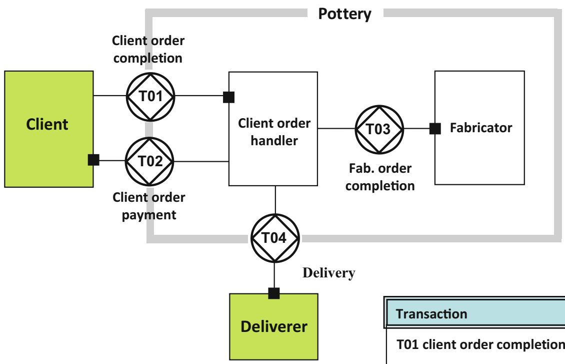
Fig. 4.28 Interaction model Firm (1)

Notably, the diagram of Fig. 4.28 applies to many situations. The ontological nature of the diagram can be appreciated since the transactions that take place at the essential enterprise level are totally abstracted from possible implementations. Unlike the impression given above, the aspect of time or the sequence of transactions is also not an issue in the model of Fig. 4.28. So the execution of T03 could succeed T02 (payment first), but the reverse is also possible (payment after order completion). In all cases, the interaction model remains the same. Differences are manifest in the process model discussed below.

Possible extensions—additional transactions—can be included relatively easily. Consider a firm making pottery based on a client order. Goods are made to order, so the client order (*CO*) leads to a fabrication order (*FO*) issued by the client order handler (Fig. 4.29). Hence, this actor initiates transaction T03 to the actor labeled 'fabricator' for producing the requested pottery. As a service to clients, the Pottery might decide to deliver the client's order to the client's address through a delivery service. Hence, an extra transaction is created between the order handler and a new actor, the deliverer (T04). If delivery is done by internal staff, the associated actor role resides within the Pottery. When delivery is outsourced, the transaction takes place through an external actor role. The latter situation is depicted in Fig. 4.29.

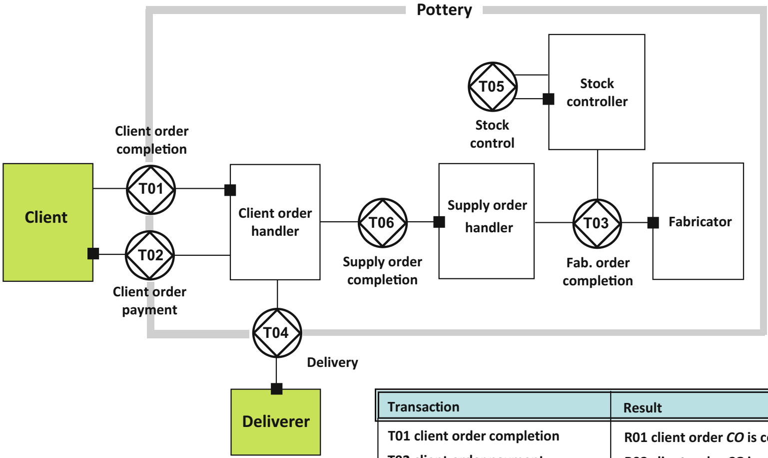
The results of all transactions are summarized in the transaction-result table, which is also shown in Fig. 4.29. As indicated previously, the interaction model does not specify the order of transactions totally. Payment (T02) could take place prior to fabrication (T03) or after delivery (T04).

As a further illustration how this way of essential enterprise modeling allows the incorporation of additional transactions relatively easily, consider the interaction model of Fig. 4.30. In order to enhance client satisfaction, Pottery decides to maintain a certain stock level of frequently ordered items. A client order (*CO*) is now followed up by a supply order (*SO*) through transaction T06 that can be completed by direct provisioning from existing stock or could lead to a fabrication



Transaction	Result
T01 client order completion	R01 client order *CO* is completed
T02 client order payment	R02 client order *CO* is paid
T03 fabrication order completion	R03 fabrication order *FO* is completed
T04 client order delivery	R04 client order *CO* is delivered

Fig. 4.29 Interaction model (Pottery 1) and the transaction-result table



Transaction	Result
T01 client order completion	R01 client order *CO* is completed
T02 client order payment	R02 client order *CO* is paid
T03 fabrication order completion	R03 fabrication order *FO* is completed
T04 client order delivery	R04 client order *CO* is delivered
T05 stock control	R05 stock control for period *T* is done
T06 supply order completion	R06 supply order *SO* is completed

Fig. 4.30 Interaction model (Pottery 2) and transaction-result table

order (*FO*) in the case of an out-of-stock condition (T03). Periodically (with period *T*), the actor responsible for maintaining the required stock level also issues fabrication orders to the fabricator. Note that transaction T05 is self-activating by the stock controller. This new interaction model will be explained further when discussing the associated process model.

Infological and Datalogical Transactions

In the previous paragraph, we spoke about *infological* and *datalogical* transactions. These transactions are not generally part of the interaction model since they do not concern the essence of the enterprise operation (ontological level). If so desired, such transactions can be included easily but must be distinguished clearly from the ontological transactions. The following example serves as an illustration. Referring to our example in the previous paragraph about the request for assessing the economic value of a house, the 'Firm' in Fig. 4.28 can be seen as the real estate agency with the order handler as the secretarial/administrative function and the producer as the assessor: the actor role doing the actual assessment. So, the infological transaction mentioned in the example can be modeled between the assessor and the external actor role providing the cadastral information. Similarly, the datalogical transaction can be modeled between the secretarial/administrative actor role and the external actor role providing the required documental form.

Figure 4.31 shows the two extra transactions. These transactions must be distinguished clearly from the ontological transactions T01, T02, and T03. A practical approach is to use different colors for the different transaction types, whereby ontological, infological, and datalogical transactions are, respectively, modeled as

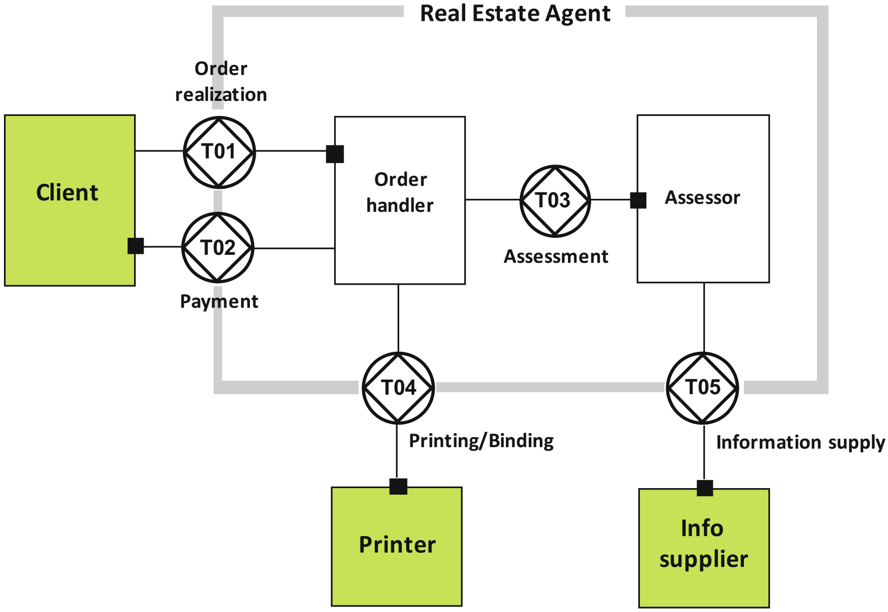


Fig. 4.31 Infological (T04) and datalogical (T05) transactions

red, green, and blue transactions (Dietz 2006). Arguably, in the example given above, the infological (T04) and datalogical (T05) transactions indeed do not add vital information regarding understanding the essential operation of the real estate agency. Traditional flowchart models of enterprise processes, however, often include infological and datalogical process steps, thereby diffusing the perspective on essential enterprise activities.

4.8.3 Interstriction Model

Transactional relationships between actors are about coordination and production activities and their associated information. When focusing on information specifically, the interaction models described earlier can be interpreted as a model showing the information links, whereby the circle of the transaction symbol signifies coordination information and the diamond the production information. Further, links to external information sources can be added to the interaction model. In the example of the real estate agency, an external information source might be about housing data. When adding these data links, the interaction model (with the transaction symbol interpreted as coordination and production information links) becomes the so-called *interstriction model* (Dietz 2006). The term 'interstriction' is coined since the information links restrict the nature of the interaction to the information

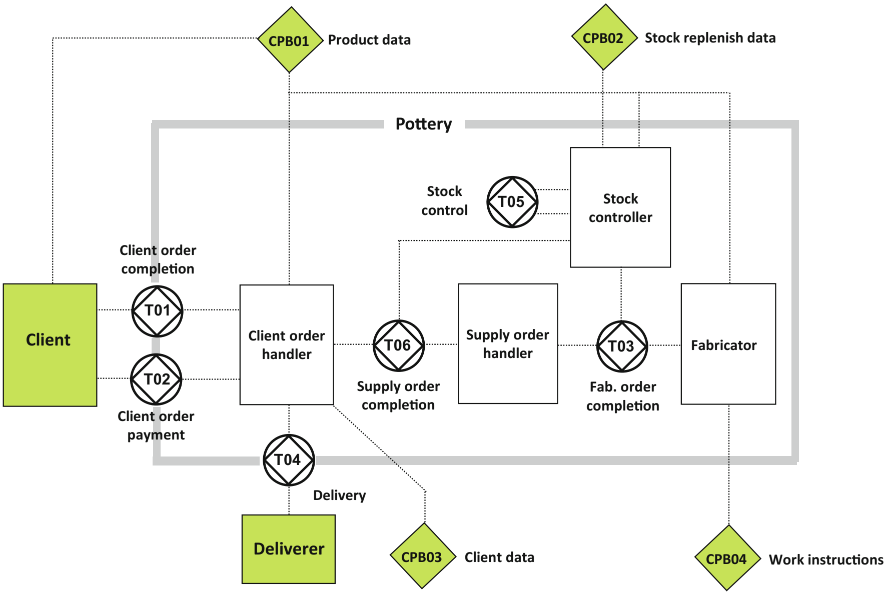
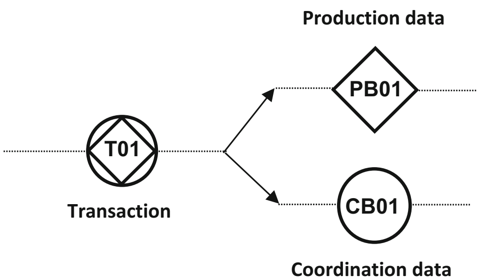


Fig. 4.32 Interstriction model of Pottery (2)

exchanged. Whereas the interaction model shows active relationships between actors, the interstriction model shows the passive information links between actors and between actors and external information sources. As an illustration, Fig. 4.32 shows the interstiction model of the Pottery of Fig. 4.30.

The dotted lines in Fig. 4.32 show the information links. Data associated with the transactions are contained in *coordination banks* (circle) and *production banks* (diamond), respectively. Within the interstriction model, the transaction symbol is interpreted as the combination of the coordination and production bank associated with a certain transaction. So, for transaction T01, the coordination information—the communicative facts request, promise, state, and accept (and possible deviations from the normal pattern)—are contained in the coordination bank CB01, like 'client order *CO* is requested,' etc. Likewise, the production fact (the result) is stored in the production bank PB01 (cf. Fig. 4.33). These production data are mentioned in the transaction-result table shown in Fig. 4.30.

Fig. 4.33 Coordination and production banks



Data used in executing the transactions comes from sources external to the part of Pottery under consideration. That is, the transactions T01 through T06 do not produce that data. So data concerning pottery products, stock level replenishment, clients, or work instructions are produced through transactions outside the part of Pottery that is modeled. Since we do not generally know whether or not the production of said data results from only one transaction, the external production banks are considered composite production banks (CPB), identified as a gray diamond.

4.8.4 Process Model

Basic Pattern

In order to outline the essentials of the process model, we will concern ourselves with the basic transaction pattern shown in Fig. 4.22 without incorporating the possible deviations from the normal pattern as shown in Fig. 4.24 or 4.25. For every transaction, the process model specifies the transaction pattern whereby dependencies between the elements of the various transaction patterns (coordination and production activities) are explicitly modeled. It is emphasized that the explicit definition of coordination and production facts enables a precise description of the required information. This differs significantly from many other ways of modeling processes since these other ways do not, for example, address all coordination actions explicitly. Figure 4.34 gives a possible process model associated with the interaction model of Fig. 4.28.

Unlike the interaction model, the sequence of actions is identified in the process model. Completion of T01 necessitates the transactions T02 and T03. Hence, there are action links between T01/pm and T02/rq and T03/rq. The implied payment request becomes formal when the production of the producer (T03) is accepted by the order handler. This waiting condition is indicated by the dotted arrow. After the payment transaction is completed, transaction T01 is ultimately completed, as is similarly indicated by the waiting condition.

Having the same interaction model, the process could also be arranged differently such that payment takes place after T01 is completed (e.g., paying in a restaurant after eating). In that case, the current waiting conditions disappear and the execution of T01 has only to wait for T03/ac. After T01/ac, the request for payment takes place. Hence, in this case, there is a second waiting condition between T01/ac and T02/rq.

Different process arrangements have to do, on the one hand, with different process design principles (architecture), but on the other, they involve different operational execution rules (operational rules), as will be discussed below. Also the process model is fully abstracted from actual implementation to a large extent since it is yet to be decided how the coordination and production activities should take place.

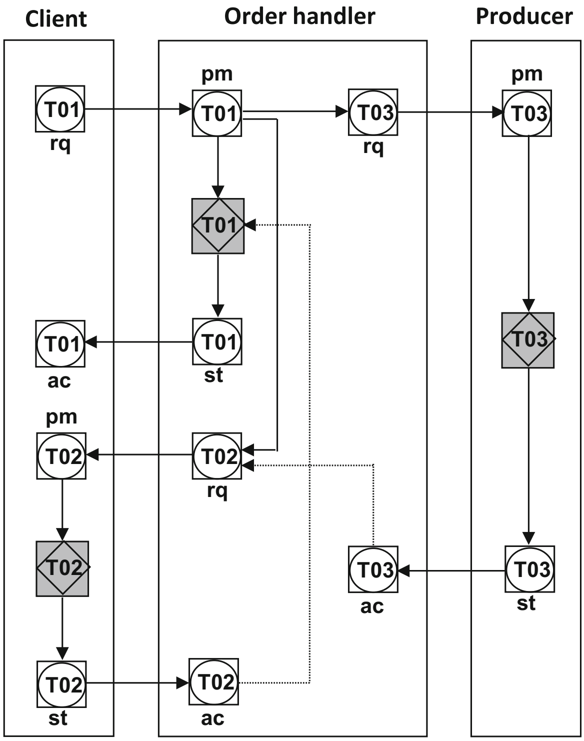


Fig. 4.34 Process model of Firm (1)

Delegation of Coordination Activities

Figure 4.35 shows the process model associated with the interaction model depicted in Fig. 4.30. After explaining this process model, we will show why and how delegation of coordination activates takes place.

The process starts with the client request (T01/rq) for certain pottery. For completing this client order, three follow-up transactions must be initiated: T06 (supply order completion), T04 (delivery), and T02 (payment). When the supply order request is accepted (T06/ac), the required pottery is available and the request for delivery is operationalized. Subsequently, accepting the delivery result will lead to the start of the payment transaction. After this transaction result is accepted (T02/ac), the initial client order transaction is completed; hence, its production result is realized.

Should the stock level be insufficient to complete the supply order, extra pottery products have to be fabricated through transaction T03 (producing the fabrication order). So, in that case, the completion of the supply order has to wait for the completion of the fabrication order. The action link between T06/pm and T03/rq is thus optional, as is indicated by the range *0. . .1*: either no (*0*) request or a (*1*) request to produce a fabrication order. Evidently, the waiting condition between T03/ac and the production of T06 has the same optional character.

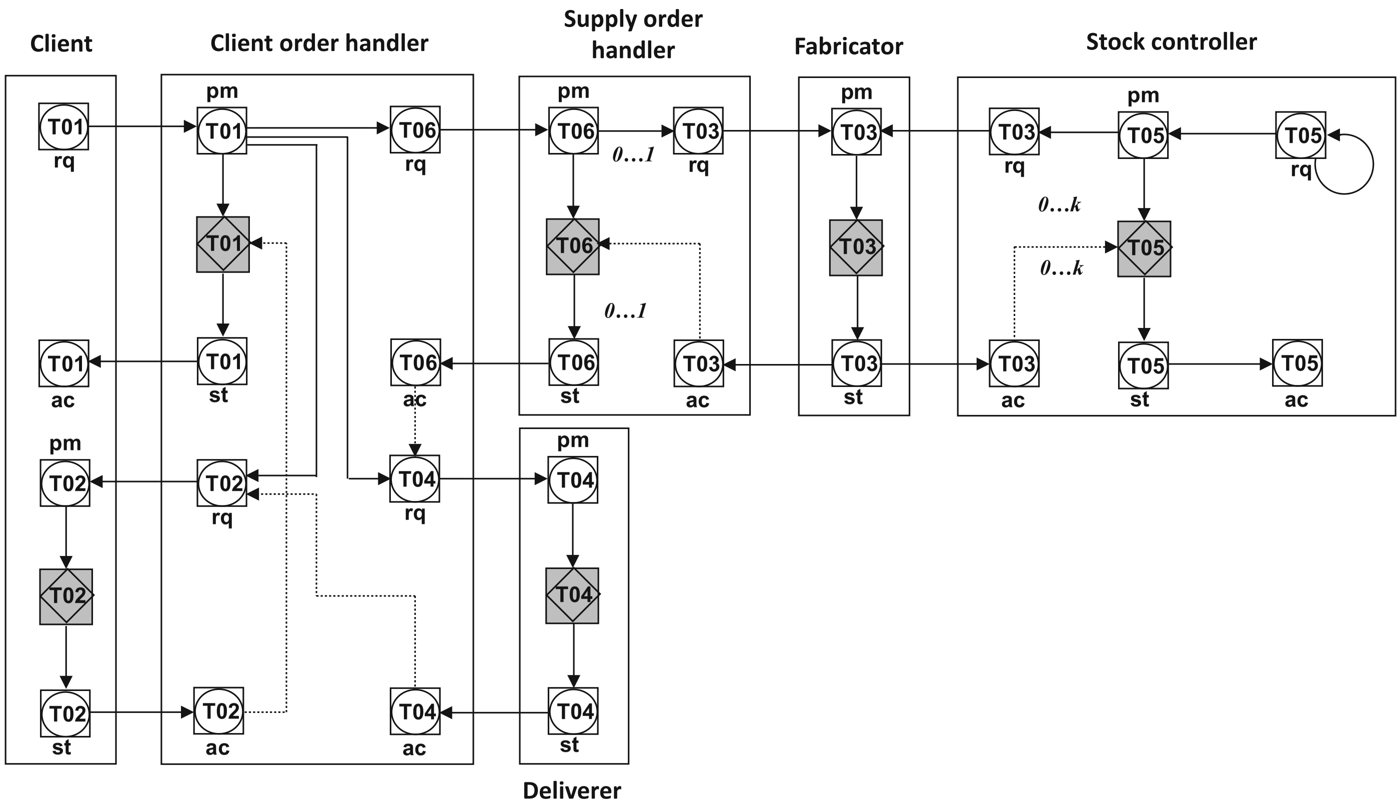


Fig. 4.35 Process model associated with Pottery (2)

Periodic self-initiated stock control determines whether fabrication of extra pottery products is required in order to maintain the required minimum stock level. Similarly, the action link between T05/pm and T03/rq is optional. The range *0...k* indicates that no request is necessary (*0*) or that up to *k* pottery products have to be fabricated, with *k* the minimum stock level for the given pottery product type. Completion of the stock control transaction has to wait for T03/ac (under the similar optional character).

It is important to stress that all coordination actions are modeled explicitly in the process model. This creates a significant advantage compared with other ways of modeling, for example, in the case of task delegation. Frequently, coordination activities are performed by actors not being the actor that should logically do that. For example, accepting a produced fact can be performed by a different actor than the one initiating the transaction. So, the acceptance of purchased goods might not be done by the purchaser but is (implicitly) delegated to an actor role within a warehouse receiving the goods. In the process shown in Fig. 4.35, the desired pottery realized through transaction T06 is brought to the client's premises by the deliverer. Particularly noteworthy are the delegations of coordination activities that are thereby necessarily introduced. First, the statement T01/st that the desired production has been realized is now done by the deliverer. Hence, the order taker has (implicitly) delegated this task to the deliverer. This holds similarly for the payment request T02/rq and the acceptance of payment T02/ac. Although the order handler requested goods delivery (T04/rq), and hence should accept the result, the actual acceptance of the delivery (T04/ac) is delegated to the client receiving the goods. Notably, this formal modeling forces acknowledgement of delegation and hence forces attention to how delegation should be handled. This is important in view of defining responsibilities and accountabilities (compliance), as well as for defining the conditions under which delegation can take place. We might observe that addressing task delegation explicitly is mostly not an area of attention in traditional process modeling approaches.

Transaction Composition/Decomposition

As previous examples show, realizing a production fact might necessitate executing various underlying transactions. For example, producing a car necessitates various additional transactions that realize additional production facts: the parts. Analogous to the composition of a car by its parts, we might envisage the ultimate production as the composition of underlying transactions producing the parts, or conversely, we might decompose the ultimate production into underlying transactions. As an illustration, we recall the interaction model of Fig. 4.28.

Suppose that in the interaction model of Fig. 4.28, the realization of the production fact associated with transaction T03 necessitates initiating transactions T04 and T05. Subsequently, the interaction model of Fig. 4.28 changes into that of Fig. 4.36 whereby it is assumed that T04 is executed by an external party, that is, an external supplier producing the T04 product or service. Successful completion of T03 is thus contingent upon the successful completion of transactions T04 and T05. These latter two transactions are contained in T03 and are initiated by the producer actor role.

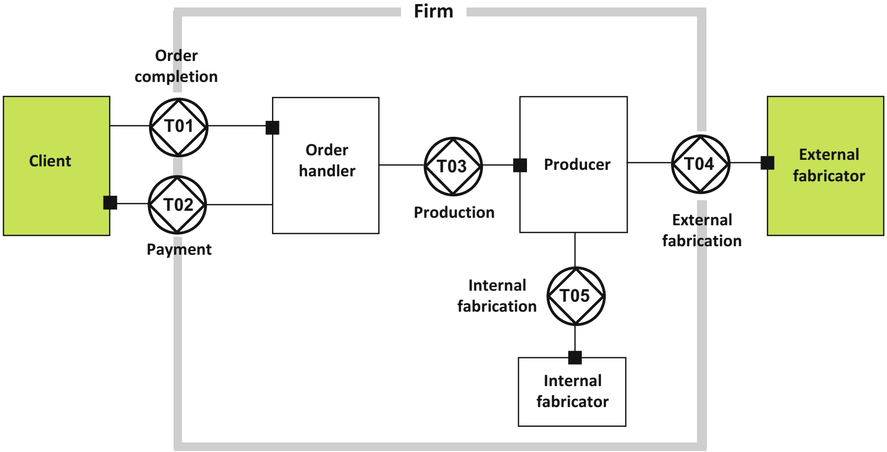


Fig. 4.36 Interaction model Firm (2)

Figure 4.37 presents the new process model showing the nesting of the transactions T04 and T05 necessary for completing transaction T03. Hence, the model shows that realizing the T03 production fact depends on the successful realization (acceptance)

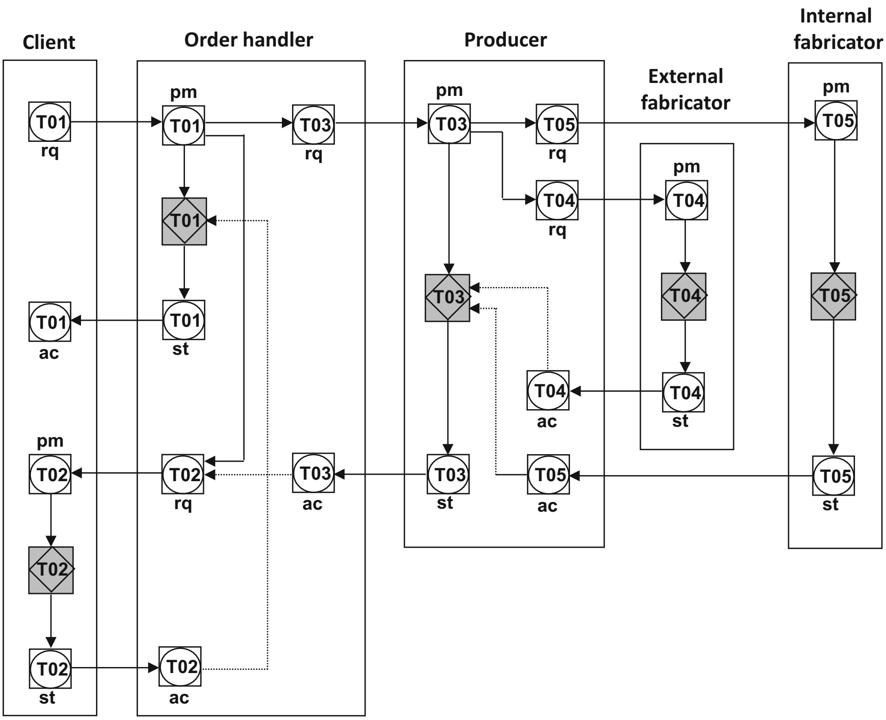


Fig. 4.37 Process model of Firm (2)

of the production facts associated with T04 and T05. Put another way, it depends on the completion of T04 and T05, which is expressed by the waiting conditions between the production realization of T03 and the two acceptance conditions T04/ac and T05/ac. Process models can be extended up to any desired level of detail. The end level of process detailing is reached when production activities of a transaction have to do with 'atomic' tasks that make further detailing impossible or unfruitful.

4.8.5 Fact Model

Section 4.8.1 defined the *enterprise state* as the totality of coordination and production facts at (or created up to) a certain moment in time. The totality of lawful states of the enterprise was identified as the *state space*. Within the methodology of essential modeling, the fact model is restricted to the production facts of the state space since production has to do with the very purpose of the enterprise and its associated transactions. Production is about realizing a material or immaterial fact such as preparing a meal or assessing the value of a house. These facts concern so-called 'objects.' Facts say something about objects: that a meal is prepared or that an assessment is completed. Objects are concrete or abstract things like the ones mentioned and are an element of the respective object class. The fact model specifies the totality of production facts by depicting the production facts pertinent to objects in the object class and by showing the logical relationships between the object classes. So the model shows what possible production facts are associated with the respective objects. This type of modeling is the domain of specialists. The theory and graphical notation of 'object-role modeling' is used within the DEMO methodology (Dietz 2006; Halpin and Morgan 2008). Since these modeling techniques require extensive explication, we will satisfy ourselves with merely indicating the essence of the fact model.

With reference to the interaction model (Fig. 4.30) and process model (Fig. 4.35) of Pottery 2, relevant object classes are 'client order,' 'product,' 'supply order,' and 'fabrication order.' Since a client is a person, there is an external 'person' object class shown in gray. Various logical relationships can be identified between the object classes. These relationships can be interpreted as follows. The client *C* is an element of the 'person' object class while the client order *CO* is an element of the 'client order' object class. The horizontal bar above the *CO*-box indicates uniqueness of the client order: a client may have more than one order, but a given order defines the associated client uniquely: the client of client order *CO* is client *C*. Further, the black dot indicates the mandatory nature of the relationship: a client order must be associated with a client and so on. Similarly, products might be part of multiple orders, but a client order (*CO*), supply order (*SO*), or fabrication order (*FO*) defines the products associated with these orders uniquely. So for example, supply order *SO* concerns product *P*. The internal object classes depicted in Fig. 4.38 show the results associated with them. These results are mentioned in the transaction-result table of

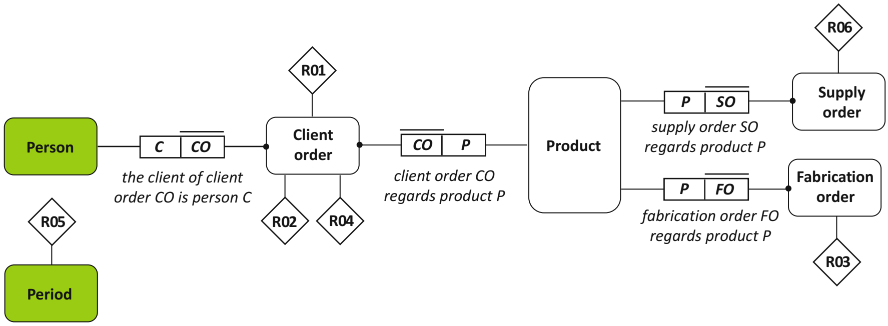


Fig. 4.38 Fact model of Pottery (2)

Fig. 4.30. Finally, result R05 has to do with periodic stock control. The external object class contains the period *T* for which stock control takes place.

As can be appreciated, the enterprise data dictionary can be defined precisely (including data ownership) through the fact model and linked to transactions.

4.8.6 Operational Rules (Action Model)

Types of Operational Rules

As the basic transaction pattern and the organization theorem express, the activities in enterprises are categorized into *coordination activities* and *production activities*. The operational activities are guided by certain directives, procedures, or precepts, which we will collectively identify as *operational rules*. These rules can be categorized according to the basic activity types:

- *Production rules* Commonly identified as work instructions that specify or indicate how a production result must be realized.
- *Coordination rules* Procedures for addressing or handling communicative acts.

Transactions are thus carried out by following coordination and production rules. The coordination rules guide coordination activities (request, promise or decline, statement, and acceptance or reject, as well as for the associated cancellations), whereas production rules—commonly identified as work instructions—guide production activities, such as for servicing a car, preparing a meal, or assessing the value of a house. Within the DEMO methodology, the focus is on coordination rules, which are identified as *action rules* (Dietz 2006). The totality of action rules is called the *action model*.

The coordination rules are often in the form of the if-then-else structure. For example, in the case of requesting for a car rental the coordination rule might read ‘if the driver has valid credentials (age, license) the requested car may be rented, otherwise decline.' The subsequent promised state will be guided by further coordination rules, such as filling in certain forms. On presenting the car (production fact stated), the associated coordination rule might require a car walk-around to assess the car's condition, which is signified subsequently by the customer's acceptance. Coordination and production rules define the process execution. Because of the explicit definition of these operational rules, the precise definition of the required information is also enabled. Note that this expresses the fundamental functional design law mentioned in Sect. 4.3.4 since it is the *constructional* insight provided by the essential model and the operational rules that defines the required (essential) information and hence defines the *functional* relationship with an information system.

State Rules and Process Rules

In Sect. 4.8.1, we introduced the notions of enterprise *state* and *process*. A new enterprise state results from events occurring in processes. Processes manifest the sequence of events. Not all states or process executions are evidently possible or desired. Renting a car to someone without a driving license must be avoided. Hence, we might conceive coordination rules that define the conditions for ensuring that the enterprise manifests only desired or required ('lawful') states and that processes are executed in the desired or required order. These rules can be defined as follows:

- *State rules* Coordination rules ensuring that the enterprise can only obtain desired or required states.
- *Process rules* Coordination rules ensuring that enterprise processes advance in the desired or required sequence.

A state rule can be formulated by expressing the allowed state or, operationally oriented, as a decision-making rule. For example, a state rule like 'the hotel may only accommodate non-smokers' can be complied with through a coordination rule stating that 'rooms may only be rented to non-smokers.' Table 4.8 gives some examples of state and process laws.

Table 4.8 Examples of state and process rules

State rules	Process rules
Meals may not contain expired ingredients	Delivery of goods only after payment
Women more than 6 months pregnant may not travel on aircraft	Goods may be returned up to 30 days after purchase
Orders may not contain more than 20 items	Credit card acceptance must await positive validation
Car rental for in-country use only	Car renters must provide a valid driving license
Students are entitled to a 25% discount	Lunch can be served between 11 AM and 2 PM

The Notion of 'Business Rules'

One might notice a growing interest in the notion of 'business rules.' In this context, the term 'business' must be understood in the same sense as we have used the term 'enterprise.' In this paragraph, we will follow the customary nomenclature. Noteworthy publications were issued by the Business Rules Group (Hall et al. 2005). Business policies and business rules are viewed as directives, and their conceptual difference is defined as follows (op. cit., p. 20):

- *Business policy* A non-actionable directive whose purpose is to govern or guide the enterprise.
- *Business rule* A specific actionable directive to implement business policies. These latter policies are thus the basis for defining business rules.

The term 'non-actionable' means that the formulation of a business policy is such that conditions under which the policy can be effectuated remain unclear. So the statement that 'purchased goods may be returned' is considered a business policy (a general directive), but the specific statement that 'purchased goods may be returned up to 30 days after purchase' is viewed as a business rule. Sometimes the notion of business policy is used in a strategic sense, like 'we will provide meaningful work for our employees.' In view of our discussion in Sects. 4.5.1 and 4.5.2, such policy expresses a strategic area of concern which is addressed through defining enterprise architecture. Business policies and business rules are seen as means to aid in operationalizing strategic choices. A strategic choice to increase 'repeat business' is supported by a business rule stating 'call first-time customers personally' (op. cit., p. 15). In view of our previous observations, it can be appreciated that the notion of 'business rules' closely compares with the notion of 'operational rules.'

Operational Rules and Ideological Convictions

Understandably, the nature of operational rules will depend upon the viewpoint on organization and employees. Within enterprise mechanization, rules will obtain the character of 'mechanistic dictates' that must be adhered to under all circumstances. Increased employee competences will most likely lead to relaxation of the strictness of rules. Also the domain to which the rules apply, such as safety or security, might lead to more or less focus on strictly following rules. Some varying level of enforcement—or conversely level of freedom in applying a specific operational rule—can thus be envisioned. We suggest four different levels of enforcement (Hall et al. 2005, p. 17):

- *Strictly enforced* The rule must be adhered to and violation is penalized.
- *Pre-authorization override* Prior approval is obtained for deviation from a rule.
- *Post-justification override* After-the-fact justification for rule deviation is provided, which does not necessarily mean that the justification is accepted. Deviation might have consequences.
- *Guideline* A rule is a suggested course of action.

Within the employee-centric perspective on organizing, strongly advocated in Chap. 2 and discussed in (Hoogervorst 2017, 2018), the involvement of employees and their self-organizing capacity is a central notion since employee-initiated behavior is seen as crucial for enterprise success. Evidently, this viewpoint entails refraining from imposing such detailed rules that would make self-organization impossible and hence would create enterprise mechanization under the erroneous assumption that the more employees behave according to predefined rules, the better the enterprise performs. Nonetheless, some regulation is required, not only for safety or legal reasons but also for guiding self-organization into the desired direction. Within the employee-centric perspective, compliance with rules is to a large extent subject to employee judgment and relies on their competence except in those cases where rules must (generally) be strictly adhered to.

Operational Rules, Requirements, and Architecture

As we have seen, operational rules concern the execution of transactions and define, next to requirements and architecture, the design of an enterprise. All these concepts must be mutually coherent and consistent. Evidently, the design of an enterprise must enable the desired operation and hence must enable executing operational rules, but moreover, the operational rules should not be in conflict with requirements and architecture. Hence, all three concepts must be coherently and consistently addressed within the enterprise-wide design perspective. Only then can it be ensured that, although operational rules, requirements, and enterprise architecture are conceptually different, they will be based on the same strategic choices and concerns. So, a strategic choice to enhance customer satisfaction might lead to requirements and architecture for easy customer interaction (e.g., through a web portal), as well as to an operational rule allowing purchased goods to be returned within a certain period of time (for which the web portal enables easy interaction). Likewise, the concern for meaningful work will lead to associated requirements and architecture, but must also be visible in the definition of operational rules, for example, by stating that 'employees may use their own judgment in dealing with customer complaints.'

Successful enterprise operation is not to be expected when operational rules are mutually conflicting. But avoiding conflicting conditions has a wider scope. Coherence and consistency have been emphasized as important conditions for avoiding strategic failures and avoiding employee cynicism and disengagement. As our previous discussion shows, the requirement for coherence and consistency not only pertains to the set of operational rules internally but also concerns the relationship with requirements and architecture.

4.8.7 Reflection on Essential Modeling

The Structural Functionalist Foundation: Enterprise Skeleton

In explicating the structural functionalist foundation of an enterprise lies the importance of essential modeling. The theory and methodology briefly outlined above

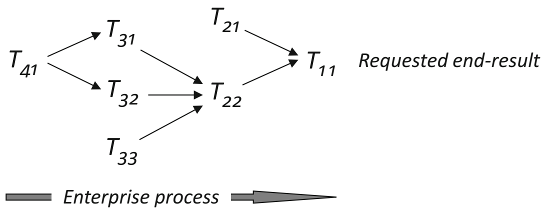


Fig. 4.39 An enterprise process as causally related transactions

enable to define this foundation precisely in a coherent and consistent manner. Within this essential perspective, coordination acts can be seen as the 'atoms' of an enterprise because they are the units of action pertinent to exactly one commitment concerning exactly one production fact (Dietz 2003). Coordination and production actions constitute the transaction. So, transactions can be viewed as the 'molecules' of an enterprise because they are composed of the coordination atoms and the units of action that produce exactly one production fact (op. cit.).

Most likely, enterprise products or services are provided through multiple transactions and their associated actor roles. One might envision the totality of transactions as the enterprise 'skeleton.' Within this picture we define:

- *Enterprise process* The collection of causally related transactions.

Figure 4.39 symbolically shows several causally related transactions that jointly compose the transaction T11 that ultimately provides the requested end-result. As we have seen, such a process can be modeled formally, using the basic transaction pattern model whereby the process can be modeled up to any basic transaction for which the production activity does not warrant further detailing.

Essential Differentiation and Integration
As mentioned before, every enterprise faces the issue of (1) functionalization or *differentiation*—creating specific tasks or task complexes—and (2) coordination or *integration* for ensuring unity in task execution. Note that essential modeling solves this issue elegantly within the essential enterprise perspective. Production activities of the various transactions and actor roles executing these activities represent the differentiation in tasks, while the coordination activities of the various transactions represent the integration of these tasks. This is an enormous advantage since the essential models provide the baseline understanding of how the structural functionalist aspects of an enterprise work together. Without such understanding, attempts to create a unified and integrated enterprise easily fail. Nonetheless, a limitation of essential modeling is that the focus lies on coordination activities, while for obvious reasons, production activities are not formally addressed.

Emerging Transactions
Devising essential models is, as said, a necessary first step in understanding and designing enterprises. The models present the intended, assumed, or expected way of operating. Notwithstanding the importance of devising these models, the danger might be that essential models are not only viewed as expressing the essential operational aspects but considered reflecting enterprise reality, that is, reflecting

how the enterprise *is*. So, only the transactions defined *are* the activities that employees carry out and only the facts defined *are* the facts that matter. It refers to the presumed way of organizing mentioned in Sect. 1.1.1. Further, of the types of social action identified in Sect. 2.3.5, the transactions express the purpose-rational actions only. Arguably, enterprise reality is far from completely and comprehensively captured. In view of our observations in the previous chapters, we reiterate that assuming completeness and comprehensiveness denies or ignores the complex, dynamic, and emergent nature of enterprise reality and hence ignores the important notion of emerging organizing as discussed in the Sects. 1.1.1, 2.3.6, and 2.3.14. Underlying aforementioned assumption is the belief in the possibility to define in advance the precise nature of enterprise activities and the precise nature of employee behavior pertinent to these activities. This belief is highly naïve. As outlined, the emergent nature of much of enterprise reality makes clear that required forms of enterprise activities and specifically employee behavior cannot be completely determined in advance since these activities and employee behavior have to respond to external and internal operational contingencies emerging out of dynamics, complexity, and the associated uncertainty. Further variety also emerges because of ambiguity, lack of clarity, and dynamics associated with the formally defined actor roles themselves, for example, because of the interpretation by the role actor of what the role is all about in light of the experienced contingencies and the imposed role expectations by the actors of other organizational roles, including customers. Because of emerging unpredictable operational contingencies (also associated with the organizational roles themselves), unpredictable patterns of activity and collaboration must develop to address the operational contingencies. Similar considerations hold for emerging phenomena that necessitate strategic activities and collaboration. One might say that these unpredictable patterns of activity and collaboration lead to the emergence of temporal collaboration patterns. Put differently, unforeseen transactions emerge that must be carried out, as driven by unforeseen, emerging operational issues concerning customers, suppliers, business partners, stakeholders, employees, machines, equipment, spare parts, material, information systems, work instructions, utilities, offices, buildings, or conflicts, as well as driven by emerging strategic issues associated with these and other topics. Some of the emerging transactions might be formalized as a future way of working. Understandably, properly defining and executing emerging transactions (emerging organizing) depend on employee involvement and their capacity for self-organizing discussed in Sect. 2.3.6. Employee variety is crucial, as the Law of Requisite Variety requires.

What essential models express is thus only a part of employee activities and the reality of enterprises. Moreover, an exclusive focus on this aspect of enterprise reality excludes grasping the relevance of emerging transactions and induces organizational approaches that preclude addressing emergent enterprise phenomena effectively.

Emergence, Enterprise Variety, Sensemaking, and Organizing

The emergence of unpredictable patterns of transactional collaboration manifests that enterprises are high variety systems whereby variety grows exponentially with the number of enterprise aspects that manifest variety in various degrees. Section 2.3.14 argued the importance of adequate enterprise regulating variety and argued the importance of employee involvement for providing that variety. Enterprise mechanization reduces or attenuates enterprise variety through operational rules that enforce predefined behavior. In doing so, much external or internal variety is not acknowledged nor addressed. As outlined, increase in enterprise regulating variety must come from employees, that is, must come from an increase in the maneuverable space of employees. Satisfying the Law of Requisite Variety depends on participating employees and their capacity for self-organizing and self-ordering (cf. Sect. 2.4.6). Put differently, continuously ensuring that the number of (yet unknown) possible operational regulating actions is at least equal to the number of (yet unknown) emerging operational contingencies requires the creative involvement of employees who determine what the effective operational regulating actions must be. It is here that employee involvement becomes manifest through creativity and initiatives directed at safeguarding operational process reliability, as well as directed to product, quality, and service improvements. Employee involvement and self-organizing can thus accomplish coordination and integration of activities more efficiently and effectively than much of the detailed predefined working arrangements. The formal working arrangements lead to a certain level of enterprise performance, but higher performance levels come from the involvement of employees (op. cit.). Self-organization is thus the key to satisfying the 'Law of the Situation' and manifests the fundamental insight in the convolution of organizing and sensemaking (cf. Sect. 2.3.14). It is the 'here-and-now' sensemaking about emerging operational contingencies that determines what needs to be done for addressing those contingencies adequately, even in cases were predefined rules and regulations may exist. Regulating must be an integral part of the process of organizing carried out by employees themselves because they have the knowledge about the organizational situation. Hence, it is sensemaking about the 'total situation' that defines the nature of emerging transactions (op. cit.).

Arguably, by exclusively focusing on the collaboration patterns given by enterprise essential models, the continuously evolving character of organizing is ignored. This brings the danger of likewise ignoring conditions for creating enterprise regulating variety and hence ignoring the conditions for employee involvement and self-organizing which are the conditions for employee-centric organizing.

The Essential Focus and Employee-Centric Organizing

The importance of enterprise coherence and consistency has been stressed before. Obviously, this requires completeness and comprehensiveness of the perspective on enterprises such that all enterprise facets having a bearing on coherence and consistency are included. In other words, the completeness and comprehensiveness of the 'systematic view' on enterprise phenomena must be ensured. However, one might observe that the current practices concerning 'the systematic view' on enterprises is dominated by structural functionalism and virtually ignore emerging phenomena and ignore the interpretive, symbolic-interactionist, and cultural aspects within enterprises. Put differently, the current practices almost exclusively focus on structures and systems and ignore other crucial, and oftentimes more important, determinants of enterprise performance and successful enterprise change. Moreover, the current practices thus ignore important aspects of enterprises being morphogenic social systems as expressed by the morphogenic enterprise conceptual system model. The exclusive structural functionalistic focus of the systemic view entails the danger of inducing a mechanistic perspective that, as briefly summarized above, ignores emerging enterprise phenomena, as well as entails the danger of inducing a focus on stability and conservancy and runs the risk of disregarding essential sources for enterprise development and change. We might observe that organization theories of the social sciences cannot be applied properly within the structural functionalist viewpoint only. Arguably, this viewpoint is inherently theoretically incomplete and consequently does not enable holistic, unified, and integrated enterprise design. It seems fair to say that much of the thinking about enterprise design induces mechanistic thinking, precisely the type of thinking that excludes employee-centric organizing. Hence, the question that concerns us is whether essential modeling becomes the (unwilling) servant of this mechanistic thinking.

In answering the aforementioned question, one might observe that conceiving a process as a collection of causally related transactions could induce a deterministic and mechanistic perspective. Such perspective is further strengthened by viewing operational rules as means to enforce operational process execution in a predefined way. Evidently, the mechanistic character depends on the specific nature of the operational rules and on the level of compliance required. Operational rules can be formulated such that employee self-organizing is enabled, whereby information systems are designed such that self-organizing and employee involvement are supported. Nonetheless, all too often, the nature of operational rules contributes to enterprise mechanization, supported by information systems that do not easily allow rule deviation. Rules become automated, and 'the IT system' is presented as the reason for certain behavior, despite the fact that—as the essential models clearly express—a human being is ultimately responsible.

Obviously, organizing implies some level of formalization in the form of predefined working arrangements. For expressing the structural functionalist essence of the predefined work patterns, the essential models are important since it must be clarified how the enterprise would operate in the intended essential fashion, not disturbed by the uncertainties and the puzzling nature of emerging phenomena that must be made sense of. We have presented ample arguments that this nominal 'would-be' picture needs to be adjusted and complemented because reality does not 'behave' according to the nominal picture. The danger of enterprise mechanization by exclusively focusing on essential modeling can thus only be avoided if the necessary development of essential models is part of the wider comprehensive perspective on understanding and designing enterprises. This wider perspective on understanding enterprises has been summarized in Chap. 2. Next is the wider perspective on enterprise design which is presented in the following paragraphs.

4.9 Enterprise Functional and Constructional Perspective

4.9.1 Main Enterprise Design Domains

Four Main Areas of Attention

The function-construction distinction was outlined before by using the car example. Similarly, this distinction characterizes enterprise design: functional and constructional design. Functional design concerns the various functional relationships between the black-box properties of an enterprise and elements of its environment that have wants and needs. Constructional design concerns the arrangement and operation of the enterprise for making the functional relationships possible, that is, for bringing the black-box properties forward. Two classes of enterprise design domains can thus be identified: functional design domains and constructional design domains. Earlier, we emphasized that the set of design domains must be complete: necessary and sufficient for (1) holistically designing the enterprise in a unified and integrated manner, (2) comprehensively defining requirements and architecture, and (3) effectively addressing requirements and areas of concern. We will identify the main functional design domain as 'business' and might identify the main constructional design domain as 'organization.' But in view of the importance of information and information technology, we will identify these latter two domains as separate main constructional design domains. So, three main constructional design domains are identified: 'organization,' 'information,' and 'information technology' (IT), as depicted in Fig. 4.40.

The main enterprise design domains can be introduced as follows:

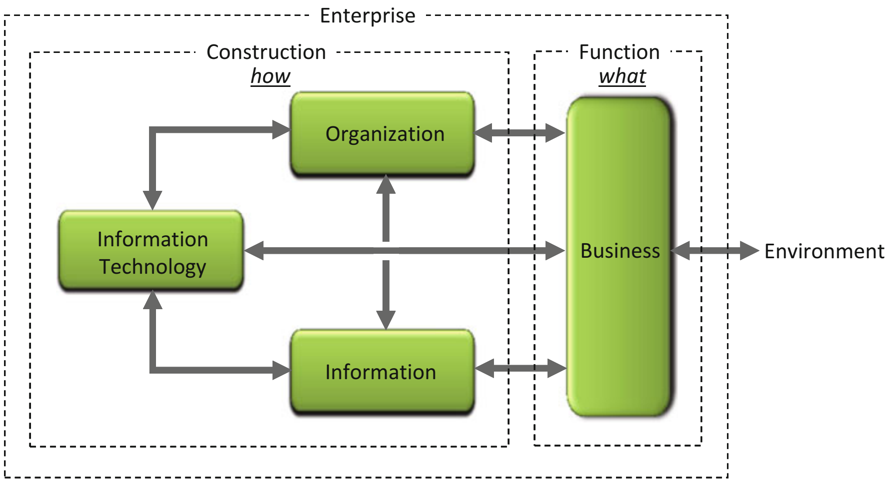


Fig. 4.40 Main enterprise design domains

Business This main enterprise functional design domain concerns the functional relationships of the enterprise with its environment. Recall from Sects. 4.3.4 and 4.6.2 that these relationships are about the wants and needs of human beings and (social) systems on the one hand (the using system) and the black-box properties of the enterprise (the provisioning system) on the other hand. Examples of functional relationships were given in Sect. 4.3.2.

Organization The main constructional design domain 'organization' concerns white-box properties: the internal arrangement and operation of the enterprise that bring the black-box properties forward. It concerns all constructional aspects not covered by information and IT design domains. The internal arrangement and operation is determined by the components of the morphogenic enterprise conceptual system model discussed in Sect. 2.3.9 and is also visualized in Fig. 4.1 of Sect. 4.2.3. We have yet to find out how employee behavior, management behavior, culture, and structures and systems relate to formal organizational subdesign domains. Understandably, the essential organizational models discussed in Sect. 4.8 express organizational aspects. All transactions are part of the organizational domain since they express and structure organizational activities.

Information Information is a crucial factor in establishing white-box constructional properties. Many informational aspects play a role, such as (1) the type, structure, and quality of information; (2) the management of information (gathering, storage, distribution); and (3) the utilization of information. Informational aspects concern the nature and quality of the relationships of various information systems (provisioning systems) with their respective environment (using system) and relate to the infological transactions discussed in Sect. 4.8.1.

Information Technology (IT) Obviously, technology is essential for business, organizational, and informational support. Technology is thus an important part of the enterprise construction. In terms of essential modeling discussed previously, technology is an important aspect for carrying out the material production activities of transactions. In view of the large spectrum of such production activities, also a large spectrum of technology plays a role. For our current discussion, we limit ourselves therefore to information technology (IT). Nonetheless, our line of thinking is similar for other technologies. IT is used to support transactions, specifically infological and datalogical ones. IT design domains thus concern the design of the overall enterprise IT system that provides information services to the enterprise organization.

Lack of unity and integration was identified in Sect. 1.4.3 as the core reasons for failing enterprise (strategic) change initiatives. Avoiding lack of unity and integration requires coherence and consistency within and between the main design domains. For example, a business based on a high level of flexibility regarding the market and customers seems incoherent and inconsistent with a bureaucratic organizational arrangement. Important relationships thus exist between the four main domains as Fig. 4.40 shows, which will be clarified below. Important subdesign domains must be identified within the four main design domains for making comprehensive enterprise design possible. This concerns functional and constructional decomposition, to be discussed below.

Enterprise Systems and Design Domains

We have introduced the notion of design domains as enterprise facets where design needs to take place, guided by architecture and thereby dealing with requirements. These enterprise facets might refer to an enterprise subsystem, such as 'network' or 'remuneration,' but a design domain can also be a facet of a subsystem, such as 'job profile' or 'syntax.' Jointly, the design pertinent to design domains will create the systems that make up the enterprise. To clarify this viewpoint, we will introduce three macro-level enterprise systems that collectively form the enterprise construction: the overall enterprise system. Because we like to reserve the label 'organization' for another system, the overall enterprise system is identified as the enterprise institutional system. Within this overall system, three macro-level systems can be identified: (1) the organization system, (2) information supply system, and (3) IT system. These systems are defined below and depicted in Fig. 4.41.

Enterprise institutional system With reference to the morphogenic enterprise conceptual system model, the overall enterprise institutional system is defined as the unified and integrated whole of structures and systems, employees, management, and culture. Structures and systems comprise a wide variety of aspects, such as infrastructure (buildings, offices, utilities, etc.), transactions, processes, actor roles, job profiles, machines, equipment, tooling, information supply, and IT components. Associated with employees and management are aspects like competences, employment conditions, assessment, and remuneration. In short, the overall enterprise institutional system comprises everything of its construction.

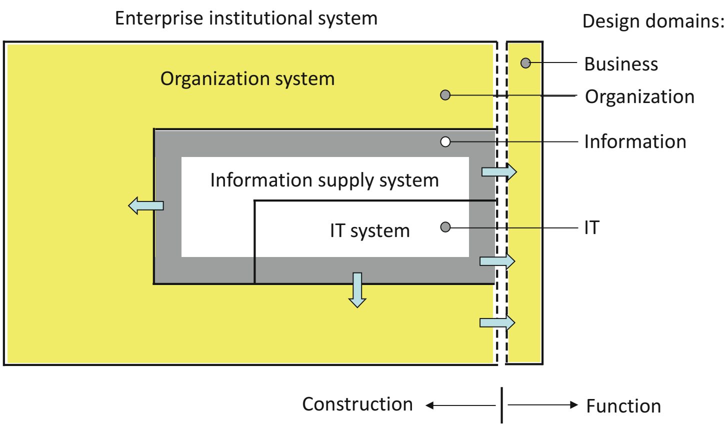


Fig. 4.41 Main enterprise systems and design domains

Organization system This is defined as the unified and integrated whole of infrastructure (buildings, offices, utilities, etc.), transactions, processes, actor roles, job profiles, machines, equipment, tooling, employees, and management that produce the enterprise products and services. Shortly put, the organization system is that part of the institutional system to which the information supply system delivers its function, or more formally, that part of the institutional system with which the information supply system has functional relationships. In terms of our previous discussions, the information supply system is the provisioning system of informational services to the organization system as the using system. The information supply system is defined as follows.

Information supply system This system is concerned with all instances of provisioning information and is defined as the unified and integrated whole of information-related infrastructure (buildings, offices, utilities), staff (employees, management), and technology components for creating, collecting, retrieving, storing, transmitting, distributing, displaying, and managing data.

The information supply system has a broad scope and includes all forms of providing information (data), such as libraries, archives, or service centers. A significant element of the information supply system is the enterprise IT system, defined below.

IT system The enterprise IT system is an important part of the information supply system and defined as the unified and integrated whole of electronic and computer subsystems, components, and their associated transmission infrastructure for provisioning information services to the organization system. As before, the enterprise IT system is the provisioning system for the organization system as the using system.

The distinction between using system and provisioning system also implies that for all the systems mentioned above, the function/construction distinction applies. Figure 4.41 depicts our viewpoints graphically. All systems have functional relationships with the enterprise environment. For example, the relationships of the organization system with the environment are formed by physical customer interfaces or traditional communication channels. Conventional information channels, such as archives, libraries, or call centers, are examples of relationships the information system has with its environment. Within this system, the IT system provides virtual relationships, such as through web interfaces. The *business design domain* aims to capture all the various design facets concerning these functional relationships with the environment. Constructional design starts with the design of the organization system. Design facets are given by the *organization design domain*. The *information design domain* concerns design facets about the nature and quality of information. This design domain is identified by the gray band in Fig. 4.41 and defines the nature and quality of the relationships that the information system and the IT system have with the internal and external environment of the enterprise. Finally, the *IT design domain* presents the design facets of IT technology. Note that design facets such as

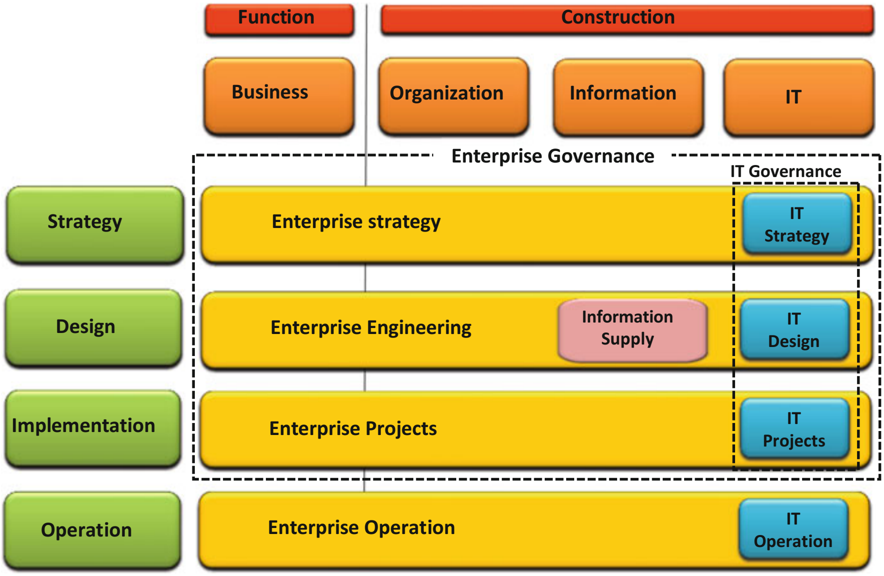


Fig. 4.42 Main enterprise design domains

buildings, offices, utilities, employees, management, transactions, and processes that are used by the information supply system and the IT system (as defined above) are grouped under the organization design domain, as Fig. 4.44 expresses. Of course, it has to be acknowledged that the information supply system and the IT system might pose specific requirements and areas of concern for the organization system, such as those concerning building conditions and availability of utilities.

Governance and Phases of Enterprise Realization

Along the horizontal axis of Fig. 4.42, the four main enterprise design domains are depicted. Likewise, the vertical axis shows the phases of enterprise realization. They refer to the phases depicted in Fig. 3.7 of Sect. 3.2.8. As Fig. 4.42 illustrates, strategy development involves both functional and constructional considerations, as we have discussed in the previous paragraphs. Recall from Chap. 3 the iterative relationships between strategy development and design, whereas a strict separation is conceived between design and implementation. The latter activities (physical realization) can only begin if design (conceptual realization) is finalized. Ultimately, the enterprise engineering theory, methodology, and methods operationalize the functional and constructional strategic desirables, requirements, and areas of concern into enterprise design (guided by architecture), which design is subsequently implemented. Note that a mere focus on information supply or IT governance is totally inadequate for holistically creating a unified and integrated enterprise. This concurs with the message conveyed in Sect. 1.4.1. Finally, Fig. 4.42 expresses the distinction between governance and operation.

4.9.2 Enterprise Functional Decomposition and Functional Design Domains

Functional Relationships and the Designed Provisioning System

Section 4.3.2 introduced the general expression (4.5) for a functional relationship as:

$$\mathcal{F}\ (\text{function}) : \mathit{System}\ S_1(\text{need, purpose})\ \mathcal{R}\ \mathit{System}\ S_2(\text{properties}).$$

The using system S_1 is the system with the need or purpose that is addressed by the properties of the provisioning system S_2. In case the latter system needs to be designed, we also speak of the object system. For our current discussion, the provisioning system is an enterprise. Section 4.3.2 explained that in the case of enterprises, the functional relationship can be expressed as:

$$\mathcal{F}\ (\text{function}) : \mathit{Subject}(\text{need, purpose})\ \mathcal{R}\ \mathit{Enterprise}(\text{properties})$$

or as

$$\mathcal{F}\ (\text{function}) : \mathit{Social\ entity}(\text{need, purpose})\ \mathcal{R}\ \mathit{Enterprise}(\text{properties}).$$

Hence, the using system can be a human subject, such as a customer or employee, or a social entity. Such social entity can be a group of human beings, such as shareholders, society at large, communities, or other enterprises (business partners, suppliers, governmental institutions, etc.).

Properties of the enterprise (provisioning system) are expressed as black-box properties since from the perspective of the human subject or social entity (using system), the construction of the enterprise is not known nor relevant. The fundamental functional design law discussed in Sect. 4.3.4 states that for properly designing the functional relationship, that is, for properly defining the black-box properties of the enterprise, the *construction* of the using system must be known, since it is the construction of the using system that defines the wants, needs, and purpose that the black-box properties of the enterprise must satisfy.

For designing the functional relationships adequately, hence for conducting functional design adequately, functional decomposition needs to take place. Section 4.3.4 outlined such decomposition in case the provisioning system is a car and the using system a human being: the driver that needs control functions provided by the black-box properties of the car. We use the same reasoning in case the provisioning system is an enterprise. So, a functional decomposition, identified as $\mathcal{FD}$, results in a set $\mathcal{V}_f$ functional design domains, such as (not exhaustive):

$$\mathit{Enterprise}\ \mathcal{FD} \rightarrow \mathcal{V}_f = \{\text{sales, access, marketing, recruitment, purchasing}\}.$$

As before, a functional decomposition can be made down to a level that expresses functional aspects that need no further breakdown because the aspects are necessary and sufficient for designing the required functional relationships. Figure 4.43 gives

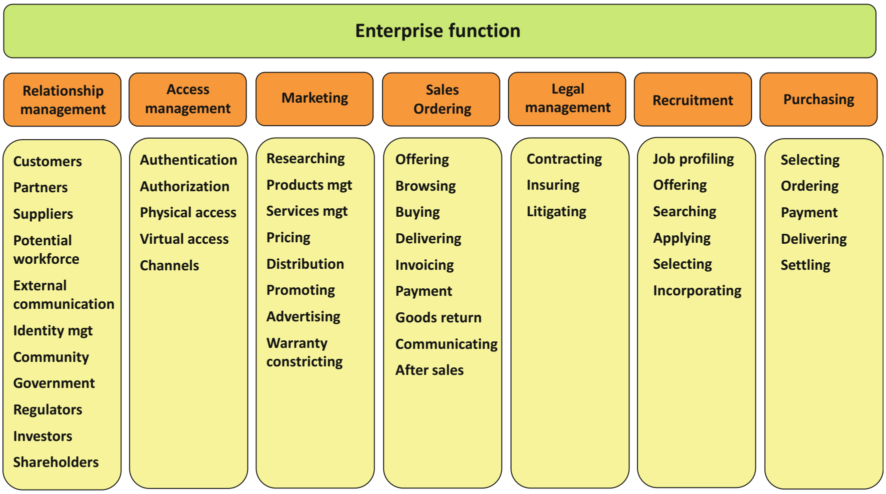


Fig. 4.43 Functional decomposition in functional design domains

our functional decomposition in case of an enterprise. This represents the decomposition of the main functional design domain 'business' into subdesign domains. Note that the subfunctional design domains are defined from the perspective of a commercial enterprise. For other types of enterprises, other functional design domains might play a role. For example, for a university the domain 'sales/ordering' would most likely be replaced by 'enrollment,' while a municipality could speak about 'services.' Nonetheless, the core idea is that the functional subdesign domains define the black-box properties of the enterprise that serve in addressing the wants, needs, or purpose of human individuals or social entities.

Functional Relationships and an Existing Provisioning System

Section 4.3.4 discussed functional relationships in case the provisioning system S_2 and its black-box properties are already given. Take functional relationships like:

$$\mathcal{F}\ (\text{payment}) : \textit{Enterprise}(\text{satisfying creditors})\ \mathcal{R}\ \textit{Bank}(\text{payment service})$$
$$\mathcal{F}\ (\text{purchasing}) : \textit{Enterprise}(\text{goods})\ \mathcal{R}\ \textit{Supplier}(\text{producing goods}).$$

As mentioned before, when the provisioning system is a given, designing the functional relationship is based on constructional knowledge of the using system (enterprise) such that the black-box properties of the provisioning system can be used. Thus, the functional relationships concerning payment and purchasing are based on the given properties of banks and suppliers, respectively. All these functional relationships are part of functional design and included in the functional decomposition of Fig. 4.43.

4.9.3 Enterprise Constructional Decomposition and Constructional Design Domains

For comprehensively realizing the enterprise construction, constructional decomposition (identified as $\mathcal{CD}$) into a comprehensive set $\mathcal{V}_c$ of constructional design domains is essential. So, we have (not exhaustive):

$$\textit{Enterprise } \mathcal{CD} \rightarrow \mathcal{V}_c = \{\text{job profiles, processes, information, infrastructure}\}.$$

Also the constructional decomposition must extend down to a level whereby further decomposition is not required. Figure 4.44 shows our decomposition. As this figure indicates, the constructional subdesign domains associated with the main design domains 'organization,' 'information,' and 'IT' can be related to three components of the morphogenic enterprise conceptual system model: employee behavior, management behavior, and structures and systems. For structures and systems, the relationship is rather straightforward, but it remains yet unclear what the precise relationships are between the constructional subdesign domains and employee behavior and management behavior. Put differently, it remains yet unclear what the nature of the subdesign domains must be in order to establish desired forms of behavior. Further, we have included the fourth component of the morphogenic enterprise conceptual system model: enterprise culture. As summarized in Chap. 2,

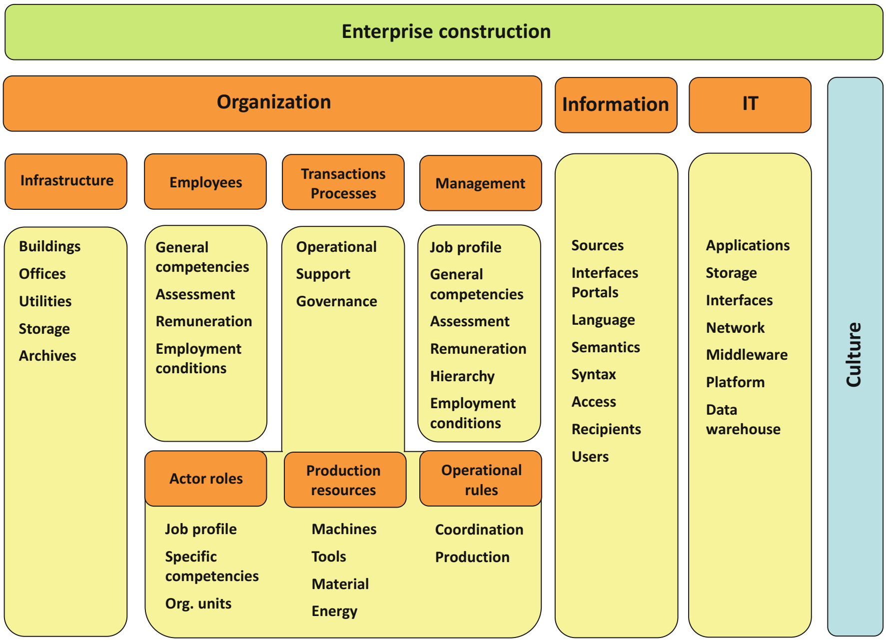


Fig. 4.44 Enterprise constructional decomposition in constructional design domains

enterprise culture is an important behavior determinant; hence, culture is an important determinant of enterprise black-box properties. Figure 4.44 thus expresses the difficulty that culture is an aspect of the enterprise construction but not a formal constructional design domain, since culture cannot be 'constructed' in a direct sense, nor the behavior of management and employees. This difficult issue will be further discussed below.

4.9.4 Linking Enterprise Design Domains with Essential Partitioning

Section 4.8 outlined essential enterprise modeling as an important first step in understanding and designing enterprises. Three essential perspectives were considered: ontological, infological, and datalogical. Activities within enterprises are categorized accordingly into three types of transactions. We might identify such categorization as *essential partitioning*. The three types of transactions define three 'aspect organizations': the O-organization, I-organization, and the D-organization. An enterprise is then considered the collective of these organizations. We remarked that these 'organizations' can generally not be readily identified within enterprises, for example, because information systems conceal ontological transactions. Also the distinction between I and D activities is sometimes problematic. Using information technology has blurred this distinction in practical contexts. Approaches whereby the O-organization is considered synonymous with enterprise processes, the I-organization with information supply, and then D-organization with IT infrastructure can be seriously questioned. Evidently, such approaches do not address the enterprise holistically in all its aspects.

Based on the reflections given in Sect. 4.8.7, a wider perspective on enterprise design was argued. We reiterate the main points:

- The partitioning in O, I, and D activities must be complemented in order to capture the multidimensional complexity of enterprises.
- Formal transaction patterns do not capture the totality of the enterprise reality, since enterprises are characterized by emergence: the occurrence of new, unpredictable, novel developments. These developments are not only manifest pertinent to enterprise strategic change and adaptation but also manifest in 'regular' operational work. People will engage in unpredictable patterns of activity and collaboration. As mentioned, these unpredictable patterns of activity and collaboration lead emerging temporal transactions.
- The importance of employee involvement and employee-centric organizing necessitate focusing on design aspects beyond the perspective offered by the O, I, and D partitioning.
- Requirements, architecture, and areas of concern need to be defined independently of (yet-to-be-defined) transactions and pertinent to functional and constructional design domains, as outlined in Sect. 4.5. Recall that decomposition

into a complete set of practically recognizable functional and constructional design domains is crucial for adequately defining requirements and architecture, as well as for adequately addressing areas of concern. Such design domains are identified in Fig. 4.44.

- The definition of transactions themselves and their specific nature needs a wider context, that is, a context that enables reasoning about the need for, and the nature of, a transaction and the associated operational rules. Such reasoning, for example, about ethical aspects of employment and meaningful work, implies areas of design attention beyond O, I, and D perspectives.

Proper enterprise-wide design assumes a comprehensive view on all relevant enterprise design aspects and hence assumes decomposition into a complete set of subfunctional and constructional design domains. This is what the previous decompositions aim to provide. Nonetheless, it might be that in specific cases other design domains than the ones given in Figs. 4.43 and 4.44 might be identified. In any case, the necessity to define a necessary and sufficient (complete) set of such design domains seems evident for enabling coherent and consistent enterprise design, as argued in Sect. 4.5.8.

The relationships between essential transactions and the enterprise design domains can be visualized as follows. The main enterprise design domains are depicted horizontally in Fig. 4.45. Vertically, the three aspects of the essential partitioning are given: the O, I, and D perspectives. The figure can be understood as follows. The main enterprise design domain 'business' concerns the functional relationships of the enterprises and hence concerns the black-box properties of the

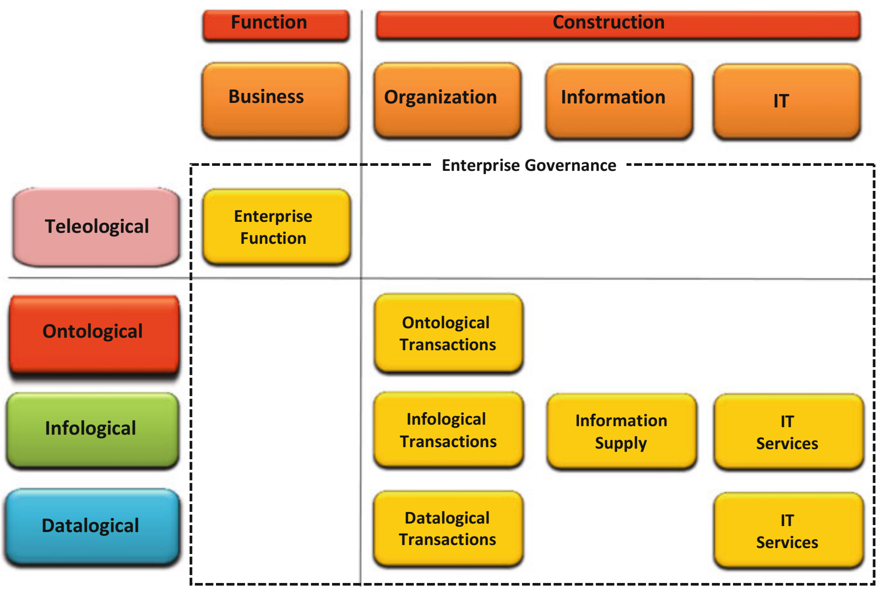


Fig. 4.45 Linkage between main enterprise design domains and essential partitioning

enterprise which are associated with the enterprise teleological perspective: *what* the enterprise must provide for the functional relationships to be established. The main enterprise design domains 'organization,' 'information,' and 'IT' make up the enterprise construction: *how* the black-box properties are brought forward. Designing transactions takes place within the main organizational design domain: the domain of activities. Information supply enables and supports the infological transactions. Finally, IT services support information supply and datalogical transactions insofar data is stored in IT systems, next to other means, such as archives. Figure 4.45 shows the linkage between main enterprise design domains and essential enterprise partitioning.

4.9.5 Enterprise Design and the Morphogenic Enterprise Conceptual System Model

The importance of enterprise coherence and consistency has been amply stressed before. Successful enterprise change and adequate enterprise performance are all contingent upon coherence and consistency. Moreover, these conditions are further important in view of avoiding employee cynicism, distrust, and disengagement. Through a double-sided effect, these latter detrimental conditions resulting from incoherence and inconsistency will further jeopardize enterprise performance and enterprise change. As emphasized before, all components of the morphogenic enterprise conceptual system model must therefore be mutually coherent and consistent and must show congruence pertinent to the common purpose. In view of employee involvement and employee-centric organizing, the topics mentioned in Tables 4.1 and 4.2 of Sect. 4.2.2 are important, more specifically the *behavior context* as defined by enterprise structures and systems, enterprise culture, and management behavior, discussed in Sect. 2.4.9. Empirical evidence demonstrates that successful enterprise change can only be established under coherence and consistency of the behavior context, whereby culture and management behavior turned out to be critical areas of attention (cf. NUMMI-case in Sect. 4.7.8*).

When discussing the enterprise constructional decomposition, we mentioned the difficulty associated with behavior and culture: these aspects must be formally seen as part of the enterprise construction since they determine the enterprise white-box properties and thus the nature of functional relationships. Yet they are difficult to conceive as constructional design domains. Hence, from the perspective of designing the behavior context, the critical importance of enterprise culture and management behavior poses a serious problem since these two components of the behavior context are difficult to address directly. Merely 'instructing' to express different norms, values, and behavior will have little effect since our discussions about the development of culture and the conditions that determine human behavior revealed the strong determining influence of contextual conditions, as summarized in Sects. 2.3.9 and 2.4.9. Massive amounts of money are often wasted on training and

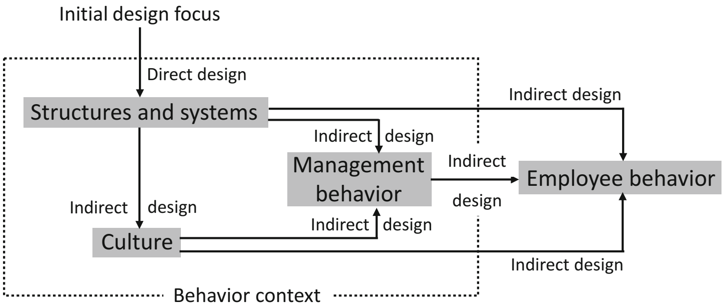


Fig. 4.46 Direct and indirect design facets

education to change employee behavior with no effect because the behavior context remained unchanged and did not support the intended behavior (Beer et al. 2016). Enterprise culture, management behavior, and subsequently employee behavior can thus only be influenced indirectly through changing the contextual conditions that are the topics of direct enterprise design. An important initial focus of enterprise design therefore concerns enterprise structures and systems. Figure 4.46 expresses the direct and indirect design facets graphically.

The two facets of enterprise design are defined as follows:

- *Direct design* Enterprise design that results in a concrete artifact.

The wide range of structures and systems will result in a wide range of concrete artifacts, such as machines, equipment, utilities, offices, production lines, work instructions, operational rules, job profiles, wage structures, information systems, and so on. The introductory chapter defined the notion of 'design' as courses of action aimed at changing existing conditions into preferred ones. Such courses of action also concern changing existing conditions about culture and behavior into preferred ones. So, we define:

- *Indirect design* The intentional change of culture and behavior because of direct design.

For example, changing enterprise performance reporting from an exclusive productivity focus into reporting reflecting quality and service will—combined with other coherent and consistent measures such as concerning assessment and rewards—induce culture and behavior change. Insight into the relationship between direct and indirect design is largely given by the social sciences, such as the theories about human behavior and motivation (Hoogervorst 2018).

As Fig. 4.46 indicates, the starting point for design is the design of the various structures and systems which cover a wide range of topics: reporting, communication, accounting, remuneration, assessment, job profiles, operational rules (work instructions and coordination rules), information supply, work scheduling, recruitment, purchasing, and so on. In view of our focus on employee involvement and the necessary humanization of work associated with the employee-centric view, we consider structures and systems as crucial components of the employee behavior context that must manifest a number of essential attributes in order to evoke employee involvement and afford meaningful work. We have argued that the behavior context must provide and manifest (op. cit.):

- Purpose/meaning.
- Moral/ethical correctness.
- Achievement/personal development.
- Autonomy/self-efficacy.
- Recognition/respect.
- Social belonging/relationships.
- Assurance/trust.

These attributes and those mentioned in Tables 4.1 and 4.2 of Sect. 4.2.2 must be the direct and indirect outcomes of enterprise structures and systems design. As mentioned, the foundational viewpoints of the social sciences serve two purposes: (1) determining the content of the employee-centric approach and (2) explaining the effect of the nature of structures and systems on the attributes of the behavioral context and subsequently explaining how the nature of this context guides employee behavior. As summarized in Sect. 2.4.6, employee behavior and employee involvement must be directed to the enterprise performance areas: productivity, quality, service, enterprise learning, and innovation.

In order to operationalize the direct and indirect design approach in terms of employee-centric organizing and the enterprise performance areas, we need to (1) define areas of concern, (2) define functional and constructional requirements pertinent to the functional and constructional design domains, (3) define functional and constructional architecture, and (4) apply the generic requirements and architecture framework, as well as the generic system development framework in the case of enterprises. The next sections will outline this approach.

4.10 Enterprise Requirements and Architecture Framework

Section 4.5.8 explained the relationships between areas of concern, requirements, architecture, and system design domains. Exactly the same reasoning applies in case the system is an enterprise as the following examples illustrate.

In the example of Fig. 4.47, the area of concern is employee motivation. Two requirements about behavior are formulated. Employee-initiated behavior is a manifestation of employee involvement. In order to evoke such behavior, guidance for direct design must be defined in the form of architecture. Two principles are defined concerning payment and operational rules. The principle about payment reflects insights of motivation theories (cf. Sect. 4.6.4*), while the principle about operational rules creates employee freedom in the performance of tasks (cf. Sects. 4.7.5* and 4.7.7*). The indicated constructional design domains—where requirements are addressed and architecture is applied—are elements of the constructional

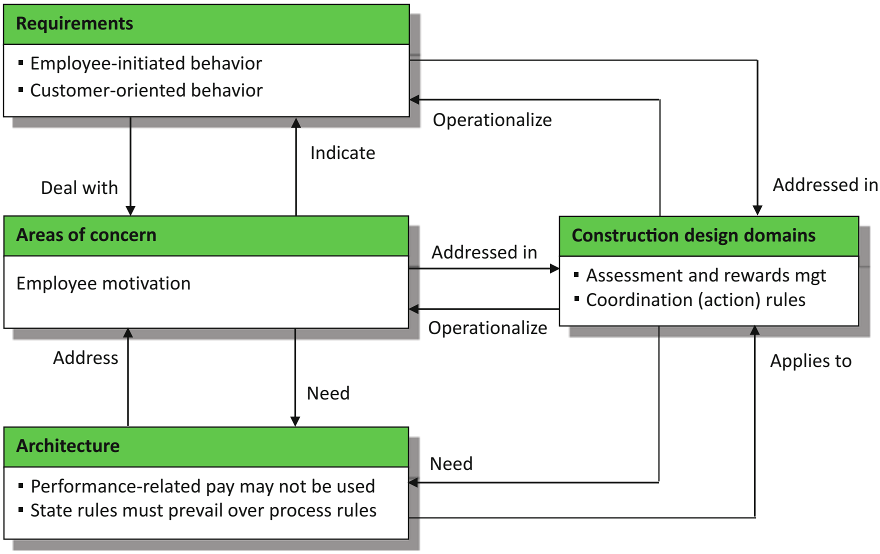


Fig. 4.47 Example of requirements and architecture

decomposition depicted in Fig. 4.44. Note that this example reflects both direct design and indirect design.

In the second example of Fig. 4.48, only direct design takes place based on the concern for security. The requirement for safe network access is addressed in the

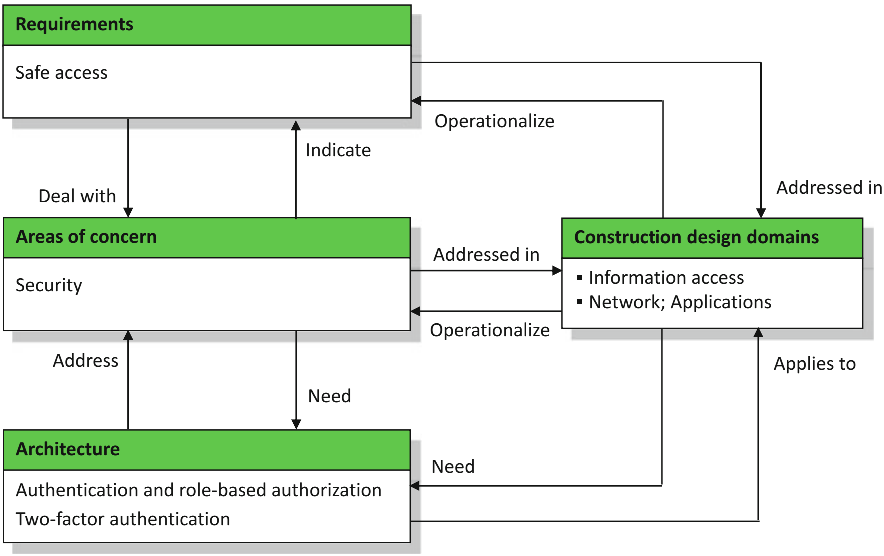


Fig. 4.48 Example of requirements and architecture

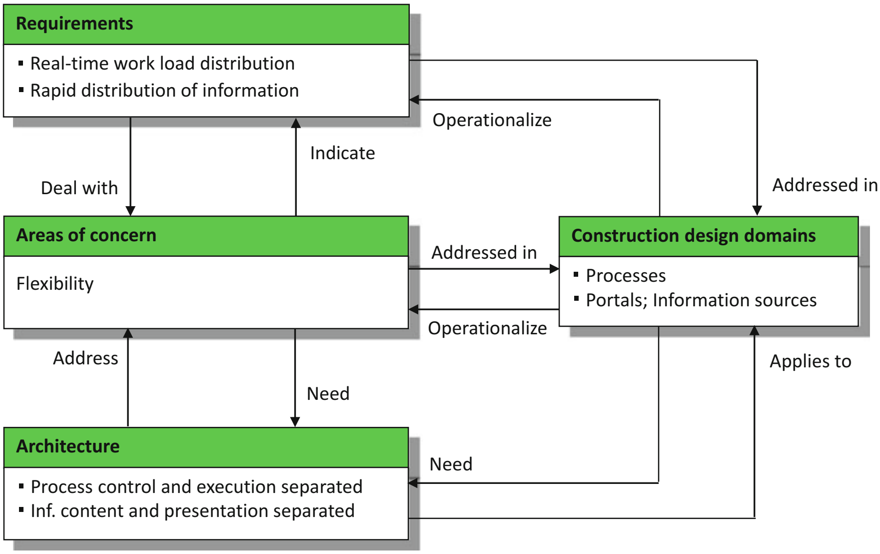


Fig. 4.49 Example of requirements and architecture

constructional design domains indicated, guided by two architecture principles concerning authentication and authorization.

Finally, in the example of Fig. 4.49, the area of concern is enterprise operational flexibility. Two requirements are formulated relative to this concern, which are addressed in several constructional design domains. Design pertinent to these domains is guided by two architecture principles that reflect separation of concerns such that flexibility is enabled.

4.11 Generic Enterprise Development

4.11.1 Generic Enterprise Development Framework

Applying the generic system development framework discussed in Sect. 4.6.1 in the case the system is an enterprise gives the framework depicted in Fig. 4.50. Note that the generic requirements and architecture framework discussed previously is part of the generic enterprise development framework. The various elements of the framework will be discussed in the next paragraphs.

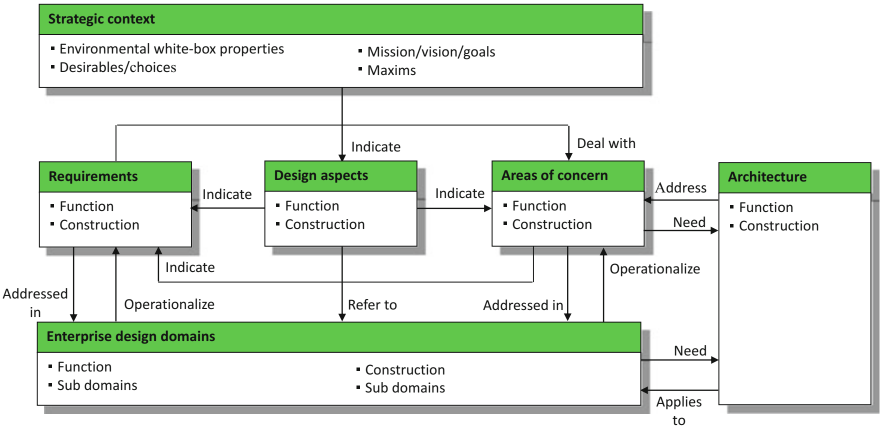


Fig. 4.50 Generic enterprise development framework

4.11.2 Strategic Context: The Environmental Using System

Seeing the enterprise as a system with various functional relationships, we envision the enterprise as the *provisioning system* and the enterprise environment or context as the *using system*. In terms of our discussion in Sects. 4.3.2 and 4.3.4, knowledge about the construction of the using system must be available for defining the black-box properties of the provisioning system (enterprise) in order to design proper functional relationships. Figure 4.51 shows various white-box properties of the using system: the environmental 'construction' with wants and needs that define the

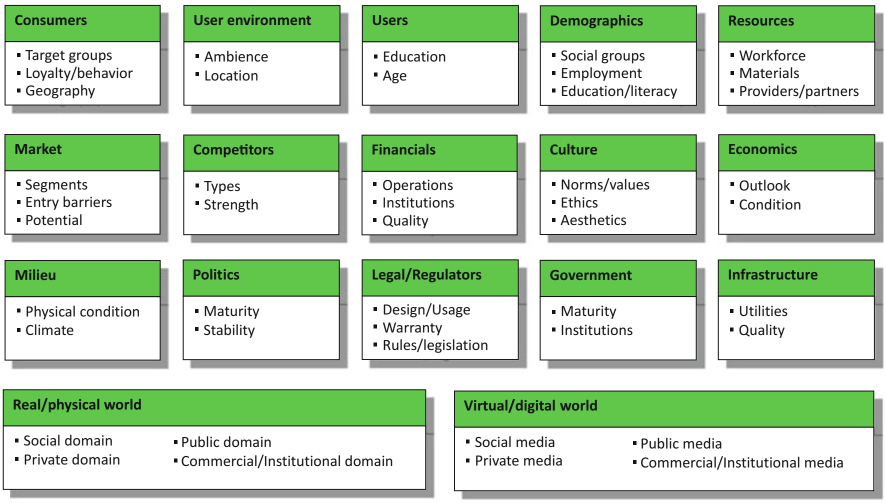


Fig. 4.51 White-box properties of the enterprise environment

functional relationships with the black-box properties of the enterprise. A wide spectrum of wants and needs can be envisioned, not only determined by consumers but also by market, economic, political, or legislative conditions, to name but a few aspects. Obviously, the relative importance of the various white-box properties of the enterprise environment is contingent upon the type of enterprise, the products and services provided, as well as various other functional relationships the enterprise intends to have. Nonetheless, generally speaking, the white-box properties of the enterprise environment and the associated wants and needs thus identify the enterprise strategic context, which is defined as:

- *Strategic context* The reference for formulating strategic desirables, as defined by white-box properties of the enterprise environment (using system) and other orientations, such as the enterprise purpose, mission, vision, goals, maxims, and associate strategic desirables and choices.

4.11.3 Design Aspects

As Fig. 4.50 shows, the strategic context is the basis for creating an initial orientation about topics that need to be addressed, in yet-to-be-defined ways, by enterprise design. Similarly as in Sect. 4.5.1, we define design aspects as:

- *Design aspects* A comprehensive set of initial and preliminary attention areas for enterprise design which are formulated based on the strategic context, or reasoning about the strategic context.

In view of the main enterprise design domains business, organization, information, and IT, we will present some relevant design aspects relative to these domains.

Business Design Aspects
The business design aspects concern the functional relationships between the enterprise and its environment. Some of the typical functional relationships have been identified before when discussing the functional decomposition. In most cases, the business design aspects shown in Fig. 4.52 are relevant. Some design aspects might be taken directly from statements and intentions of the strategic context, such as products and services, market, customers, and competitors. Others follow from reasoning about the strategic context, such as concerning the economic or revenue model, the type of channels, and so on. Note that some of the business design aspects correspond to business design domains mentioned in Fig. 4.43.

Organization Design Aspects
Important organizational design aspects are given in Fig. 4.53 and structured in three categories: social context, behavior context, and structural functionalist context. They represent important areas of attention that design should address. However, some of the aspects shown in Fig. 4.53 cannot be directly addressed by design. As indicated previously, aspects such as culture, management behavior, employee

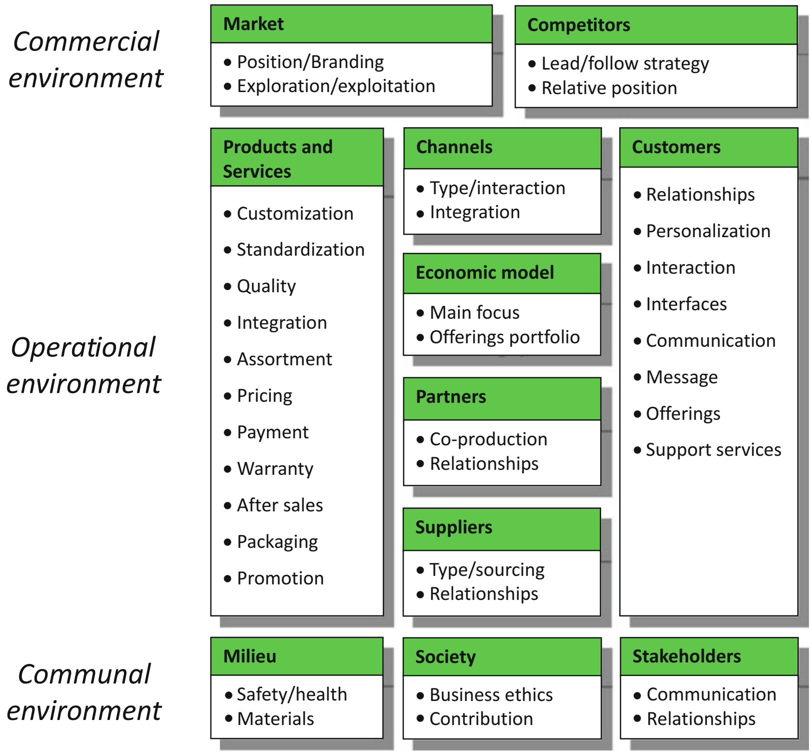


Fig. 4.52 Business design aspects

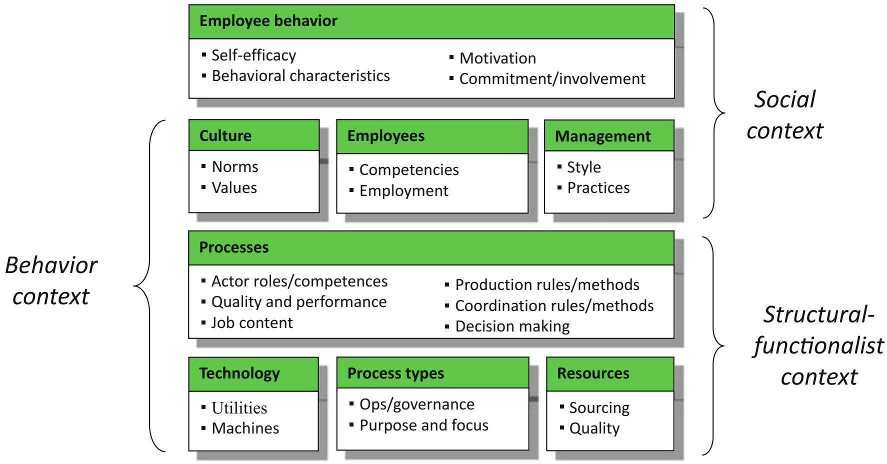


Fig. 4.53 Organization design aspects

behavior, motivation, commitment, and involvement can only be designed indirectly. For these indirect design aspects, the initial design focus lies on the constructional design domains indicated in Fig. 4.44 of Sect. 4.9.3. Nonetheless, it is important to explicitly consider the organizational design aspects since (1) the design aspects identify important topics of indirect design; (2) identify important areas of concern, such as concerning behavior and motivation; and (3) stress the importance of design aspects beyond the traditional structural functionalist topics. Note that some of the organizational design aspects correspond to organizational design domains mentioned in the decomposition of Fig. 4.44.

Various process types were identified as constructional design domains in the constructional decomposition of Fig. 4.44: operational, support, and governance processes. Table 4.9 summarizes some specific operational and support processes.

Information Design Aspects
The information design aspects concern the utilization and administration of information (probably better identified as 'data'). Also the foundational aspects of data are relevant, such as the structure of data, their meaning (avoiding multiple interpretations), and the quality of data. The latter aspect has to do with the confidentiality and currentness of data, as well as concerns security for avoiding unauthorized use of data (Fig. 4.54).

IT Design Aspects
As the topics expressed by Fig. 4.55 illustrate, IT design aspects regard the use of IT systems and their infrastructural characteristics.

Table 4.9 Operational process types

Process types		
Externally oriented	Internally oriented	
Access management	Accounting	Maintenance
Customer relations mgt	Archiving (storage/retrieval)	Logistics/warehousing
Goods return	Assessment and rewards mgt	Personnel administration
Invoicing (to customers)	Auditing	Production
Legal/insurance management	Catering	Quality control
Marketing	Document management	Salary/payroll management
Ordering/sales/acquisition	Facilities management	Security management
Partner relations management	Health management	Staff scheduling
Payment (customer/enterprise)	Information management	Training
Product delivery (transport)	Information system services	Utilities management
Public relations management	Internal communication	Working environment mgt
Purchasing (by the enterprise)	Internal reporting	Work preparation
Recruitment	Knowledge management	Work scheduling
Reputation management		
Stakeholder relations mgt		

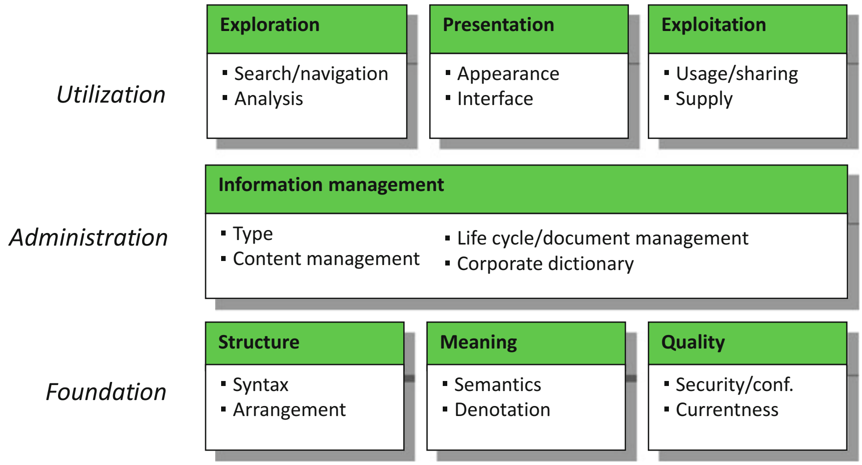


Fig. 4.54 Information design aspects

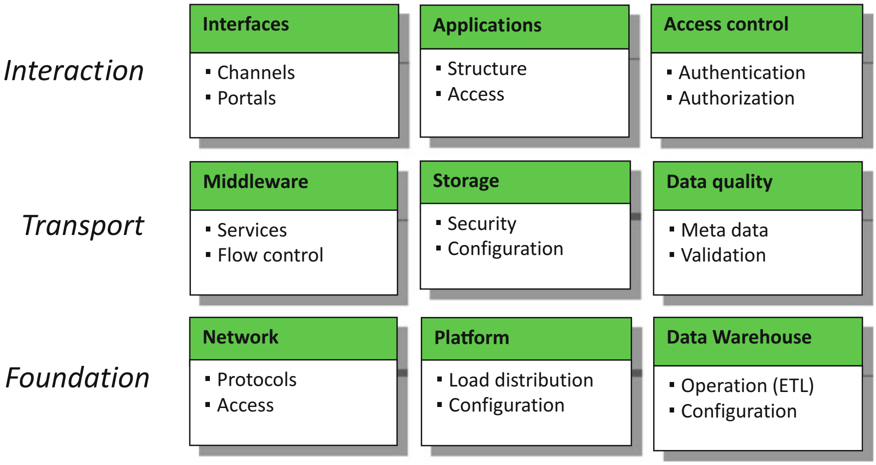


Fig. 4.55 IT design aspects

4.11.4 Areas of Concern

As the generic enterprise development framework indicates, the design aspects—the comprehensive set of initial and preliminary attention areas for enterprise design—must be further formalized in either functional and constructional requirements or areas of concern. Based on our discussion in Sect. 4.5.1, we define an area of concern as:

- *Area of concern* A generic characteristic that the black-box and/or white-box enterprise properties must manifest.

Table 4.10 Examples of enterprise areas of concern

Enterprise areas of concern	
General	
Integration	Scalability
Adaptability, flexibility	Efficiency
Ethics	Safety, health
Business	
Customer satisfaction	Service and support attitude
Environment	Business intelligence
Organization	
Employee involvement, motivation	Quality (process, product, service)
Meaningful work	Knowledge sharing
Norms and values (culture)	Security, safety
Teamwork	Compliance with rules and regulations
Management as leadership	Reliability, availability
Learning, innovation	Cleanliness
Information	
Security	Currentness
Consistency	Trustworthiness
IT	
Availability, reliability	Security
Maintainability	Interoperability

Numerous areas of concern can be identified for enterprises. Table 4.10 summarizes some important ones categorized according to the main organizational design domains.

4.11.5 Functional and Constructional Requirements

Recall from Sect. 4.5.2 that requirements are:

- *Requirements* A coherent and consistent set of functional or constructional wants and needs that are addressed through design in certain functional and/or constructional design domains. Requirements express *what* is wanted and needed, hence *what* the enterprise must manifest.

Next to areas of concern, requirements provide the second formal way to address the initially formulated design aspects. Various requirements can be envisioned, contingent upon the specific enterprise or a part thereof that is (re)designed. As the generic requirements and architecture framework and the generic enterprise

Table 4.11 Requirements indicated by areas of concern

Main design domain	Area of concern	Requirement
Business	Efficiency Currentness	Customers must be able to manage their own data
	Customer satisfaction	Status reporting about customers' orders
Organization	Quality, efficiency	Real-time workload distribution
	Business ethics	Employment for (15%) disabled staff
Information	Currentness	Easy data extraction from operational systems to information systems
	Security Compliance	Secure access to enterprise information sources
IT	Adaptability	Capability to quickly reconfigure IT services
	Reliability	No single point of failure for critical IT systems

development framework indicate, areas of concern might indicate requirements. Conversely, when the requirement materializes through design, the area of concern is dealt with. Stated otherwise, when the requirement is effectuated through design, the area of concern is implicitly addressed. Table 4.11 shows some examples of requirements categorized according to the main enterprise design domains: business requirements as the enterprise functional requirements and organization, information, and IT requirements as the enterprise constructional requirements.

As the examples in Table 4.11 show, a requirement might be relevant for more than one area of concern. Besides the concerns mentioned, the requirement that customers must be able to manage their own data is also likely to positively affect customer satisfaction. A requirement can thus deal with more than one concern. On the other hand, a concern might be dealt with by more than one requirement. All that contributes to enterprise coherence and consistency since different enterprise aspects of design are aligned pertinent to the same concern. Although Table 4.11 only mentions the main enterprise design domains, the associated subdesign domains can be readily identified. For example, the business requirements mentioned in Table 4.11 concern customer relationship management (cf. Fig. 4.43), while organization requirements refer to processes and employees' employment conditions (cf. Fig. 4.44). Arguably, the complete set of subdesign domains of the functional and constructional decomposition aid in formulating a complete set of functional and constructional requirements.

Using the same categorization according to the main design domains, Tables 4.12, 4.13, 4.14, and 4.15 show some additional examples of business, organization, information, and IT requirements.

Table 4.12 Examples of business (functional) requirements

Business requirements
Products and services offerings must enable customization
Commercial activities must be based on quickly and intelligently following competitors
Customers must be able to manage their own data
Secure and user-friendly internet access
All sales interactions must be supported by integrated and easy to use payment services
Products and services design and delivery must comply with applicable rules and legislation
Easy to use goods return and refund services
Status reporting about customer orders
All customer interaction channels must be integrated
Helpdesk open 24/7
Efficient website yielding high customer productivity
Marketing and recruitment website must be integrated
Easy to use website to capture customer experiences and manage subsequent follow-up
Product and services design may must secure their safe utilization
Website availability must be higher than 99.8%

Table 4.13 Examples of organization (constructional) requirements

Organization requirements
Real-time workload distribution
Short time-to-market for new products and services
Capability to quickly reconfigure services and processes
Employment for (15%) disables staff
Health, safety, and environmental conscience processes
Full use of employee capabilities
Rules and regulations only in evident and inevitable cases
Rules and regulation should have meaning and purpose for employees
Employee self-efficacy
Culture directed to improvement, problem solving, and taking initiative
Management behavior that expresses leadership
Management behavior directed to employee enablement
Employee behavior directed to cooperation and knowledge sharing
Employee involvement and commitment
Technology must enhance customer and employee productivity and comfort
Organizational coherence and consistency

Table 4.14 Examples of information (constructional) requirements

Information requirements
Integration and transparency of all customer and production data
Customer recognition in a consistent manner at all customer-employee contact points
Availability of all customer information at all customer contact points
Unification of all structured and unstructured data for improving services and processes
Integration of all customer data
Easy to use data analysis and search capabilities
Maximum information support for employee tasks and decision-making
Capabilities for knowledge sharing
Easy data extraction from operational systems for informational systems
End-user customization for the presentation of information
Information denotation uniform enterprise-wide
Information life cycle management capabilities
Secure access to enterprise information sources
Classification of (sensitive) information
No departmental restrictions for information utilization enterprise-wide

Table 4.15 Examples of IT (constructional) requirements

IT requirements
Short time-to-market for new IT services
Seamless interoperability of systems, networks, data sources, and interaction channels
Capability to quickly reconfigure IT services and processes
Removal of legacy complexity
Attaining an industry-comparable cost level
IT operational (continuity) cost lower than 60% of total IT costs
Secure and user-friendly access to networks, applications, and data
Cross-functional transparency of all user interfaces
IT should enhance customer and employee productivity
Unified databases
IT systems availability > 99.9%
Seamless integration of legacy IT systems with web-based systems
No single point of failure for critical IT systems
Maximum use of employee-owned access devices
Social media application integration with operational systems

4.11.6 Functional and Constructional Architecture

Based on our discussion in Sect. 4.5.2, we define:

- *Enterprise architecture* A coherent and consistent set of principles that guide enterprise design.

Recall from the frameworks discussed before that architecture formally addresses areas of concern through design guidance that is applied in design domains. Since we have identified four main enterprise design domains, there are likewise four main sets of architecture: business architecture as the enterprise functional architecture and organization, information, and IT architecture as the enterprise constructional architecture. Table 4.16 gives some examples, categorized by the main enterprise design domains.

As with requirements, a concern can be addressed by more than one architecture principle, while conversely, an architecture principle might address multiple concerns. Different enterprise design domains are thus aligned pertinent to the same concern. Arguably, this significantly contributes to enterprise coherence and consistency and once again underlines the importance of decomposition of the main enterprise design domains into a complete set of functional and constructional subdesign domains (cf. Figs. 4.43 and 4.44). These subdesign domains can be readily identified for the examples presented in Table 4.16.

Other examples of architecture are given in Tables 4.17, 4.18, 4.19, and 4.20, again categorized by the main enterprise design domains.

Table 4.16 Architecture addressing areas of concern

Main design domain	Area of concern	Architecture
Business	Customer satisfaction, employee motivation	Customer agents must handle requests/complaints end-to-end (no delegation)
	Adaptability	Interaction channels must separate content from presentation
Organization	Quality, security, compliance	Sales and purchasing processes must have non-repudiation protection
	Quality, employee motivation	Quality control must take place at the point of production
Information	Customer satisfaction, service, currentness	Data from operational systems must update information systems in real time
	Security, compliance	Classified data access must record its purpose
IT	Adaptability	Integration services may not contain business logic
	Security	Data transport over public lines must be encrypted

Table 4.17 Examples of business (functional) architecture

Business architecture
Products and services offerings may only be composed with predefined modules
Product delivery through specified third-party courier service only
Customer agents must handle customer requests/complaints end-to-end (no delegation)
Customer-managed relationships only via our website
All marketing/sales communication must follow corporate identity policies
Products and services must be offered through direct sales only
All customer interaction channels must separate content from presentation
All formal customers interactions must be confirmed
All invoicing and payment must be handled digitally only
Access to the customer account files must be based on two-factor authentication
Complementary service offerings of business partners only through our sales channels
Suppliers may gain access to our network through our virtual private network only
Product and service marketing/sales must explicitly disclose consumer rights
Product delivery only after payment
Products and services design and delivery must comply with applicable rules and legislation

Table 4.18 Examples of organization (constructional) architecture

Organization architecture
Contract, sales, procurement, and payment processes must have non-repudiation protection
Decision-making must take place at the lowest possible organizational level
Accounting procedures must be in accordance with the International Financial Reporting Standards
Individual performance-related pay systems and management may not be used
Appraisal systems must focus on individual employee development
Processes coordination (action) rules must enable employee self-management
Performance indicators must be based on team/unit purpose and meaning
Staff functions may not have operational management authority over operational teams/units
Coaches supporting self-managing teams may not have managerial roles
Individual team members may not hold more than two coordinating roles
Self-managing team may not exceed *x* employees
Process control logic must be separated from execution logic
All processes requiring authentication/authorization must store related operational data
Competence descriptions must express and be consistent with espoused norms and values
All operational authentication/authorization must be linked to personnel data
Process design must exclude the necessity for data reconciliation
Local efficiency must be subordinated under end-to-end process performance
Process coordination (action) rules must be consistent with espoused norms and values
Actor role clustering into org. units must be based on minimizing external relationships
Control of quality should take place at the point of production
Only certified material and equipment may be used
Maximum/minimum salary ratio must be 15

Table 4.19 Examples of information (constructional) architecture

Information architecture
Data from operational systems must update informational systems real-time
All informational data may have only one authorizing source
Authentication and authorization data must be stored centrally
Access to classified data must be based on authentication and role-based authorization
Type and purpose of information must be consistently linked to presentation style and form
Information structure must be based on the XML standard
Supplier data must be available from one unified source
Semantics must be consistent over all processes and in accordance with the corporate dictionary
Data to authenticate/authorize users must be taken from one central directory
Operational data must be separated from informational data
User authentication/authorization must be based on one service only
Metadata must be centrally managed
Classified data access must record the access purpose
Process events must be recorded in read-only data storage
Redundant data entry is not allowed

Table 4.20 Examples of IT (constructional) architecture

IT architecture
Portlets must disclose resources using a service-oriented approach
Integration services may not contain business logic
Back-office applications may not contain brand-specific logic
Remote access must be based on two-factor authentication
Data content and presentation must be separated
All message definitions must have a documented content
Asynchronous messaging must be considered before synchronous messaging
Each portlet may correspond to one service only
A business component must be able to communicate its state
Data transport over public lines must be encrypted
Portlets may not bypass security of back-end resources
Separate execution of a business component from flow control
Legacy system access must use ‘service wrappers’
Databases must be partitioned
Data warehouses must be read-only

4.11.7 Publication of Requirements and Architecture

Section 4.5.9 argued the importance of proper publication of requirements and architecture according to the four-tier structure. Several examples are given in Figs. 4.56 and 4.57.

Figures 4.58, 4.59, 4.60, and 4.61 will present examples of architecture publications.

Requirement
Easy to use goods return and refund service

Rationale
We aim at quality-sensitive customers expecting high levels of service. The service for returning goods and refunds is expected to increase customer satisfaction, hence, increase customer retention, which is an important condition for our firm's continuation and growth.

Implication
Increased inventory costs and item rejects.

Key actions
Develop seamless goods return capabilities as part of our web portal.
Research the ability to use a packaging and transport service aiding customers.
Develop operational rules for returning goods and refunds.

Fig. 4.56 Example of a business (functional) requirement publication

Requirement
Employment for 15% disabled staff

Rationale
Our company has always been known for its environmental and societal concerns. The latter concern is addressed by making positions available for disabled persons in our community.

Implications
Factory lay-out, administrative or production means and processes are likely to be affected.

Key actions
Investigate in what administrative or production areas disabled staff might be successfully employed.
Develop associated organizational arrangements.

Fig. 4.57 Example of an organization (constructional) requirement publication

<u>Principle statement</u>
All invoicing and payment must be handled digitally only.

<u>Rationale</u>
The digital form of invoices and payment allows easy integration of these processes with other enterprise processes (e.g. financial and accounting process). Process quality is increased, and the complexity of processes – hence costs – is reduced due to the significant reduction of manual interventions. Customer satisfaction will most likely increase. Further, the process are faster in execution, while they can be more easily adapted to business growth. The electronic nature of the processes enable greater security and adherence to rules and regulations.

<u>Implications</u>
Current non-electronic forms of invoicing and payment must be reduced gradually. This has consequences for some customers and the internal administrative staff. Specific implications are faced by customers without acceptable electronic means.

<u>Key actions</u>
Investigate solutions for electronic invoicing and payment services.
Consider the consequences for the current administrative staff.
Investigate possible solutions (or exceptions) for those customers not having (or unlikely to have) adequate means to handle invoices and payment electronically.
Define under which conditions exceptions to the principle must be granted.
Define the requirements for electronic invoicing and payments services.
Develop electronic invoicing and payments services as part of our commodity services.

Fig. 4.58 Example of business (functional) architecture publication

<u>Principle statement</u>
Quality control must take place at the point of production (by production employees themselves).

<u>Rationale</u>
In view of our quality strategy, separate quality inspectors are not conducive to employee involvement with, and commitment to quality. Dedication to quality must be an inherent part of production employees behavior. Hence, separate quality inspectors rather reduce than enhance this dedication.

<u>Implications</u>
Task enhancement of production staff.
Possible wage increase.
Discontinuation of the quality inspector functions.

<u>Key actions</u>
Define and arrange production staff training.
Investigate remuneration aspects.
Investigate and arrange new employment possibilities for the current quality inspectors.

Fig. 4.59 Example of organization (constructional) architecture publication

Principle statement
Data from operational systems must update informational systems real-time.

Rationale
Information is a key enterprise 'resource'. Timely availability is key in order to control enterprise processes adequately and respond to otherwise unnoticed trends and developments. These might for example concern quality degradations, material consumption or consumer behavior. Improved process performance, business intelligence, as well as security and compliance are the result of timely availability of information. Moreover, the 'real-time' enterprise offers opportunities to enhance the customer and service orientation, since customer data is always current and can be used productively and proactively in all subsequent customer interactions.

Implications
Data must be considered as a corporate asset. No restrictions on their utilization outside the domain where the data are generated should exist. Operational processes should not limit the extraction of informational data.

Key actions
Study how different types of operational data must be extracted, transformed, and loaded (ETL) into unified informational databases.
Define ETL, back-up, (re)store, replication, synchronization, archiving, and reporting services in the context of data warehousing.

Fig. 4.60 Example of information (constructional) architecture publication

Principle statement
Resource access must be location-independent and only based on the resource name.

Rationale
Flexibility and speed is a crucial enterprise area of concern. Access any place and any time is crucial. This principle also enables role-based access.

Implications
The enterprise business must conform to the corporate naming standards.
Partner and supplier resource names must be known.

Key actions
Develop Dynamic Naming Service linked to the global Corporate Directory Service, containing user, server, and workstation profiles.
Investigate and migrate instances not compliant with this principle.
Develop corporate naming standards.

Fig. 4.61 Example of IT (constructional) architecture publication

4.11.8 Coherence and Consistency of Requirements and Architecture

Section 4.9.1 mentioned the strong mutual relationships between the main enterprise design domains as graphically depicted in Fig. 4.40. Associated with the main enterprise design domains are four main sets of enterprise requirements and enterprise architecture, like those exemplified by the previous examples of functional and constructional requirements and architecture. The strong mutual relationships between the main enterprise design domains and the necessity for enterprise coherence and consistency thus implies strong relationships between the four sets of requirements and architecture as Fig. 4.62 depicts. Hence, the four sets must be mutually coherent and consistent which the formal publication helps to achieve.

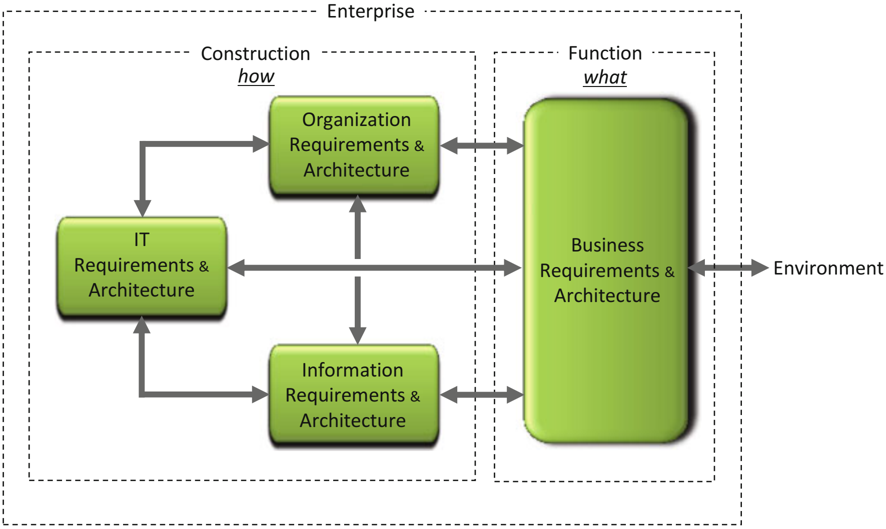


Fig. 4.62 Mutual relationship between four sets of requirements and architecture

The importance of the formal publication of requirements and architecture has been discussed in Sect. 4.5.9. As the examples in the previous paragraph show, the rationale of a requirement or architecture principle provides the clear and formal linkage between strategic intentions and desirables on the one hand and design considerations and activities on the other hand. This clear and formal linkage provides the first formal foundation for the successful operationalization of strategic desirables and hence provides the first formal foundation for realizing strategic desirables in a coherent and consistent way. This foundation is further provided through the defined key actions. Recall that key actions might be needed for addressing certain implications or conditions of a requirement or architecture principle, as well as for establishing conditions for architecture compliance. The previous examples clearly illustrate that key actions define the initial activity portfolio. Later activities that become part of this portfolio follow from the design process itself. All these activities are developed and operationalized within the inquisitive, creative process of design outlined in Chap. 3. The publication of, and the discussion about, requirements and architecture must ensure that they are coherent and consistent. This subsequently ensures that the formal portfolio of activities is coherent and consistent since activities are based on coherent and consistent sets of requirements and architecture. We have criticized the idea of 'portfolio management' as a relatively autonomous activity for defining or selecting projects based on the erroneous assumption that such 'management' of a project portfolio would safeguard the enterprise coherence and consistency and would ultimately lead to successfully operationalizing strategic desirables and areas of concern (cf. Sect. 3.2.10).

Since enterprise change activities are the central topic of the enterprise governance competence—with an essential role for the central governance function discussed in Sect. 3.2.9—also ensuring the proper definition and publication of requirements and architecture is an important task of the central governance function. Publication of requirements and architecture is thus is a key aspect of enterprise governance. The case study discussed in the next chapter will further illustrate the role of the central enterprise governance function.

4.12 Enterprise Design Process and Enterprise Change

4.12.1 The Inquisitive Process Revisited

The previous chapter discussed enterprise change and the realization of strategic desirables (choices, intentions, initiatives). Two main categories of strategic desirables can be identified. The first is desirables that concern the functional relationships of the enterprise with its environment, formed by customers, business partners, suppliers, and other stakeholders, and hence concern the black-box properties of the enterprise. The second is strategic desirables regarding the manner in which the functional relationships are brought forward. Hence, this second category concerns the white-box properties of the enterprise: the way of working which is expressed by the internal arrangement—the construction—of the enterprise. Both categories of strategic desirables must be formally operationalized in and through the inquisitive process: the creative process of enterprise design. Through the multidisciplinary inquisitive process, the ongoing, unknowable, and unpredictable stream of experiences associated with strategic issues and the ill-defined realm of strategic desirables are coped with and addressed coherently, together with all relevant stakeholders. As amply outlined, the process is iterative, evolutionary, and emergent, gradually yielding clarity for the various issues. Once again, the inquisitive process is a crucial element of enterprise governance.

The concepts of the enterprise engineering theories, methodology, and methods are applied within the inquisitive process. Taking the phases of enterprise realization discussed in Sect. 3.2.8 as a reference, we can create a graphical conceptual overview by complementing Fig. 3.7 with the essential concepts of enterprise design. This conceptual overview is shown in Fig. 4.63. With reference to the frameworks discussed before, the conceptual overview can be readily understood. Strategic desirables that are formulated based on the strategic context lead to design aspects: the initial areas of attention for design which indicate functional and constructional requirements and areas of concern. Through the design activities within the inquisitive process, the requirements and areas of concern are addressed since it is *design* that materializes what is desired. Nothing else can. Of crucial importance is enterprise architecture because of explicitly providing design guidance for (1) addressing an area of concern specifically and (2) ensuring enterprise coherence and consistency. As outlined, design starts with developing essential enterprise models and ends when construction models are developed that can be implemented. The construction models define the conceptual realization of the

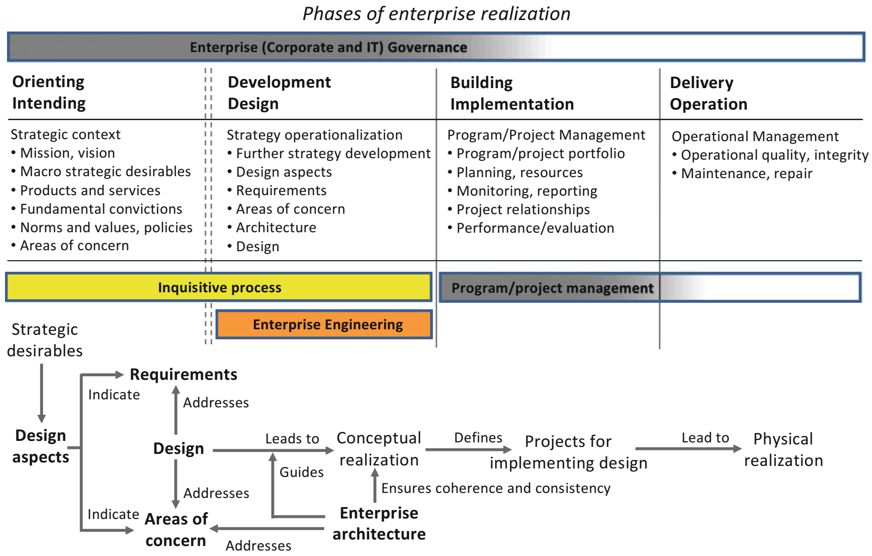


Fig. 4.63 Conceptual overview

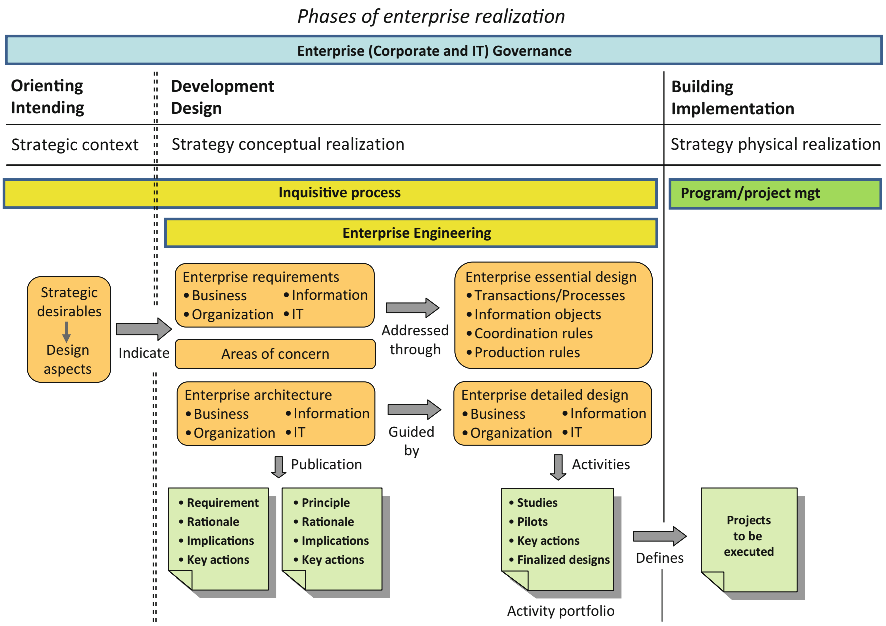


Fig. 4.64 Conceptual overview

enterprise or parts thereof. Then and only then can projects be defined for implementing design leading to the physical realization of what is desired. Another way to present the conceptual overview is given in Fig. 4.64.

Similarly as in Fig. 4.63, based on the strategic context, the formulation of strategic desirables leads to design aspects which indicate functional and constructional requirements and areas of concern. Four main sets of enterprise architecture need to be defined (or adopted if already available) for guiding enterprise design in order to address areas of concern and ensure enterprise coherence and consistency (unity and integration). Publication of requirements and architecture is an important aspect of enterprise governance and defines key actions that become part of the activity portfolio. Enterprise design starts with devising the essential enterprise models (transactions/processes, information objects, and operational rules) subsequently followed by detailed design guided by enterprise architecture. Since the inquisitive process is all about clarifying how to precisely operationalize strategic initiatives, it is highly likely that in the process of clarifying, studies or pilots have to be carried out for acquiring relevant knowledge. These studies and pilots are additionally part of the activity portfolio. Then and only then, when designs are finalized, and hence when certain aspects of the conceptual realization are completed, can projects be defined for implementing a design.

4.12.2 Enterprise Change: More than Merely Design but Based on Design

We have outlined in the introductory chapter that changing existing enterprise conditions into preferred ones involves enterprise design. In view of our previous discussion, enterprise design concerns the conceptual realization of the preferred conditions. Enterprise change thus involves (re)design. Things desired do not develop spontaneously but have to be intentionally created (cf. Sect. 1.1.1). Successful change without adequate enterprise (re)design is inconceivable since design clarifies *what* needs to be done, as outlined in Chap. 3. Nonetheless, successful enterprise change is not synonymous with creating and implementing a (re)design, because of the needed buy-in, support, and commitment of those involved with the (re)design. As discussed in Sect. 3.2.4, an important aspect of the inquisitive process is therefore the involvement of stakeholders. Various complementary processes and techniques can be used to organize stakeholder involvement, solicit their input, and create conditions for support (Caluwé and Vermaak 2000; Barrett and Fry 2005; Burns 2007). Discussion of these techniques falls outside the scope of our current discussion. However, using such techniques without the centrality of enterprise (re) design is fruitless since the very content about which involvement, input, and support must be developed comes from the process of design. Indeed, design clarifies *what* needs to be done and thus *what* needs to be discussed. Hence, within the scope of our discussion, we consider enterprise change from the perspective of enterprise (re)design. Within this perspective, the central process of consideration is the design process discussed before, as conceptually depicted in Figs. 4.63 and 4.64. The following example will further illustrate this process.

Table 4.21 Illustration of enterprise change topics

	Function	Construction		
	Business	Organization	Information	IT
Improvement goals	Increase customer satisfaction	Lower complaint response time Reduce admin errors	Improve accuracy and currentness of customer information	
Purpose	Stop defecting customers			
Involved actor roles		Contract starter/ender Invoice administrator Complaint handler		
Involved operational tasks		Contract handling Invoicing Complaint resolution	Recording customer information	Extraction, transformation, loading
Key requirements	Easy complaint filing Progress reporting	Real-time work load distribution	Integration of all (un)structured customer information	Unified databases
Key architecture	All formal customer interactions must be confirmed	Customer processes must have non-repudiation protection	Semantics must be compliant with the corporate dictionary	Data must be validated at the source
Key actions	Define formal customer functional relationships	Employee training Redesign complaint handling	Define corporate dictionary	Define ETL processes

We will use the elements of Table 4.21 to structure our discussion about the enterprise change example. Consider an enterprise that faces the problem of low customer satisfaction and considers customer satisfaction as an area of concern. With reference to the main enterprise design domains, low customer satisfaction relates to the design domain ‘business’ and characterizes an inadequate functional relationship. Hence, a strategic desirable or improvement goal is increasing customer satisfaction with the purpose of stopping defecting customers. This is the starting point reflected by the lower-left quadrant of Fig. 3.4 in Sect. 3.2.4 and the lower-right point in Fig. 3.5 of Sect. 3.2.5. Through the inquisitive process, root causes of low customer satisfaction are identified: high complaint response times, administrative errors, and not up-to-date customer information. Subsequent improvement goals are defined as indicated in Table 4.21, pertinent to the main enterprise design domains ‘business,’ ‘organization,’ and ‘information.’

In view of the importance of essential enterprise modeling, the actor roles involved with the activities to be improved should be identified. If essential models are not available, they must be developed in order to clarify the essential operational tasks involved. Various requirements will play a role, of which only a few can be identified in Table 4.21. This likewise holds for architecture principles and key actions. Through design, guided by architecture, the requirements are operationalized such that improvement goals are realized. Note that the topics mentioned in Table 4.21 are merely of structural functionalist nature. For increasing customer satisfaction, many other issues need to be addressed coherently and consistently such as those concerning performance reporting, rewards, behavior, norms and values, etc. Nonetheless, the structure of Table 4.21 might aid in conceptualizing enterprise change.

4.13 Implications of the Poietical Foundation

In this chapter, the fundamentals of enterprise design were outlined. The implications of these fundamentals are summarized below:

1. Two pillars underlie the foundation for creating and making enterprises: enterprise governance and enterprise engineering. Enterprise design, with enterprise engineering as the design science, must be the central aspect of enterprise governance since enterprise change is effectuated through design, while certain aspects of enterprise engineering contribute to governance in the form of architecture that expresses guidance for future change and design.
2. Enterprise governance, introduced in Chap. 1 and further discussed in Chap. 3, is positioned as an organizational *competence*—the unified and integrated whole of skills, knowledge, culture, and means—for continuously inciting enterprise adaptive and reshaping initiatives and their unified and integrated operationalization through enterprise (re)design and subsequent implementation. Change is not something that mostly originates from 'the top.' On the contrary, enterprise adaptive and reshaping initiatives come from 'within' the enterprise. Enterprise governance must thus be positioned as *distributed governance*, as the Law of Requisite Variety requires.
3. Since establishing enterprise unity and integration is crucial, enterprise governance must be effectuated over the domain for which unity and integration is required since all enterprise governance activities must cover the totality of the domain. Network or chain integration thus necessitates (also) enterprise governance for the totality of the network or chain in order to address topics and stakeholders that need the integral approach. Different levels of observation are thus associated with the notion of 'enterprise.'
4. Adding to the previous point, the theories, methodology, and methods used for enterprise design must be able to address the multidimensional aspects of enterprises. Enterprise design is thus inherently multidisciplinary. Enterprise governance must be arranged such that the multidisciplinary aspects can be brought into an integrated approach, aided by enterprise engineering. These conditions are all too often not satisfied. This leads to partial, fragmented solutions to problems

that require integrated solutions. Separate (executive) management functions concerning IT governance and corporate governance should be avoided and contained in one overarching (executive) function concerned with enterprise development and change.

5. The first step in developing the enterprise governance competence and applying the enterprise engineering design science is establishing the central enterprise governance function discussed in Chap. 3 and further illustrated in the next chapter. In view of the previous point, this function has a multidisciplinary focus, maintains productive relationships with the various stakeholders concerned with enterprise change, and carries out the inquisitive process wherein design takes a central place. The central enterprise governance function must be positioned at the right level, as mentioned in point 3. Overall, this central function is the very basis for gradually enhancing the maturity of the enterprise governance competence.
6. Enterprise change—the adaptive and reshaping initiatives—always involves the two phases of change discussed in Chap. 3: the creative phase and the algorithmic phase. This chapter mainly addressed the creative phase. Nonetheless, the algorithmic phase wherein enterprise designs are built or implemented is evidently important. The central enterprise governance function must be competent pertinent to both phases. However, the two phases must be clearly distinguished, and methods that are applicable for the algorithmic phase (such as project management) may never be used in the creative phase, as Chap. 3 has emphasized. Then and only then, one might speak of a project if a clearly defined design is available for implementing through the algorithmic phase.
7. With reference to the previous point and point 4, organizational and management arrangements that frustrate close multidisciplinary cooperation in the creative phase must be avoided. Approaches such as strategic planning, project portfolio management, demand-supply management, or business case management are questionable in this respect. Proper arrangement of the central enterprise governance function should make such approaches superfluous.
8. Enterprise unity and integration—manifest in enterprise coherence and consistency—is not only conditional for operational and strategic performance in a direct sense but also indirectly since lack of coherence and consistency breeds low employee trust and widespread employee cynicism which creates low employee involvement and fuels resistance to change. Specifically culture and behavior change are extremely difficult to accomplish while precisely these aspects are key in establishing enterprise coherence and consistency as the morphogenic enterprise conceptual system model expresses. The traditional exclusive focus on the structural functionalist aspects of an enterprise is thus largely ineffective. A proper poietical foundation thus requires a broad scope of enterprise engineering to enable bringing all multidisciplinary enterprise facets within the enterprise design perspective. Close ties with the foundational social and organization sciences are therefore crucial (Hoogervorst 2018).

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Chapter 5
Case Illustration: Creating EnerServe

5.1 Introduction

5.1.1 A New Enterprise

Previous chapters presented examples for elucidating our themes of discussion. In addition to these examples, this chapter provides further illustration of enterprise governance and enterprise engineering to operationalize strategic desirables and areas of concern. Core facets about the practical use of these concepts will be illustrated by considering a fictitious enterprise called EnerServe that needs to be created through a considerable transformation of an existing longstanding energy company. This existing company has power plants for generating electrical energy and a distribution network with meters installed at customers' premises for measuring energy usage. The existing company is affected by the development of Europe's open (competitive) energy market which enables customers to select their supplier for electrical energy and gas, independent of the geographical location of the customer and supplier. So suppliers are not necessarily associated with a certain geographical activity domain but can (in principle) supply throughout Europe. Energy companies must change fundamentally because of the open energy market developments, as we will further outline below. An essential macro strategic question concerns how EnerServe must be created for adequately coping with the new situation. This question will be answered in the next paragraphs. In doing so, the validity of our perspectives on enterprise change outlined in Chap. 3 will be demonstrated and illustrated.

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The Enterprise Engineering Series, https://doi.org/10.1007/978-3-319-73658-7_5

5.1.2 Developing the Enterprise Governance Competence

The EnerServe case shows that it is not the top-down, management- and planning-oriented governance approach which is crucial for making sense of the new situation and its consequences but the enterprise governance competence as outlined in the previous chapters, with enterprise design as its central activity. It is through the inquisitive process—initiated, maintained, and managed by the central enterprise governance function—that the various aspects of the open energy market are identified and addressed, using the concepts discussed in the preceding chapters. The first and essential step that the existing energy company thus has taken is developing the enterprise governance competence, starting with the central governance function as discussed in Sect. 3.2.9. It is this central governance function and its competence for enterprise design that guides, enables, and fuels the successful transformation and forms the very foundation for further development into a mature enterprise governance competence. Our discussion below is based on the assumption that the central enterprise governance function is in place. In a later paragraph, we will pay attention to the organizational aspects of creating the central enterprise governance function. Without the ability to discuss all facets of the transformation towards EnerServe comprehensively, the case aims to illustrate how the core concepts discussed previously can be applied. The case also corroborates the importance of recognizing that developments associated with operationalizing strategic desirables occur in an emerging fashion since the complexity and initial unclarity associated with the strategic desirables, as outlined in Sect. 3.1.2, is obvious. As such, the innate nature of strategy development and subsequent realization is illuminated. Through illuminating and explicating the innate nature of how strategic desirables and areas of concern are turned into reality, the case aims to show that strategic failures are not the inevitable consequence of the unavoidable complexity and uncertainty associated with the strategic desirables and areas of concern but are a result of the inability and/or unwillingness to acknowledge these characteristics and act accordingly by establishing the organizational competence that can successfully address the complexity and uncertainty through enterprise governance and enterprise design.

5.2 Strategic Context: Changing Energy Utilities

5.2.1 The Open Energy Market

We will explain the essential facets of the open energy market without trying to be comprehensive. Some detailed aspects that might unnecessarily reduce the clarity of the case are thus omitted. For the same reason, actual practices might differ slightly from the ones portrayed in this case.

The open energy market enables customers to select an energy supplier of their choice easily, either initially or by switching over to another supplier. Evidently, switching to another energy supplier should not entail switching to another infrastructure. So, the open energy market implies the use of one infrastructure over which multiple suppliers can deliver energy. This implies a formal distinction between two activity domains: *supply* of energy and *transport* of energy. The *production* of energy is the third core activity domain. Within the new setup, suppliers purchase energy (provided by energy producers) on the open market for further selling to their customers. In fact, the open energy market has introduced the notion of energy trading, whereby suppliers aim to balance demand and supply in a most cost-effective way.

Similarly as with infrastructure, it is highly undesirable if switching to another supplier necessitates installation of new energy metering equipment associated with the new supplier. Thus, a fourth core activity domain plays a role: the *metering of energy usage* must be done by equipment owned by a separate entity, independent of a specific energy supplier. This means that switching does not affect metering. Note that the end-user can also act as a supplier by delivering surplus energy to the network.

So, choosing an energy supplier freely can only take place if the choice can be made easily. Put another way, switching to another supplier should be merely an administrative affair. This is then only possible if a fundamental design principle is used: energy usage must be fully independent of the actual implementation of supply. In terms of our previous discussions, all suppliers have similar black-box properties that enable the functional relationship of energy supply with the white-box properties of consumers, independent of any specific supplier. Not having this design principle would imply more than merely administrative measures since specific aspects associated with the actual arrangement of energy supply should be taken into account when switching.

As can be appreciated, producing, transporting, delivering, and metering energy is a highly collaborative affair in which multiple parties must operate and communicate seamlessly. Such a unified and integrated operation obviously needs governance. An industry-wide 'Energy Governance Body' effectuates this governance. This body has defined various standards, including those on energy procurement and payment and the way customers and connections are defined, usage is measured, billing takes place, etc. Note that this governance body expresses acknowledgment of the need for unity and integration in the open energy market.

In summary, the following core activity areas can be identified:

- Production of energy.
- Supply of energy to end-users.
- Distribution (transport) of energy.
- Metering of energy usage.

5.2.2 Strategic Choice: Focus on Energy Supply

Prior to the open energy market, the existing energy company took care of all four activity areas. These activity areas were not distinguished formally as in the open market situation. Hence, the new situation entails splitting the old organization into the four identified areas such that the associated activities can be carried out autonomously. As mentioned, the network will be used by various energy suppliers. This necessitates network operation by an independent party and the discontinuation of network activities in their current form within the existing energy company. The network part could position itself as a network operator. Similar considerations hold for the metering function. From a competitive viewpoint, two activity domains are of particular interest for creating a new enterprise: energy production and energy supply. But these domains must be fully independent. So, the production part can produce energy for the supply part of EnerServe but also for other suppliers, while the supply part of EnerServe can purchase energy from other producers. Essentially, the existing energy company faces the significant transition from a situation with entangled processes covering four activity areas in the old situation to a new situation with integrated but decoupled processes covering those areas. Although the full magnitude of the open market dynamics are not yet clear for EnerServe—various developments regarding the precise interaction among the different parties within the open market have not been finalized—EnerServe will concentrate initially on arranging its supply part since this is crucial for serving existing and new customers. Note that the open energy market strategy manifests the two dimensions of strategy development: (1) relationship with the environment (functional) and (2) the internal organizational arrangements (constructional) (cf. Sect. 4.4.4*)[1].

5.2.3 The Switching Process

Apart from starting a contract or ending one, the really new feature is the ability to switch easily between energy suppliers. A central administrative concept is the so-called ‘connection registry’ managed by the network operator and for which the Energy Governance Body has defined standards. This registry keeps track of every energy connection point with its unique connection number. Each customer is uniquely associated with a connection point and a supplier serving that connection point. The connection number plays a central role in communication between different suppliers mutually and between the suppliers and the network operator. Additional data is stored in the collected records such as the customer’s energy consumption at the specific connection point. EnerServe must thus inform the network operator of the energy consumption (meter readings) of its customers.

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[1] An asterisk (*) identifies a reference in *Foundations of Enterprise Governance and Enterprise Engineering* (Hoogervorst 2018).

The contract with the current supplier must be ended if a customer wishes to switch to EnerServe. That should normally be done by the customer owning the contract. But to speed up the process and to avoid all kinds of coordination issues on the customer side, the various energy market parties agreed that the new supplier takes care of ending the customer's contract with the current supplier. Authorization for that must be obtained from the customer. To distinguish itself positively from its competitors, EnerServe takes full responsibility for adequate contractual transition. A contract with a supplier also includes a so-called 'connection and transport agreement' (required by law) between the customer and the network operator. The formal authorization mentioned previously also authorizes the supplier to act on behalf of the customer in terms of this agreement. By law, the contract can be revoked within a 7-day period. The switching procedure is basically as follows:

- Registration of a new customer at the proposed contract starting date 'd,' which must include the formal authorization to terminate the existing contract. The minimum contract period is 1 year.
- Confirmation by e-mail and letter and the start of the 7-day period.
- Providing the meter reading of date 'd' to both EnerServe and the current supplier.
- EnerServe requests the network operator to change the connection code associated with the customer from the current supplier to EnerServe as per date 'd,' which defines the starting date of the contract.
- Payment of the final invoice to the current supplier.

Along with taxes, there are three categories of consumer costs: (1) energy delivery by the supplier, (2) transport costs charged by the network operator, and (3) meter costs charged by the owner of the measuring equipment (in this example, we will use quarterly transport and metering charges). As a service to its customers, EnerServe will send a (monthly) invoice to customers containing all costs. EnerServe must transfer the collected charges to the network operator and the meter company periodically.

The process illustrates that switching is indeed an administrative affair. Since customers can switch or revoke an intended transition to a new supplier relatively easily, the administrative processes are highly dynamic.

5.3 Strategic Context: New Perspectives

To clarify essential characteristics of the new situation, the central enterprise governance function of EnerServe assessed the external developments and their consequences and identified several new perspectives, discussed below, that EnerServe should deal with in its enterprise design.

5.3.1 Managing Demand and Supply: Energy Trading

In the traditional situation, demand and supply were matched through merely technical means, whereby energy generation was adjusted to energy demand. But the open market makes it possible to purchase energy 'from the market.' This market is defined by energy producers but also by energy suppliers who, for various reasons, might resell already-purchased energy. Energy trading will thus become an important new competence, comparable with the financial and oil markets. Short-term and long-term developments concerning energy demand, supply, and prices are important dynamic parameters for action. This indicates a vital new competence that EnerServe must establish. The effectiveness of this competence not only has consequences for the adequacy of energy supply but also has economic consequences given the energy volume to be acquired. Alongside integrated information about actual and predicted energy usage and prices, information systems for decision support and scenario analysis also seem relevant.

5.3.2 Business and Market Dynamics: Increased Competition

The open energy market introduces considerable dynamics. What was once a closed market with monopolistic enterprises changes into an open market with many players and increased competition. The latter aspect is the very reason for starting the open energy market developments in the first place. Competition is fuelled by the ability of customers to switch to another supplier easily which in and of itself increases the dynamics energy suppliers are facing. Trading energy and matching demand and supply also introduce considerable dynamics for EnerServe. Closely observing and following market and competitor dynamics is thus considered vital. Hence, the ability to gather and analyze data about these dynamics is likewise vital.

5.3.3 Other Ways of Organizing

Business and market dynamics as well as the increased competition have fundamental implications for the ways of organizing (one of the strategic perspectives mentioned before). Delivering energy in a closed market from a monopolistic position is often associated with a focus on internal enterprise facets, whereby the relatively stable environment tends to give the enterprise rigid characteristics. However, the introduction of the open energy market necessitates a shift in EnerServe's culture and ways of organizing: from a predominantly internal focus towards an external, customer- and service-oriented focus. This shift calls for additional activities beyond merely the delivery of energy such as relationship management with customers and business partners. Increased dynamics require flexible and adequate responses from

EnerServe to changed conditions, including scalability to accommodate further growth.

Other ways of organizing are further introduced by the 'virtualization' of business and organizational activities. Using Internet technology and services will enable EnerServe to execute the switching process and perform relationship management more efficiently and effectively. Moreover, the strategic idea of delivering complementary services in conjunction with energy supply, to be discussed below, can most likely only be effectuated by using Internet technology and services.

5.3.4 Mergers and Acquisitions

Creating an open market for delivery of a commodity such as energy will likely create tendencies among enterprises in the energy sector to create scale and synergy advantages. These tendencies develop since the market is Europe-wide on the one hand, so scale advantages can be exploited through mergers or acquisitions, while on the other hand, energy suppliers from outside Europe might penetrate the European market through merging with or acquiring a European partner. Apart from the inherent dynamics of these developments, these tendencies also have implications for the internal organization (and the associated information support) since the integration effort in the case of a merger and acquisition should be minimal. Insight into EnerServe's construction is thereby essential.

5.3.5 Towards 'Price-Based Costing'

The open energy market is based on the idea that such an approach would lead to better service and lower energy prices for consumers. Customers simply switch to another supplier if the service or price is considered better. One might argue that energy is a commodity and that commodities are only judged on the basis of price. As such, operational costs are an important area of concern. Associated with this is an important paradigm shift. Where the monopolistic position could previously offer the possibility to determine the price based on internal costs, now the open market dictates that cost must be based on the market price that can be asked. So, EnerServe faces a shift from 'cost-based pricing' towards 'price-based costing.'

5.3.6 Complementary Services

Despite—or probably because of—the commodity character of energy supply, service turns out to be an important competitive weapon. Since energy supply is generally adequately arranged, the supply itself can be labeled as a hygiene factor: a basic condition that should be in place but as such is not a motivator for selecting a specific supplier. Various other functions such as contracting and invoicing are also hygiene factors. These aspects do not act as motivators but can certainly act as demotivators: they can be a reason to switch. Attention to operational excellence is thus essential and conditional for customer satisfaction.

The delivery of complementary services might create a strong motivation to select a certain supplier because of the value these services provide and for which customers are willing to pay. So EnerServe should explore and exploit possible new business areas in this respect.

Delivering complementary services has three important advantages: (1) they act as motivators for selecting EnerServe, (2) provide extra revenue, and (3) create a barrier to switching since another supplier will deliver the same energy but (most likely) not similar complementary services. Complementary services thus create higher 'switching costs.'

Rather than delivering complementary services by EnerServe itself, these services can most likely be delivered effectively in combination with business partners. Innovative services might follow from combining different services of other parties with those of EnerServe, such as energy delivery in combination with home security services or communication services. Services that help customers to save energy could also be considered. We might observe that the delivery of energy is highly regulated, but that is not the case for the delivery of complementary services or significantly less so. Business degrees of freedom are thus considerably higher. Understandably, EnerServe must be able to combine and integrate services from different disciplines in a unified and integrated manner.

5.3.7 Towards Empowered Customers

As mentioned earlier, the open energy market with customers who can switch easily necessitates that EnerServe changes from an internally, technology-focused enterprise towards an externally, customer- and service-focused enterprise. It is not the contract but the relationship with customers which plays the central role. Customer relationship management—with its associated values (culture), employee behavior, information supply, and so on—must become an essential area of attention. Within this focus, customer self-service is an important facet: offering services when and where desired by customers. So-called 'customer-managed relationship' must also be considered, referring to the ability of customers to define the nature of the relationship with EnerServe such as by offering services that can be customized. Overall, the open energy market creates a power shift from supplier-initiated actions (push) to customer-initiated actions (pull).

5.3.8 Customer Focus, Loyalty, and Employee Involvement

Understandably, the emergence of empowered customers with the ability to easily switch to another energy supplier implies that customer satisfaction and customer loyalty are of critical concern. Acquiring and retaining customers is EnerServe's lifesaver. Customer and service orientation must therefore permeate into every cell of EnerServe and must be manifest in all it does. EnerServe expresses concern for customers with the label 'customer proximity': always think and act with the benefit of the customer in mind. Based on our summary in Sect. 2.4.6 about empirical and theoretical arguments for employee involvement, the central enterprise governance function has identified employee behavior and involvement as important areas of attention in creating EnerServe. Complementary services valued by customers will create extra revenue but, above all, are expected to create extra switching barriers. EnerServe will focus on the relationship with customers and their loyalty and on lifetime economic value. Attention must go to knowing, understanding, and realizing customer wishes and affecting customer behavior, for example, concerning energy saving. Customer self-service offers interesting possibilities for creating customer value while simultaneously enhancing the effectiveness and efficiency of processes.

5.3.9 Virtualization

The virtualization of business and organizational activities was mentioned above. EnerServe's central enterprise governance function envisions that customer and operational processes will be based increasingly—if not exclusively—on web technology. This is considered to provide an important basis for decoupling autonomously operating units while simultaneously ensuring their operational integration. Associated with this is a shift from offline towards online (real-time) activities, transactions, and communication. EnerServe's Intranet must evolve into an all-embracing information utility, where information is exchanged between individuals, between individuals and physical objects, and between these objects mutually (such as energy consumption data provided by the energy meter itself, connected to the Internet). Increasing virtualization also means increased need to integrate EnerServe's virtual and physical processes. In addition to these developments, EnerServe's central governance function investigates the possibilities of the new revolutionary blockchain technology, discussed in the introductory chapter, for effectively arranging transactional and contractual processes.

5.3.10 Technology Developments

Alongside the open energy market developments, also various technology developments will influence energy supply. A typical development is the ability of consumers to generate their own energy, for example, through solar panels. Moreover, energy consumers can turn into energy suppliers by delivering the surplus energy they generate to the electricity network. These developments are paralleled with other technology developments such as 'smart grids' and 'smart metering.' By using intelligence about local energy consumption or supply, the concept of 'smart grid' enables to better balance energy demand and supply, thereby increasing energy supply reliability and efficiency. Two-way communication between energy suppliers and consumers is a central aspect of smart grids. Hence, the traditional energy network is complemented with an information and communication network. Smart metering is essentially a device that not only measures energy consumption but is connected to the Internet for automatically informing the energy supplier about energy consumption, thereby taking into account the locally generated energy that a 'consumer' delivers to the network. Because of smart metering, EnerServe gains insight in actual energy consumption and can advise consumers about possible energy savings. This feature can be part of the complementary services that EnerServe envisions.

5.3.11 Core Characteristics of Change: Paradigm Shifts

Important changes (paradigm shifts) that EnerServe faces are summarized below.

Closed market	→	Open market
Internally focused	→	Externally, customer focused
Technology focus	→	Service focus
Customer contract focus	→	Customer relationship focus
Single service	→	Multiple (complementary) services
Stable environment	→	Dynamic environment
Autonomous energy supply (one party)	→	Collaborative energy supply (multiple parties)
Energy delivery	→	Energy trading
Monopolistic	→	Competitive
Rigid	→	Flexible
Entangled processes	→	Decoupled but integrated processes
Information-poor	→	Information-intensive
Cost-based pricing	→	Price-based costing
Stable rules and legislation	→	Changing rules and legislation
Push (supplier-initiated) actions	→	Pull (customer-initiated) actions
Few business events	→	Many business events
Asynchronous enterprise	→	Real-time enterprise

(continued)

Stable customer base	→	Dynamic customer base
Central power generation	→	Distributed power generation
Few producers	→	Multiple producers
Simple metering	→	Smart metering
Simple grid	→	Smart grid

Once again, the paradigm shifts luminously indicate the complexity, uncertainty, and initial unclarity of the strategic initiative, as stressed in Sect. 3.1.2. The starting point of the initiative is clearly in the lower-right quadrant in Fig. 3.4 of Sect. 3.2.4 and the lower-right point in Figs. 3.5 and 3.6 of Sects. 3.2.5 and 3.2.6, respectively. Activities concerning the transformation are initially in the creative phase of change discussed in Sect. 3.1.3 and not in the implementation phase. Let alone that methods and measures of this latter phase could be effectively used in the creative phase, as the characteristics of change make abundantly clear.

5.4 Design Aspects and Areas of Concern

5.4.1 EnerServe's Environment

As the previous reflection clearly shows, for properly defining EnerServe's functional relationships (black-box properties), the constructional characteristics (white-box properties) of EnerServe's environment must be known. One can easily verify that virtually all the aspects mentioned in Fig. 4.51 of Sect. 4.11.2 are relevant in EnerServe's case. In view of the open energy market developments, obvious aspects of concern are government, legislators/regulators, politics, infrastructure, market, competitors, and consumers. But also the virtual/digital world is an aspect of the constructional environment that EnerServe must know thoroughly, not only because the energy switching process and the relationship with customers become virtualized but also because of smart grid and smart metering developments (Internet of 'things').

5.4.2 Business Design Aspects

Important (functional) design aspects that are certainly relevant for EnerServe are shown in Fig. 4.52 of Sect. 4.11.3. We have seen that a key paradigm shift for EnerServe concerns the focus on customers. Description of the strategic context indicated the necessary focus on relationships with empowered customers, maintaining their loyalty and considering their lifetime value. In view of the mentioned customer focus, the relationship, interaction, and communication with customers are important design aspects which indicate customer satisfaction and service orientation as crucial areas of concern. In order to 'decommoditize' the relationship with customers, the products and services that EnerServe intends to offer should be innovative and should enable the noncommodity relationship, specifically the envisioned complementary services. EnerServe wants seamless integrated service delivery associated with energy supply. Business partners for delivering these services need likewise to be considered as are the channels for effectuating the functional relationships. The ability to deliver seamless, integrated services is thereby an area of concern. For accommodating growth and remaining competitive, EnerServe must ensure that (1) existing products and services must be made available to new customers quickly and (2) existing customers must be able to receive new products and services quickly. As mentioned, EnerServe's environment is highly dynamic, created by regulators and government but in particular by market and competitor developments. Needless to say, EnerServe wants to follow market, consumer, and competitor trends closely. Hence, 'business intelligence' is thus a vital area of concern. This concern is also vital for effectuating the energy trading function mentioned earlier, as well as for creating and maintaining mutually beneficial customer relationships. Finally, the economic model is based on market energy prices (price-based costing).

5.4.3 Organization Design Aspects

EnerServe is the outcome of an extensive transformation of the existing energy company. The paradigm shifts indicate that the transformation is fundamental. The structural functionalist context of EnerServe depicted in Fig. 4.53 is an obvious design aspect. As the strategic context shows, processes, technology, and resources must change such that unified and integrated operation is arranged, new customers are incorporated quickly, the contractual transition proceeds swiftly and adequately, and complementary services are delivered seamlessly in association with energy supply. Reliability and operational excellence is important, not only for the primary delivery of energy but also for administrative and customer processes on which successful switching depends. Quality of processes, products, and services is thus an important area of concern, as is security, specifically in view increasing virtualization. Compliance with rules and regulations is also an area of concern since organizational processes must satisfy these rules and regulations. EnerServe intends to investigate the emerging blockchain technology for addressing quality, security, and compliance concerns.

Given the significant business dynamics, possible future change must be enabled. Adaptability or flexibility in response to market, consumer, or competitor dynamics is thereby an obvious area of concern. Anticipating future growth, scalability of the structural functionalist context is likewise an area of concern. The ability to accommodate business growth is seen as vital for EnerServe. Accommodating business growth means organizational flexibility and scalability. Creating flexibility and scalability is no easy matter since the current organizational arrangement shows many interwoven processes, thereby creating considerable complexity. Experiences teach that substantial rigidity and costs are associated with the current organizational complexity. Hence, reduction of this complexity is essential for creating flexibility and scalability and reducing operational costs. This latter area of concern is important in view of the shift towards price-based costing. So, the shift towards price-based costing indicates efficiency as an area of concern and a relevant organization design aspect. EnerServe's management is convinced however that costs represent a fine result but a poor objective. Costs and their reduction must result from EnerServe-wide activities associated with the various design aspects. Finally, EnerServe needs to integrate virtual and physical processes.

EnerServe's central governance function well knows the Law of Requisite Variety and fully understands that adequately addressing EnerServe's operational and strategic dynamics necessitates the critical involvement of employees. This is likewise required because of the needed customer and service orientation. Hence, the social context depicted in Fig. 4.53 presents important design aspects. These aspects indicate employee involvement, motivation, and norms and values (culture) as important areas of concern. Employee-centric organizing and creating meaningful work will thus be core issues. For that, management behavior must manifest leadership characteristics. This is a major concern given the hierarchical, mechanistic characteristics of the existing energy company. Underlying these new viewpoints are ethical concerns that EnerServe aims to address in business and organizational conduct. Employee involvement is further essential for ensuring operational quality in the face of various operational contingencies. These contingencies are likely to emerge in view of the increased dynamics that EnerServe is facing. Employee involvement is further crucial for enabling increase in productivity, quality, continuous improvement, learning, and innovation.

5.4.4 Information Design Aspects

As the paradigm shifts show, EnerServe will become information intensive. Customers, employees, business partners, smart metering, and smart grids all depend on information. This likewise holds for process, market, consumer, and competitive developments. Gathering and analyzing data about these developments is thus crucial ('business intelligence'). Exploiting, exploring, presenting, and managing information are thus important design aspects shown in Fig. 4.54. Transforming and unifying operational data into informational data on an EnerServe-wide scale enables the use of that data in customer and operational (decision-making) processes, such that the quality of these processes is enhanced. In view of the concern for flexibility and adaptability, EnerServe design must enable real-time use of informational data. Information can only be a valuable resource if the quality of information is adequate. Information (data) integrity is vital for the operational integrity mentioned before. This indicates currentness, trustworthiness, consistency, and security as typical areas of concern.

In view of EnerServe's intended customer focus, an important information design aspect regards the productive informational relationship with customers. Closely related are the informational aspects for 'making the customer real' which points to the concern expressed under the label 'customer proximity' mentioned before. Information supply should be such that employees and management experience the virtual presence of customers in their daily work, are fully abreast about EnerServe's performance towards customers, and can act in the interests of customers.

Finally, a vital facet of information supply concerns employee-centric organizing and the creation of meaningful work. These aspects were identified as organization design aspects above. Not only should information supply enable employee self-regulation and self-organization, it should also bring EnerServe's mission, purpose, norms, and values within the realm of employees by linking these aspects with the roles, responsibilities, and activities of employees. Meaning and purpose of local activities thus follow from the overall meaning and purpose of EnerServe, as stressed in Sect. 2.4.12.

5.4.5 IT Design Aspects

Various reasons necessitate a focus on the IT design aspects depicted in Fig. 4.55. The first reason is the mentioned information intensiveness of EnerServe since information is largely provided through IT systems. Moreover, the extensive virtualization of customer and operational processes, including the cooperation with various business partners, makes IT design aspects core attention areas. This attention is further fuelled by the need to untangle the current IT ('legacy') environment into the four activity domains of the open energy market. Organizational complexity of the existing energy company has created similar complexity in IT systems (legacy complexity). The difficulty of untangling organizational processes is thus likewise manifest in untangling IT processes. Finally, the design aspects mentioned before necessitate simple and immediate (on demand) communication with actors in the business network, independent of time and place. This translates into immediate and simple access to data networks and data sources. Such access entails considerable risks, due to possible breaches of operational and/or informational integrity. Given the various design aspects mentioned before, areas of concern are availability/reliability, maintainability, efficiency, adaptability, interoperability, and security.

5.4.6 Areas of Concern

Analysis and description of EnerServe's strategic context and the considerations about the design aspects revealed a number of areas of concern which are summarized in Table 5.1.

Table 5.1 EnerServe's areas of concern

General		
Integration	Adaptability	Scalability
Efficiency	Ethics	Customer proximity
Safety	Health	
Business		
Customer satisfaction	Service attitude	Support attitude
Business intelligence		
Organization		
Employee involvement	Employee motivation	Meaningful work
Norms and values	Learning, innovation	Management as leadership
Quality	Security	Compliance
Information		
Currentness	Trustworthiness	Security
IT		
Availability	Interoperability	Maintainability
Security		

5.5 The Character of Change

5.5.1 The Challenges, Complexity, and Uncertainty

It seems no exaggeration to submit that transforming the existing energy company into the new company EnerServe poses significant challenges and manifests enormous complexity and concurs with the observations in Chap. 3. Figure 5.1 repeats Figs. 3.4 and 3.5, expressing the character of change. The challenges and complexity are briefly summarized as:

- Interpreting, analyzing, and making sense of the dynamic and emerging open energy market developments.
- Identifying and addressing the fundamental paradigm shifts associated with the open energy market.
- Defining, in cooperation with various stakeholders, the business, organization, information, and IT requirements that express and address EnerServe's strategic desirables and areas of concern.
- Untangling the previously interwoven processes of energy production, supply, transport, and metering.
- Establishing relationships with new market parties and developing associated processes.
- Developing complementary services in conjunction with energy supply.
- Developing new core roles, activities and processes for:

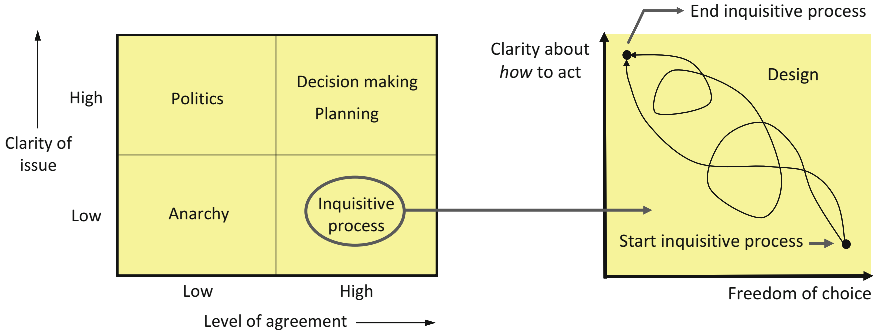

Fig. 5.1 Change through the inquisitive process

- – Subscribing and unsubscribing customers (switching process) and the associated administration.
- – Customer relationship management.
- – Managing energy demand and supply.
- – Buying and selling energy on the energy market (energy trading).
- – Delivery of complementary services.

- Establishing a unified and integrated enterprise.
- Establishing culture change and changes in employee and management behavior.
- Addressing new technology developments and integrating these developments within the current technology base.
- Addressing the complex IT legacy environment.
- Maintaining operational integrity during the process of transformation.
- Balancing short-term necessities with long-term desirables.

Inevitably, the challenges and complexity are associated with uncertainty because (1) the changes are fundamental as the paradigm shifts indicate; (2) new business, organizational, informational, and technology domains need to be explored; (3) new competences need to be developed; (4) there are mutual relationships between technology and organization aspects; (5) multiple stakeholders play a role; and (6) rules and regulations create unforeseen effects. All these uncertainties will lead to emergent developments.

5.5.2 *Culture and Behavior Change*

Focus Areas

For understanding the successful transformation of the existing energy company into EnerServe, the morphogenic enterprise conceptual system model introduced in Sect. 2.3.9 is shown for EnerServe in Fig. 5.2. As will be briefly outlined, for successful change, all components of the model need to be jointly addressed such that

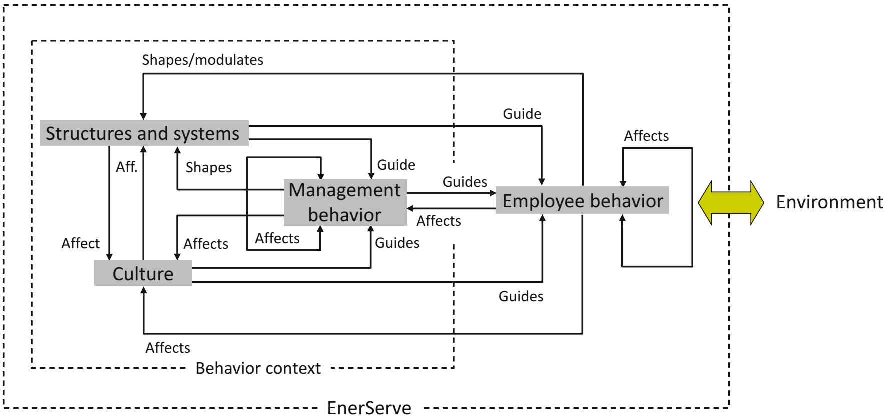

Fig. 5.2 EnerServe morphogenic conceptual system model

coherence and consistency between the components of the model is established. Culture and behavior change are the hardest ones to establish and critically depend on coherence and consistency. Important aspects will be discussed below.

Change Is Needed

In view of the paradigm shifts associated with transforming the existing energy company into EnerServe, culture and behavior change is among the most important issues to address. For EnerServe, these changes are vital in order to enable and sustain the necessary quality, service, and customer focus. EnerServe fully understands that the majority of its income is generated by returning customers and that attracting new customers involves a considerably higher cost level than retaining existing ones. Quality is not only relevant for retaining customers, but a significant part of yearly income is lost due to costs of non-quality. For EnerServe, being in the service sector, this loss is estimated to be even higher. Hence, quality, service, and customer focus are the cornerstone to organizational success, competitiveness, and profitability.

Culture and behavior change is crucial since almost all customer complaints and sources of customer dissatisfaction do not relate to the performance of products and services themselves but relate to poorly addressing product or service problems. Defecting customers thus mostly result from inadequate performance possibilities. EnerServe understands that customer retention has a significant influence on profitability. Customer satisfaction is thus conditional for growth in market share and profit. EnerServe wants to build on the positive relationship between employee satisfaction and motivation to provide good service on one hand and customer satisfaction, repeat sales, and profit on the other hand. EnerServe knows that the economic impact of service and customer loyalty is high and that customer loyalty is inextricably linked to employee loyalty, making it impossible to maintain a loyal customer base without a base of loyal employees. Ensuring employee variety is crucial to addressing individual customer needs, as we have argued in Sects. 2.4.5

and 2.4.6. Employee variety can only be effective if performance possibilities for employees are of central concern, as stressed in Sect. 2.4.12. Customer loyalty is all about employee motivation and behavior and is sustained by humanistic values and principles.

Meaningful Work

Culture and behavior change is expressed by employee involvement, loyalty, commitment, and self-efficacy, based on employee motivation. These conditions rest on the properties of the employee-centric working environment. Such environment, manifest in meaningful work, will enable employee motivation and loyalty. Moreover, employee-centric organizing enables employee and enterprise learning which fuels product, service, and organizational improvements. EnerServe views employees as professionals that must have considerable control over how work is performed. Planning and control practices and enterprise mechanization are viewed as detrimental to a professional attitude. Further, work must create the possibility to perform well and to create professional achievement. This possibility is conditional for feelings of respect and personal dignity. Insight into the meaning and purpose of work and the contribution to the collective efforts of EnerServe is considered vital. This is a key area of attention for developing information systems and mentioned as an information design aspect. Meaning and purpose are essential for feelings of self-worth and accomplishment. These feelings closely relate to the ability to perform well and to personally develop, as summarized in Sect. 2.4.12.

EnerServe is convinced that these attributes of the working environment address basic human needs and are conditional for intrinsic motivation. EnerServe is meticulous about securing that employees grasp and acknowledge the truth, fairness, and trustfulness of their working environment. The coherence and consistency of the behavior context is thus considered as an important aspect of EnerServe's unity and integration. The determinants of the behavior context are all aspects that must be included in formal considerations about transforming the existing energy company into EnerServe.

Unitarist View

For EnerServe, integrating and aligning the needs of employees with the needs of the EnerServe is the most fundamental expression of coherence and consistency. This forms the basis for psychological satisfaction of employees whereby necessary activities, seen from EnerServe's perspective, are also desired activities as seen from the employees' perspective. EnerServe's performance and employee satisfaction are thus not considered as necessarily mutually exclusive but as mutually enforcing (cf. Sect. 2.4.12). Desired forms of employee behavior based on enterprise performance or based on considerations about human development have to be aligned. Practicing the unitarist view is the basis for performing exceptionally well both economically and socially. Moreover, EnerServe is convinced that when work is congruent with personal principles, it becomes a source of energy, while work that sacrifices personal principles becomes a drain of personal energy.

Leadership

A critical success factor in the transformation towards EnerServe is having the right type of management, which expresses leadership characteristics. This becomes a critical aspect in management recruitment and subsequent assessment. Leadership characteristics are manifest in the mutual relationship between management and employees. EnerServe considers this reciprocal relationship foundational for successful change and thus seeks managers that fully understand the reciprocal relationship and will behave accordingly. Hence, managers who fully understand what the manager-as-leader does to employees but also what employees do to the manager-as-leader. Both the manager-as-leader and employees are shaped by the dynamics of the reciprocal relationship. This enables learning in the context of social interaction. The reciprocal relationship reduces the separation between management and employees since management encourages and supports the contributions of employees and establishes strong cooperative contexts.

Managers within EnerServe are expected to understand that the reciprocal relationship leads to their own self-actualization: leading by being led. Hence, they teach and are taught by their employees, thereby helping to keep the manager-as-leader abreast of the situation. Via stimulating leadership, expectations and possibilities are being shaped by formulating an overriding purpose and transcending values. Equally important is stimulating self-confidence and self-efficacy of employees which in turn leads to their self-actualization (cf. Sects. 4.6.6* and 4.7.7*).

EnerServe well knows that the reciprocal relationship between the manager-leader and employees concerns and affects the motivation of employees, based on mutual needs, expectations, and values. Values are crucial to the concept of leadership. An important aspect of the manager-as-leader therefore concerns moral aspects that shape and give meaning to the relationship with employees. Moral aspects concern the fundamental wants, needs, aspirations, and values of employees. Obviously, the management recruitment, selection, and assessment criteria of EnerServe explicitly express these views.

Since leadership characteristics of management cannot be developed if there is no learning interaction with employees, freedom is required to enable these characteristics to exist and develop. EnerServe knows that in a mechanized enterprise, leadership has no place since the essence of leadership refers to the reciprocal process of influence that affects the motivation of both manager-leaders and employees and is incompatible with a mechanistic approach to organizing. Mary Parker Follett's maxim is the source of inspiration: "The person who influences me most is not he who does great deeds, but he who makes me feel that I can do great deeds" (cf. Sects. 4.7.7* and 4.7.8*).

Meaning of Work

Part of the leadership characteristics that EnerServe seeks to establish concerns EnerServe's purpose which has to be clarified and made real. This refers to the meaning of work, as summarized in Sect. 2.4.12. The management of meaning is thus a core aspect of management such that employees orient themselves to the achievement of desirable ends for EnerServe. Employee-centric organizing implies the infusion of meaning into working experiences. Meaning, purpose, and values are pillars without which empowerment of employees cannot be realized. For employees to experience empowerment means that they not only have the feeling of being in control of their own activities and thus responsible for their effects, but similarly important, this means that there is an underlying purpose, meaning, and value given to actions for which there is personal commitment. Meaning, purpose, and values align activities towards a common goal and intentions and replace the detailed rules and regulations of the mechanistic environment.

Trust

In a broad sense, trust is expressed by feelings of confidence, recognition, solidarity, and dependability among people. EnerServe's well-being, as well as its ability to compete, is conditioned by a single pervasive cultural characteristic: the level of trust inherent in the EnerServe. For trust to develop among employees, shared norms and values are essential since the conviction that EnerServe's management can be trusted is based on expected behavior which is founded on shared culture that defines the reciprocal expectations for each other's behavior in social interaction. In a trustful enterprise, these reciprocal expectations are fundamentally different from those in a non-trustful enterprise. Decline in trust is associated with detrimental effects such as lack of productive cooperation, wrongful behavior, or even the breakdown of the enterprise social fabric. EnerServe is keenly aware that decline in trust will lead to in increased focus on formal contractual relationships between employees and management, as well as between customers and EnerServe. Conversely, the very focus on these aspects will maintain and further fuel the feelings of distrust. Beliefs and suppositions about human behavior act as self-fulfilling prophecies: distrusted employees behave as the beliefs and suppositions expect them to. EnerServe is convinced that if people who have to work together trust one another because they are all operating according to a common set of ethical norms, EnerServe will prosper and will be better able to innovate organizationally since the high degree of trust will permit a wide variety of activities to emerge. By contrast, if people do not trust one another, cooperation will be arranged through a system of formal rules and regulations which have to be negotiated, agreed to, litigated, and enforced, often by coercive means, as the mechanized enterprise sketched in Sect. 2.4.2 shows.

Structures and Systems

Within the existing energy company structures and systems are the traditional areas of attention for organizing. Various organizational (or functional) units represent different organizational structures, while various systems offer specific functions supporting the organizational units such as systems for management reporting, accounting, and purchasing. The structures and systems represent the formal structural functionalist part of the existing energy company which focuses on management control and operational efficiency. Supporting IT systems further contribute to the mechanization of the current energy company.

EnerServes recognizes that culture and behavior change can only be accomplished and sustained if structures and systems are becoming fully aligned with the desired norms and values and behavior characteristics. Hence, EnerServe pays careful attention to the various details of the structures and systems to ensure alignment such that quality, service, customer focus, desired behavior, and adherence to norms and values are enabled and evoked. So, accounting; performance reporting; communication; job profiles; employee and management competences; employee and management selection, recruitment, and assessment criteria; remuneration; operational rules; information supply; and so on, they all must be aligned with the desired norms and values and behavior characteristics. Generally speaking, EnerServes ensures that the arrangement of structures and systems contributes to and manifests the employee-centric way of organizing: the creation of meaningful work, the linkage of activities with EnerServe's purpose and meaning, and ensuring the enabling of employee involvement and variety in behavior, stressed in Sect. 2.4.6. As such, structures and systems contribute to desired characteristics of the behavior context depicted in Fig. 5.2. Through the inquisitive process, stimulated and guided by the central enterprise governance function and together with the various stakeholders, requirements have been defined that express EnerServe's quality, service, and customer focus and intended culture and behavior change. The requirements are presented in Sect. 5.6 below. Additionally, in order to actually guide EnerServe's design, the central enterprise governance function must define and/or adopt architecture for employee-centric organizing and for the focus on quality, service, and customers. Section 5.7 shows EnerServe's architecture. One can easily verify that various requirements and principles presented below aim to ensure EnerServe's customer focus and its commitment to employee-centric design and to evoking and supporting the desired behavior characteristics and culture.

A crucial part in the design of structures and systems is that of information supply. The complex nature of EnerServe's information supply and related IT systems will be outlined in a later section. Apart from the complex nature, the current information supply also clearly expresses the culture and behavior characteristics of the existing energy company: focused on management-defined productivity, efficiency, and other indicators of the formal bureaucracy. Besides entangling of the current organizational processes in view of the transition to the open energy market and addressing the current IT complexity, EnerServe wants to ensure that its information supply fully supports the strategic desirables and areas of concern. EnerServe's goal is to ensure that information supply and IT systems act as enterprise regulating variety amplifiers, rather than act traditionally as variety attenuators, as argued in Chap. 2 when summarizing the ideological foundation.

Summary

Some of the topics that determine the successful transformation of the existing energy company into EnerServe were discussed above. Of these topics, culture and behavior change are the hardest ones. Key in understanding the condition for successful transformation of the existing energy company into EnerServe is the joint and continuous attention to all components of EnerServe's morphogenic conceptual system model depicted in Fig. 5.2. Coherence and consistency between these components is vital. Employee-centric organizing rests on this vital condition and ensures a trustful behavioral context. Mutual trust must be established through coherent and consistent practices. Any incoherence or inconsistency that could impact mutual trust must be considered a major issue since lack of coherence and consistency jeopardizes change, but moreover, incoherence and inconsistency breeds low trust and widespread employee cynicism which fuels resistance to change as Sect. 2.4.11 reiterated.

5.5.3 The Importance of the Inquisitive Process

It is clear that the characteristics of change briefly summarized above are those that have been discussed in Chap. 3. Figure 5.1 repeats the essential message graphically: only through the inquisitive process fuelled by the central governance function of EnerServe can the challenges, complexity, unclarity, and associated uncertainties be addressed. It is thus totally clear that transforming the existing energy company has nothing to do with 'strategic planning' and the predominant use of project management techniques. We repeat that it is the competence of the central governance function that constitutes and drives the inquisitive process. It is this process by which the, partly technology-driven, dynamics of the open energy market and its vast consequences are interpreted and addressed. It is through this process that the vague, generally formulated strategic intentions and objectives are operationalized, detailed, and elaborated into possible business, organizational, informational, and IT developments. It is through this process that—in contrast to what the linear, top-down, management- and planning-oriented view suggests—enterprise developments are initiated bottom-up which anticipate possible external developments and their associated dynamics (enterprise enablement). It is through this process that the strategic (business and IT) dialog and informal social interaction are constituted and shaped, together with the participation and integration of stakeholders. It is through this process that unified and integrated design is established. Finally, the central enterprise governance function provides the very foundation for further developing and professionalizing the enterprise governance competence itself, of which the essential processes are detailed below.

5.6 Requirements

Next to areas of concern, the design aspects discussed above also indicate functional and constructional requirements. Many of the requirements mentioned in Tables 4.12 through 4.15 of the previous chapter are also relevant for EnerServe. Recall that requirements deal with areas of concern when they are operationalized through design. EnerServe's central governance function is the driving force for the inquisitive process in and through which the transformation of the existing energy company takes shape. In doing so, additional functional and constructional requirements will be formulated in cooperation with stakeholders. The results are shown in Tables 5.2, 5.3, 5.4, and 5.5, grouped according to the main enterprise design domains and their particular subdesign domains as expressed in Figs. 4.43 and 4.44 of the previous chapter. Requirements are published according to the publication structure discussed before. One might easily find out which areas of concern the requirements deal with. Specifically EnerServe's focus on employee-centric organizing and creating meaningful work leads to various associated organization requirements (employees and employee behavior) and information requirements (exploiting information for the benefit of employees). When discussing enterprise architecture, we will discuss the design principles for guiding design to create employee-centric organizing.

Table 5.2 EnerServe's business requirements

Business (functional) requirements	
Customers	Effective relationship building with customers
	Strong service focus
	Relationship with customers must be customer manageable
	Customer suggestions for improvement must be actively evoked
	Timely feedback about customer suggestions must be monitored
	Enhancement of customer productivity and assurance
	Customers must be actively involved in reporting experiences with product and services and their design
Products and services	Enable easy, customer-friendly switching to EnerServe and conversely (if so desired) from EnerServe to another supplier
	Complementary service offerings associated/integrated with energy supply
	All customer interactions concerning the start or the termination of contracts (energy supply and complementary services) must be executed completely through EnerServe's website
	Customers must be able to manage their own account/data
	Handling of different tariff structures that must be transparent to customers
	Provide customer-specific data, such as the history of energy consumption on log-in to EnerServe's website
	Providing advice about the reduction of energy consumption based on the customer's profile
	The status of customer request handling must be indicated on customer log-in
	Self-service and self-design (composition of services) capabilities for customers
	Online capabilities for customers to plan service agent contacts
	Contract changes finalized within 5 working days
	Invoices received by customers within 5 working days after the invoice period
	Invoices must be comprehensive and contain network and metering charges and/or charges for complementary services
	Invoicing must be (dynamically) based on the lowest pricing arrangement
	Easy authorization by customers allowing EnerServe to act on their behalf
	Hedging possibilities for energy price increases must be part of customer offerings
	Short time-to-market of new products and services
	Delivering products and services must address safety and security issues/measures explicitly

(continued)

Table 5.2 (continued)

Business (functional) requirements	
Channels	Secure and user-friendly access to EnerServe through multiple channels for customers, employees, business partners, and suppliers anytime, anyplace
	Easy and transparent communication through various interaction channels (e.g., website, telephone, mail, etc.)
	All interaction channels must be fully integrated
	Seamless communication with other energy suppliers, network operators, energy producers, and metering companies
	Open 24/7
Market	Products and service delivery must enable differentiation between different consumer markets
Economic model	Loss of income due to defecting customers and income gained by new customers must be recorded
	The price structure must differentiate between high, average, and low energy consumers
	Given the various price categories, charges to customers must be determined automatically based on the lowest possible charge-out amount
	The charge-out model must encourage energy saving
	The charge-out mechanism must exclude higher energy unit price due to energy saving
Partners	Relationships with partners should be based on long-term engagement/involvement
	Quickly accommodating and integrating business partners
Suppliers	Trading must be directed to preferred suppliers
	Relationships with suppliers should be based on long-term engagement/involvement
Milieu	Products and services delivery must be arranged in an energy conscious manner
	Products and services delivery must enable easy transition of current supply to ‘green’ energy supply
Stakeholders	EnerServe performance indicators must enable interactive dialog with stakeholders
	EnerServe must stimulate energy conservation community development
	Communication media must enable effective employee-to-business, business-to-employee, and employee-to-employee communication
	Regulatory developments must be proactively followed, possibly influenced, and translated to implications for EnerServe

Table 5.3 EnerServe's organization requirements

Organization (construction) requirements	
Processes	Seamless processual and informational interoperability and interconnectivity of customer and operational processes and interaction channels
	Effectively managing energy demand and supply
	Effective energy trading
	For all processes essential to EnerServe's mission, key data must be defined, measured, and presented that indicate the inherent performance capability of processes
	Process design and execution (operational rules) must express and enable espoused norms and values
	Process design must enhance customer and employee productivity and assurance
	Costs of non-quality must be made explicit and linked to process capabilities to aid improvement
	Performance reporting and accounting must reflect and be consistent with EnerServe's purpose, intentions, norms, and values
	Quality aspects of products and services must be explicitly defined and linked to process capabilities
	End-to-end process management
	Quick reconfiguration of services and processes
	Real-time workload distribution for contract and invoice processes
	Local efficiency must be subordinated to end-to-end process performance
	Process design must enable easy data extraction for use in other processes or informational systems
	Process design must exclude the necessity for data reconciliation
	Process design must enable cross-functional information sharing for supporting employee collaboration
	Effective cross-functional teams should be established for enhancing seamless collaboration and to pilot suggested improvements
	The concepts used in relation to processes (e.g., quality, productivity, safety, reliability, etc.) must be defined in operational terms, such that these concepts have meaning for performing process activities and their control
Employee behavior	EnerServe's organization must focus on behavior expressing the desire to achieve, creativity, open-mindedness, participation, and dedication to EnerServe's mission
	Self-initiated behavior must be enabled and evoked for enhancing EnerServe's performance
	Employee behavior must focus on the contribution to the overall process, the (internal) customer, and EnerServe's mission
	Cross-functional, collaborative behavior must prevail over behavior geared to local suboptimization
	Employee behavior must focus on continuous improvements and innovation to enhance performance and create new revenue streams
	Cross-functional teams must receive the power and means to pilot suggested improvements
	Employee suggestions for improvements must be evoked actively
	Timely feedback about employee suggestions for improvement must be monitored

(continued)

Table 5.3 (continued)

Organization (construction) requirements	
Employees	Employee involvement must be a core focus of EnerServe's development
	Creation of meaningful work
	Employment of employees must reflect EnerServe's espoused culture
	EnerServe's organization must enable and stimulate employee self-efficacy and development
	Employee assessment and remuneration must support and evoke desired behavior and adherence to espoused norms and values
	Cross-functional teams should continuously assess possibilities for improvements and innovation to enhance performance and create new revenue streams
	Individual employee work planning overviews with the ability of personal activity planning within work roster planning
	Capability within work roster planning for employees to swap shifts
	Carpooling facilities as part of employee collaboration services
	Quality, service, and customer-oriented behavior of employees
	Organizational arrangement directed towards employee development and self-efficacy
Culture	Culture directed towards creativity, innovation, and improvement
	Expression and enablement of EnerServe's espoused norms and values
	EnerServe's culture must be directed to customer satisfaction and the improvement of performance enterprise-wide
Management	Management behavior must reflect EnerServe's mission, espoused culture, and customer and stakeholder objectives
	Management must enable employee self-organization
	Management assessment and remuneration must support and evoke desired behavior and adherence to espoused norms and values
	Management at all levels must be trained and assessed pertinent to leadership characteristics
Resources	All resources installation and utilization must be compliant with safety and health regulations
Technology	Technology must enhance customer productivity and assurance and employee competences

Table 5.4 EnerServe's information requirements

Information (construction) requirements	
Exploitation	Customer recognition in a consistent manner at all customer contact points
	Availability of all customer information at all customer contact points
	Information about customer satisfaction and EnerServe's performance must be available on employee portals
	Cases about excellent and/or poor performance towards customers must be effectively communicated EnerServe-wide
	Information about customers' energy consumption must be available at all customer contact points
	Operational systems must enable easy data extraction for informational systems
	Informational systems must provide flexible capabilities for external and internal data analysis and trend predictions
	Integrated links with external sources for general economic data, energy volume and price developments, and consumer and demographic data must be established
	Computer-supported means and methods for employee collaboration, decision support, data analysis, and process management
	Data that enables local decision-making by employees must be available for all process steps
	Information for employee support and the enablement of self-organizing
	Information about EnerServe and unit performance must be available at all employee portals
	Extended enterprise integration, such that customer and operational data is collected by, and shared with, business partners and suppliers
	Unification and transparency of structured and unstructured data
	Integration of all customer data
	Process data must enable statistical process control
	Financial, accounting and management reporting systems must reflect EnerServe's mission and customer and stakeholder objectives
Exploration	Collection of customer and operational data during all interactions for improving services and processes and for devising new services
	Collection of consumer, market, and competitive data for commercial analyses
	Easy navigation capabilities for energy market data
Presentation	End-users must be able to personalize data presentation
	Information must be consistently presented throughout EnerServe's interfaces
Inf. mgt	Development of EnerServe's information dictionary
	Easy to use content management capabilities
	Effective information life cycle management
Meaning	Informational concepts must have identical meaning throughout EnerServe
	The data concepts used in relation to processes (e.g., quality, productivity, safety, reliability, etc.) must be defined in operational terms such that these concepts have meaning for performing process activities and their control
Quality	Customer, employee, business partner, and supplier data must be available from one unified source
	Protection against unwarranted data usage
	Ensuring currentness of customer and operational information

Table 5.5 EnerServe's IT requirements

IT (construction) requirements	
General	Reduction of time-to-market of new IT services
	Seamless interoperability and interconnectivity of systems, networks, data sources, and interaction channels
	Reduction of EnerServe's legacy system complexity and costs
	Attaining an industry-comparable cost level and ratio between IT operational (continuity) costs and total IT costs
	Secure and user-friendly network access through multiple interaction channels based on user role and tasks
	Cross-functional transparency of all user interfaces
	Reliable IT services (system reliability and availability to be specified)
	Unified databases
	Integration of new and existing (legacy) IT systems and databases
Applications	Application design must enable analysis about how customers use the applications
	Applications must be Intranet, Internet, and Extranet transparent
	Applications must be 'look and feel' transparent
	Applications must enable portal and multichannel access

5.7 Architecture

5.7.1 Principles for Employee-Centric Organizing

EnerServe's central enterprise governance function has defined and/or adopted architecture for guiding enterprise design. Examples of architecture will be given below. Before doing so, we will pay specific attention to EnerServe's strategic focus on employee-centric organizing. Employee involvement, motivation, and the provisioning of meaningful work are mentioned as areas of concern in Table 5.1. In order to concretely address these concerns, architecture must be defined or adopted. As discussed amply before, for developing this type of architecture, insights of the foundational social sciences are vital. Hence, we will present several architecture principles and explain their relevance by referring to certain social theories, specifically theories about motivation. This explanation provides an elaborate rationale for the principles. Further, some key actions for operationalizing the principles are briefly identified.

1. *Working arrangements and job profiles must clearly identify their contribution to EnerServe's mission and purpose.*

   The problem of employee alienation comes from the absence of meaning and purpose in work. In these cases, employees lack insight into how the performance of their work contributes to the overall performance of an enterprise (cf. Sects. 3.5.2* and 3.14.3*). Identifying the purpose of individual activities is also conditional for establishing desired norms and values. The aspect of meaning closely relates to the requirement that management behavior must show leadership characteristics (cf. Sects. 4.6.6* and 4.7.7*). Note that information systems can play an important role in operationalizing this design principle since, if properly designed, these systems can clarify the linkage of activities with the overall mission and purpose of EnerServe. Arguably, this architecture principle also addresses the concern for customer satisfaction and customer proximity within the realm of working arrangements.

Key action:

- Define job profiles and investigate the prime behavior characteristics in view of EnerServe's mission and purpose.

2. *Work must be arranged such that individual and unit performance is enabled and acknowledged by employees*.

   As outlined in the previous point, properly defined goals give tasks meaning and identify the relationship with EnerServe's overall purpose. Moreover, individual and unit performance criteria that are acknowledged and internalized by employees provide a sense of pride and accomplishment. Hence, higher-order motivational needs will be satisfied (cf. Sects. 4.6.3* and 4.6.4*). Properly defined performance criteria thus constitute motivational drivers. They positively affect the 'expectancy': the estimated likelihood that personal efforts will lead to obtaining goals while the goals themselves are valued. An important theory of motivation teaches that performance leads to employee satisfaction, rather than employee satisfaction being conditional for performance. This principle necessitates employee involvement in defining performance goals. Personal motivation to identify oneself with certain goals is not likely to take place if the goals are not 'internalized.' Involvement in setting the goals is seen as a condition for internalization.

   Key actions:

- In cooperation with employees, define key performance indicators and investigate working arrangement such that performance possibilities for employees are enabled, as stressed in Sect. 2.4.12.
- Study the associated information supply and training to enhance employee competences and self-efficacy.

3. *Every team member's role must be explicitly defined, known, and linked to the team's overall role and tasks*.

   Enterprise performance is a collaborative effort. Clarity about roles gives meaning to individual tasks in relation to the overall team's (or unit) purpose. This is a condition for personally felt pride and accomplishment. Role clarity also positively affects the ‘expectancy’: the estimated likelihood that personal efforts will lead to achieving goals. Clearly, devising essential models and expressing the various actor roles greatly aid in role clarity. Again, information systems can play an important role in operationalizing this principle. Note that this principle closely relates to the previous two points and their considerations.

Key actions:

- Devise essential models of EnerServe.
- Study how information supply can visualize essential models and provide clarity about the value of actor role performance.

4. *For operational rules, state rules must be preferred over process rules.*

   As outlined in Sect. 4.8.6, state rules provide more employee ‘maneuverable space’ and thereby contribute to employee self-organizing capabilities. These capabilities are important for increasing the ‘expectancy’: the conditional probability that employees estimate that their efforts will lead to results (cf. Sect. 4.6.4*). Moreover, employee freedom is essential for satisfying the Law of Requisite Variety (cf. Sects. 2.4.5 through 2.4.7).

   Key action:

   - Investigate desired and undesired states and link them to relevant operational rules. Formulate these rules accordingly.

5. *Employee assessment may not be based on criteria outside the direct sphere of control of employees.*

   According to Deming’s common causes category, virtually all instances of poor enterprise performance are caused by the way the enterprise is arranged and operates. Nonetheless, by committing the fundamental attribution error, employees are held responsible for performance defects that are outside their sphere of control. Assessment based on this error has a demoralizing effect because improvement efforts cannot come from employees personally. Efforts in this respect have thus a low ‘expectancy’ (cf. Sect. 4.6.4*).

   Key action:

   - Study relevant assessment criteria that are coherent and consistent with requirements and the other architecture principles defined.

6. *The use of contingent (if-then) rewards is not allowed.*

   As theories about motivation argue, if-then rewards will lead to a shift in focus from the tasks to be completed towards the rewards to be obtained. Performance is likely lowered because of the focus on rewards. Based on the theory of cognitive dissonance, it can be argued that a shared ‘mental map’ will develop that considers tasks not worth doing in and of themselves but only insofar as rewards are given (cf. Sect. 4.6.4*).

Key action:

- In collaboration with employees and management, investigate the nature of effective rewards.

7. *Extrinsic rewards must be unexpected and only given after task completion.*
   The considerations for this principle are similar to those given for the previous principle.
   Key action: covered by principle 6

8. *Nontangible rewards must be considered over tangible rewards.*
   Praise, sharing and celebrating success, as well as feedback and involvement are important elements of nontangible rewards. Such rewards relate (also) to management behavior. Under conditions of properly defined goals, performance will lead to employee satisfaction. See also the remarks pertinent to the second principle.
   Key action: covered by principle 6

9. *Individual performance-related pay may not be used.*
   Enterprise performance is teamwork and seldom the result of the efforts of one individual employee. Moreover, individual performance-related pay completely misses the point that enterprise performance is almost totally determined by the arrangement and operation of the enterprise (its design). As mentioned earlier, the fundamental attribution error is holding employees responsible for performance defects that are outside their sphere of control. Further, the considerations given for principle 6 likewise apply.
   Key action:

- Study possible forms of gainsharing.

10. *Extra (financial) rewards must be equally given to all employees and based on the overall enterprise performance (gainsharing).*
    Basically the same considerations apply as given previously for principles 6 and 9.
    Key action: covered by principle 9

11. *Task autonomy must be created to the maximum extent possible.*
    Unlike breaking down work in simple tasks, this principle demands the opposite (job enrichment). Simple tasks do not provide possibilities for obtaining a sense of accomplishment (satisfying higher-order needs) and hence do not provide satisfaction (motivational drivers) when executing tasks. Autonomy will further positively affect the ‘expectancy’: the estimated likelihood that personal efforts will lead to achieving goals (cf. Sect. 4.6.4*). As said earlier, employee freedom is essential for satisfying the Law of Requisite Variety (cf. Sects. 2.4.5 through 2.4.7).

Key actions:

- Investigate job enrichment and clustering of activities such that an employee can carry out multiple actor roles effectively.
- Study conditions for ensuring that task autonomy and employee performance possibilities match.
- Investigate the required information supply to aid employees in task execution and the associated decision-making.

12. *Traditional periodic employee performance reviews must be abolished and replaced by a dialog about enhancing personal competence.*
    Comparable considerations apply as given by principles 6 and 9. Focusing on employee competences will increase the ‘expectancy’ since employees feel more confident that their efforts will accomplish desired results.
    Key actions:

- Define the specific competences associated with the various actor roles.
- Define the general competences required in view of (1) customer and service orientation and (2) employee involvement and self-efficacy.
- Study the consistency and coherence of the competences with the desired task autonomy.

All the architecture principles given above are published by EnerServe’s central governance function under the four-tier publication structure outlined in Sects. 4.5.9 and 4.11.7. The rationales for these principles have been given above. Given the history of the existing energy company, the implications of the principles are considerable. Several key actions were identified. Subsequent discussion about the principles, their rationale, implications, and key actions is all part of the inquisitive process and as such will contribute to employee and management commitment, buy-in, and to the success of the enterprise transformation.

5.7.2 The Scope of Design Principles: Contributing to Unity and Integration

Section 4.11.6 mentioned that an area of concern is addressed by various architecture principles and that, conversely, an architecture principle can address more than one concern. Table 4.16 in the previous chapter gives examples. Arguably, the scope of design principles contributes to enterprise unity and integration since different design domains apply the same principles. The various concerns are thus addressed in different design domains. Obviously, this is likewise the case for EnerServe. As an illustration, Table 5.6 resumes some principles that address the concern for process quality and compliance.

Table 5.6 Examples of architecture principles addressing process quality and compliance

Architecture for process quality and compliance	
Business	Access to systems must be based on authentication and role-based authorization
	Purchasing and payment process must have non-repudiation protection
Organization	Process design must address delegation of communicative actions associated with transactions explicitly
	Process control must enable communicating the process state
	All processes requiring authorization must store operational data
	All operational authorizations must be linked to personnel data
	Process design must exclude the necessity for data reconciliation
	Customer contract and purchase actions must always be confirmed
Information	Operational events must update associated information systems in real time
	Process events must be logged in read-only data storage
	Metadata must be centrally managed
	Process events must be logged in read-only data storage
	Redundant data entries about the same data are not allowed
	All data must have associated accessibility policies
	Authentication and authorization data must be centrally stored
	Data to authenticate/authorize users must be stored in one central directory
	Data transport over public lines must be encrypted
	Data definitions must be in accordance with the EGB standards
	Data must be validated at the source
	Data errors must be traceable to the source
	User authentication and authorization must be based on one service only
IT	All user access through the Internet must be arranged through one technical entry point only
	Services may only use the common vocabulary in their communication
	Security services must be suitable for integrated monitoring and management in IT operational processes
	EnerServe-controlled access devices must include protection against malicious software and/or content
	Security services must include detection capabilities for unauthorized use or attempts to change the service
	Data storage in the data warehouse must be in accordance with archiving and aggregation policies
	Data changes may be arranged through data-editor applications only (no direct manual data changes are allowed)
	Network access must be based on authentication and role-based authorization
	Network access must be based on two-factor authentication
	Data storage in Storage Area Networks (SAN) may only be accessed via locally attached application servers
	Access to a single SAN in the DMZ is not allowed

5.7.3 EnerServe's Architecture

Tables 5.7, 5.8, 5.9, and 5.10 provide examples of EnerServe's architecture, either developed or adopted by the central enterprise governance function. The examples presented do not aim to be comprehensive since architecture is not defined for every subdesign mentioned in the functional and constructional decomposition (cf. Sects. 4.9.2 and 4.9.3). Nonetheless, the examples intend to illustrate that a relatively comprehensive set of architecture principles can be defined for addressing areas of concern and for guiding the design in the various design domains. Based on our discussion so far, it can quite easily be ascertained which area(s) of concern are addressed by a specific principle mentioned in the tables.

Table 5.7 Examples of EnerServe's business architecture

Business (function) architecture	
Relationship management	EnerServe's customer agents must handle customer requests or complaints until final resolution (no delegation)
	Customer relationships with EnerServe's partners must be arranged through EnerServe's interfaces
	All interaction with customers must disclose consumer rights
Access mgt	The Internet must be the primary customer interaction channel
	Security services utilization must be fully independent of their implementation
	Security services must be suitable for integrated monitoring and management in IT operational processes
	Security services must enable easy inclusion or exclusion of users
	Access to systems must be based on authentication and role-based authorization
	EnerServe-controlled access devices must include protection against malicious software and/or content
	Security services must include detection capabilities for unauthorized use or attempts to change the service
Sales/ordering	Invoicing and payment must only be handled electronically
	Complementary services may only be offered in connection with the primary energy service
	Products and services may not be sold unless tested in a trial period by a representative target customer group
	Delivery of complementary products and services through partnerships only
	Sales/ordering and payment processes must have non-repudiation protection
	Customer sales/ordering actions must always be confirmed
Purchasing	Purchasing and payment processes must have non-repudiation protection

Table 5.8 Examples of EnerServe's organization architecture

Organization (construction) architecture	
Employees	Assessment may not be based on criteria outside individual employee direct sphere of control
	Employee bonus payment may only be based on EnerServe's overall performance (gainsharing)
	The use of contingent (if-then) rewards is not allowed
	Extrinsic rewards must be unexpected and only given after task completion
	Nontangible rewards must be considered over tangible rewards
	Individual performance-related incentive pay and associated targets may not be used
	Performance assessment of customer service units must be based on customer satisfaction
	Rewards must recognize team and individual efforts and contributions to the enhancement of EnerServe's performance
	Traditional performance reviews must be abolished and replaced by a dialog about enhancing personal competences
	Education must be treated as an investment rather than cost
	Employee job descriptions must focus on the contribution to the overall process, the (internal) customer, and EnerServe's mission
Management	Management bonus payment must only be based on EnerServe's overall performance and the principle of gainsharing
	Individual performance-related incentive pay systems and associated targets may not be used
	Rewards systems must recognize team and individual efforts and contributions to the enhancement of EnerServe's performance
	Management job descriptions must focus on leadership characteristics and the contribution to EnerServe's mission and values
Transactions processes	Process design must be based on the minimum critical specification rule
	Working arrangements and job profiles must clearly identify their contribution to EnerServe's mission and purpose
	Work must be arranged such that individual and unit performance is enabled and acknowledged by employees
	Every team member's role must be explicitly defined, known, and linked to the team's overall role and tasks
	For operational rules, state rules must be preferred over process rules
	Task autonomy must be created to the maximum extent possible
	Prior to formalizing process arrangements and the associated communication rules and work instructions, they must be understood and endorsed by the employees using them
	Process safety must prevail over efficiency
	Process execution must be business event driven
	Process design may include enforced business rules only in case of safety, health, or compliance considerations
	Decision-making must take place at the lowest possible level
	Process control arrangements must be separated from process execution arrangements

(continued)

Table 5.8 (continued)

Organization (construction) architecture	
	Process control must enable communicating the process state
	Services may only use the common vocabulary in their communication
	Local efficiency must be subordinated to end-to-end process performance
	Quality control must be an integral part of employee activities and must take place at the point of production or service delivery
	Process performance assessment must be based on criteria supporting EnerServe's mission and values
	Process design must address delegation of communicative actions associated with transactions explicitly
	Contract, procurement, and payment processes must have non-repudiation protection
	Accounting criteria must be in accordance with the International Financial Reporting Standards
	Financial units of measure must avoid local suboptimization and must focus on EnerServe's performance overall
	Costs of non-quality must be explicitly recorded and linked to process capabilities to aid improvement
	Performance reporting and accounting must reflect and be consistent with EnerServe's purpose, intentions, norms, and values
	Absenteeism must be accounted for as a production cost
	All processes requiring authorization must store operational data
	Process design must exclude the necessity for data reconciliation
	Customer sales/ordering and payment actions must always be confirmed
	Invoicing and payment must be handled electronically only
	Clustering of actor roles into functional units must be based on minimizing the unit's external relationships
	Critical processes must have fail-operational protection
Resources	Only proven technology may be used in primary processes
	Technology arrangements must be modular
	Only open technology standards may be used
	Only certified material and equipment may be used

Table 5.9 Examples of EnerServe's information architecture

Information (construction) architecture	
Sources	Operational events must update associated information systems in real time
	Process events must be logged in read-only data storage
	Metadata must be centrally managed
	Metadata must be part of the data they describe
	Redundant data entries about the same data are not allowed
	Data from operational systems must update informational systems in real time
	Authentication and authorization data must be stored centrally
	Data to authenticate/authorize users must be stored in one central directory
	Data transport over public lines must be encrypted
	All informational data may have only one authoritative source
	Customer, employee, business partner, and supplier data must be available from one unified source
	Different presentation components must be used for different languages
	Data must be validated at the source
	Data errors must be traceable to the source
Access	Information system access must be based on authentication and role-based authorization
	All data must have associated accessibility policies
	User authentication and authorization must be based on one service only
Semantics	Presentation of key data must include the capacity to verify their meaning
	Type and purpose of information must be linked to presentation styles consistently
	Semantics must be consistent over all processes
	Data definitions must be in accordance with the EGB standards
	The data concepts used in relation to processes (e.g., quality, productivity, safety, reliability, etc.) must be defined in operational terms, such that these concepts have meaning for the processes and their control
Syntax	Information must be structured according to the XML standard
Users	End-users must be able to personalize data presentation
	Users of classified data must be recorded

Table 5.10 Examples of EnerServe's IT architecture

IT (construction) architecture	
Applications	Collaboration services must be made available through EnerServe's collaboration suite. Disjointed point solutions are not allowed
	Collaboration services must operate within EnerServe's web hosting environment
	Proprietary collaboration features may not be used
	The provisioning of collaboration services must be positioned within the service-oriented architecture approach
	Embedded collaboration features in other software packages must be disabled
	Always use an *n*-tier structure
	Separate the execution of a business software component from flow control
	A business component must be able to communicate its state
	Optimistic locking (assuming the unlikelihood of different users affecting the same data at the same time) must be used to enable concurrent user access
	Use 'service wrappers' to access legacy systems
	Every component must communicate through a local ORB, whereby enterprise access must be arranged through a service gateway
	Application integration must be arranged at the enterprise process level
	Applications must be designed to be business event driven
	Commercial off-the-shelf solutions must be compliant with EnerServe's architecture
	Commercial off-the-shelf solutions may not be modified other than through the available configuration options
Storage	Data storage must be in accordance with RDBMS
	Data storage and data processing must be decoupled
	Data storage in Storage Area Networks (SAN) may only be assessed via locally attached application servers
	The generic TCP/IP network may not be used for intra SAN traffic
	Access to a single SAN in the DMZ is not allowed
Interfaces	Presentation of services must be based on the user profile
	Business objects may only be assessed through standard access components
	All user access through the Internet must be arranged through one technical entry point only
	Different presentation components must be used for different languages
	End-users must be able to personalize data presentation
	Portlets must disclose resources using a service-oriented approach
	Each portlet may correspond to one service only
	Individual portlets must be reusable for different functions
	Portlets may not bypass the security of different back-end resources
	Portlets must be multichannel compatible
	Portlets may not contain business logic
	Control and presentation of data must be separated

(continued)

Table 5.10 (continued)

IT (construction) architecture	
Network	Resources must be accessed via a single virtual network
	Resource access must be location-independent and only based on the resource name
	Network access must be secured through a standard integrated security service
	Network access must be based on authentication and role-based authorization
	Network access must be based on two-factor authentication
	The network must support any-to-any communication to enable integration, interoperability, and information sharing
	TCP/IP must be the standard transport protocol. Deviation only when unavoid-able for access to business partners or suppliers
Middleware	No business logic may be executed by middleware services
	Object request broker standard 'XYZ' must be used
	Message-oriented middleware must be used
	Use a hub-and-spoke mechanism for business component communication
	Services may only use the common vocabulary in their communication
	Asynchronous messaging must be used
	Separate service provisioning from service implementation
	Format and standard transformations must be minimized
	Two-phase commit style distributed transactions over service innovations must be avoided
Platform	Only platforms mentioned in the Technical Reference Document may be used and for the indicated purposes only
	All new application components must be hosted on EnerServe's web hosting environment
	All platforms must be configured identically (component transparency)
	Platform workloads must be distributed according to service-level characteristics
	All platforms must be operable in a network-centric environment
	A partitioned server may not be attached to Internet DMZs or other network zones
Data warehouse	The data warehouse must be the only authoritative source for all decision support databases
	An operational data store must be separated from the data warehouse
	Operational data must be separated from informational data
	Data databases must be partitioned
	The data warehouse must be read-only
	Users' access to the data warehouse must be arranged through data marts
	No operational data may be stored in the data warehouse
	Data storage in the data warehouse must be in accordance with archiving and aggregation policies
	A hub-and-spoke model for data distribution must be used
	Data must be validated at the source
	Data errors must be traceable to the source
	Data changes may be arranged through data-editor applications only (no direct manual data changes are allowed)

(continued)

Table 5.10 (continued)

IT (construction) architecture	
	Processes must enable easy data extraction for use in other processes or informational systems
	Metadata must be centrally managed
	Metadata must be part of the data they describe
	Redundant data entries about the same data are not allowed

5.8 EnerServe's Essential Models

5.8.1 Interaction Model and Process Models

As a first step in the fundamental transition towards EnerServe, the essential operational aspects of the new situation have been defined from the energy supply viewpoint (transactions concerning complementary services are outside our current scope). EnerServe has adopted the essential modeling theory and methods outlined in the previous chapter. The central enterprise governance function has devised the interaction model shown in Fig. 5.3.

The interaction model shows the various internal and external actor roles (cf. Sect. 4.8.2). Internal actor roles are associated with one transaction only: the realization one production fact. Composite actor roles are associated with more than one transaction. Since there is generally no information about the precise nature of external actor roles, they are depicted as composite actors (CA). The various external actors represent three of the core activity domains mentioned previously. Transactions concerning trading energy and the periodic transfer of collected charges are not shown and will be discussed below. So, we will concentrate initially on the transactions shown in Fig. 5.3. Table 5.11 gives the transactions and their respective results.

With reference to the interaction model and the process models shown below, the transactions can be explained briefly as follows.

Contract Starting

For switching to EnerServe, the customer initiates transaction T01, leading subsequently to EnerServe's initiation of T02 for getting the customer's authorization to end the customer's contract with the current energy supplier through T07. The authorization includes EnerServe's full responsibility in this respect such that the consequences of inadequate contract termination are accepted by EnerServe. This way of modeling differs slightly from the actual practice, but according to EnerServe, it is more conducive to defining responsibilities properly. Note that without being authorized formally (including appropriate conditions), ending the contract with the current supplier would merely imply delegation of tasks from the customer to EnerServe. As process model of Fig. 5.4 shows, execution of T01 has to wait for the authorization received. Authorization is always required since EnerServe also acts on behalf of the customer regarding the connection and transport agreement between the customer and the network operator. For ending a customer contract with the previous supplier properly, EnerServe must provide the meter reading which is

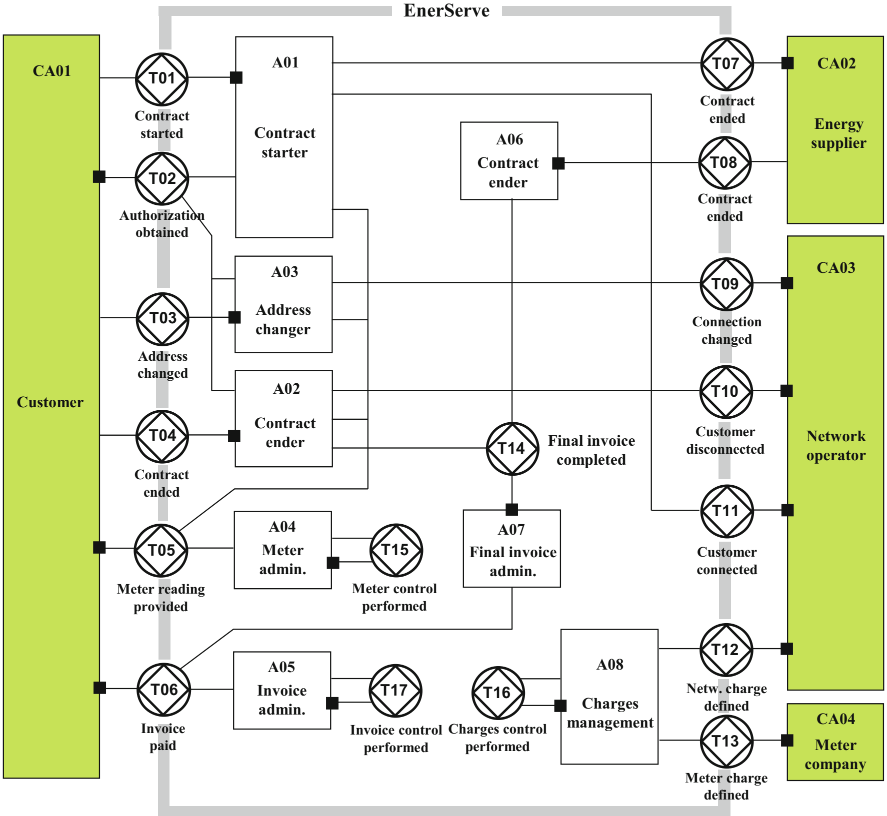

Fig. 5.3 Interaction model

arranged through transaction T05. Subsequently, the previous supplier will send the final invoice to the customer. As illustrated, for EnerServe this situation occurs when an EnerServe customer switches to another supplier.

It might be the case, however, that the customer does not have a current energy supplier, for example, by coming from abroad or by moving from the parents' home to a newly bought house. Hence T07 is optional, as indicated by the range *0. . .1*: either not required (*0*) or required (*1*). For EnerServe becoming the energy supplier, EnerServe must be linked to the customer's connection number in the connection register. Hence, T11 is initiated by the 'contract starter' actor role. The contract is operational, and hence T01 is completed, once (in addition to T02/ac) the results of T07 and T11 are accepted.

Contract Ending and Address Change

Two situations lead to contract ending: (1) the customer switches from EnerServe to another energy supplier or (2) the customer ends the contract for reasons other than switching to another supplier, for example, by moving abroad. In the first case, the new energy supplier requests termination of the contract through transaction T08, which is the mirror situation described earlier, when a customer switches to EnerServe. The

Table 5.11 Transaction-result table

Transaction	Result
T01	R01 Contract *K* started
T02	R02 Authorization *A* obtained
T03	R03 Address *L* changed
T04	R04 Contract *K* ended
T05	R05 Meter reading *R* provided
T06	R06 Invoice *I* paid
T07	R07 Contract K^* (with previous supplier) ended
T08	R08 Contract *K* ended
T09	R09 Connection *N* changed
T10	R10 Customer *C* disengaged from connection *N*
T11	R11 Customer *C* linked (to EnerServe) at connection *N*
T12	R12 Network charge *B* for period *Q* defined
T13	R13 Meter charge *G* for period *Q* defined
T14	R14 Final invoice *I* completed
T15	R15 Meter control for period *P* performed
T16	R16 Charges control for period *P* performed
T17	R17 Invoice control for month *M* performed

second case is initiated through transaction T04, next leading to T10 for ensuring that the customer is disengaged from the connection number. In both cases, the final invoice needs to be determined and paid which is organized through transaction T14. Payment is arranged by initiating transaction T06. This transaction is also initiated by the self-activating transaction T17 which ensures the monthly payment of the energy used. Notably, also if the contract ends through transaction T04, authorization is required for ending the connection and transport agreement with the network operator. The meter reading (through T05) must also be provided.

The process model of Fig. 5.5 shows that payment transaction (T06) is contained within transaction T14. So, the completion of T14 has to wait for T06/ac. Subsequently, the completion of T04 has to wait for T05/ac, T10/ac, and T14/ac, while the completion of T08 depends on T14/ac only. Similarly, the completion of T17 has to wait for T06/ac.

As the interaction model shows, transaction T03 is initiated when a customer continues to use EnerServe but changes to a new address. As a follow-up, transaction T09 ensures that the customer is linked to the connection number associated with the new address. The new address might be served by a supplier other than EnerServe. However, the associated contract should have been ended by the previous inhabitant. As before, the meter reading must be provided. Authorization must also be obtained to arrange the new connection and transport agreement. Defining the associated process model is left to the reader.

Transport and meter charges are determined for every period Q (e.g., yearly) through the self-activating transaction T16, leading to the initiation of T12 and T13. The related process model is not shown but compares with that associated with the transactions T17 and T06 in Fig. 5.5. This likewise holds for the transactions T15 and T05, which concern periodic meter reading.

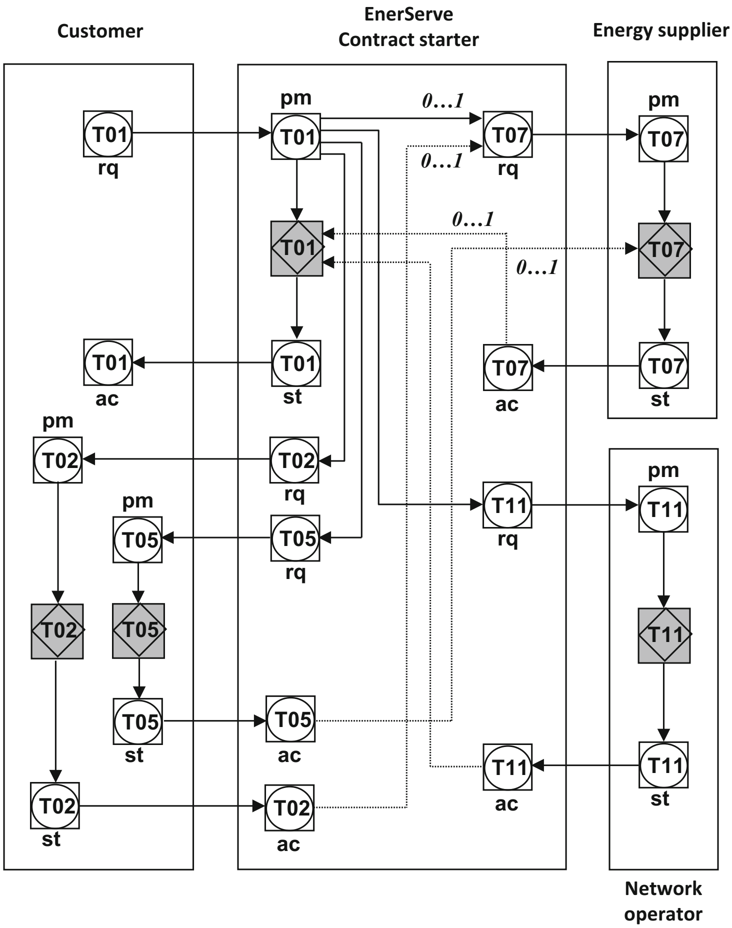

Fig. 5.4 Process model: contract starting

Notably, the contract ending process could have been arranged somewhat differently by not having the payment transaction T06 included within T14 but initiated by the contract ender. Then the nature of T14 changes into only defining the amount of the final invoice. Different waiting conditions also apply. As one might verify, the interaction model changes and a more complex process model is also associated with this option.

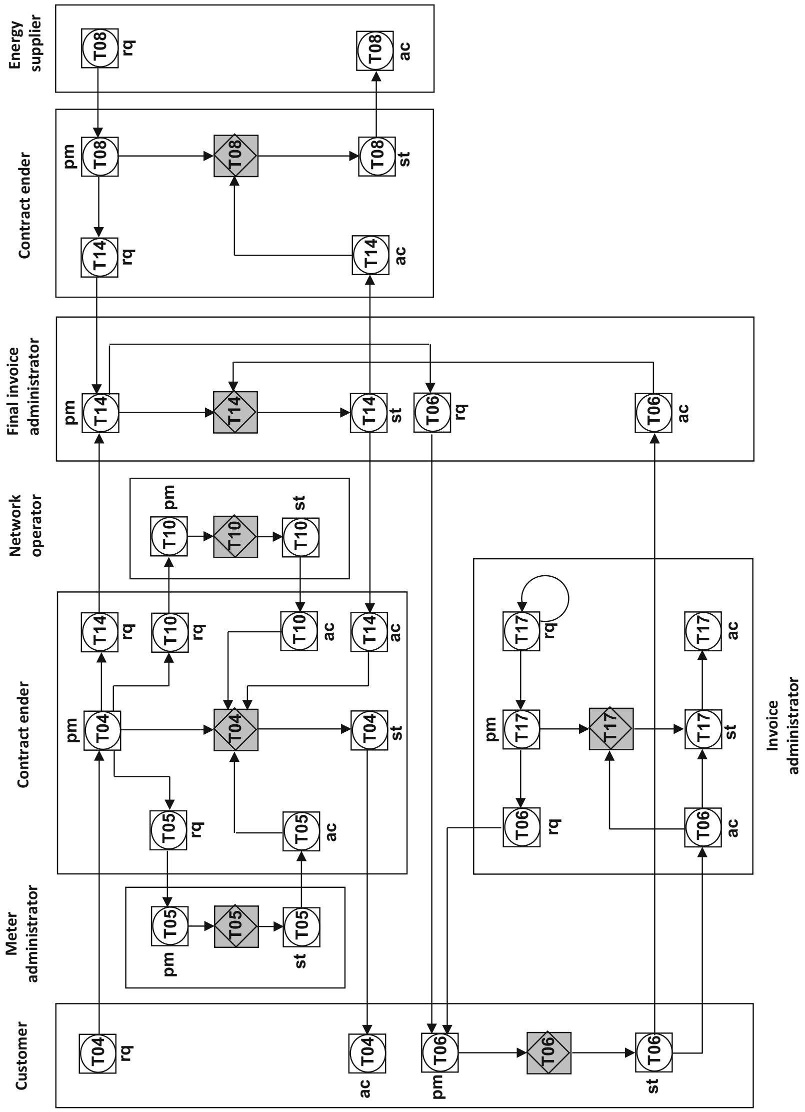

Fig. 5.5 Process model: contract ending

5.8.2 Fact Model

EnerServe's fact model of production facts and the associated object classes is shown in Fig. 5.6. Relevant logical relationships between object classes are given (cf. Sect. 4.8.5). The black dot indicates that a relationship is mandatory. So, for example, a customer must have a contract, while a contract must be related to a customer. The horizontal bar indicates uniqueness: the contract *K* identifies the customer *C* uniquely. Since a customer might have more than one contract, the reverse is not true: a customer does not identify a contact uniquely. Two horizontal bars imply that both elements of the respective object classes are related uniquely. For example, a connection is uniquely related to an address, and vice versa.

The production results are shown in the fact model. For the specific nature of the results, we refer to Table 5.11. Particularly noteworthy are the binary production results R10, R11, R12, and R13, indicated by a two-part diamond.

Besides the previous models, the fact model identifies the core object classes of which the data is essential for carrying out EnerServe's processes. Hence, the fact model assists EnerServe's governance competence in defining the core elements of EnerServe's data dictionary.

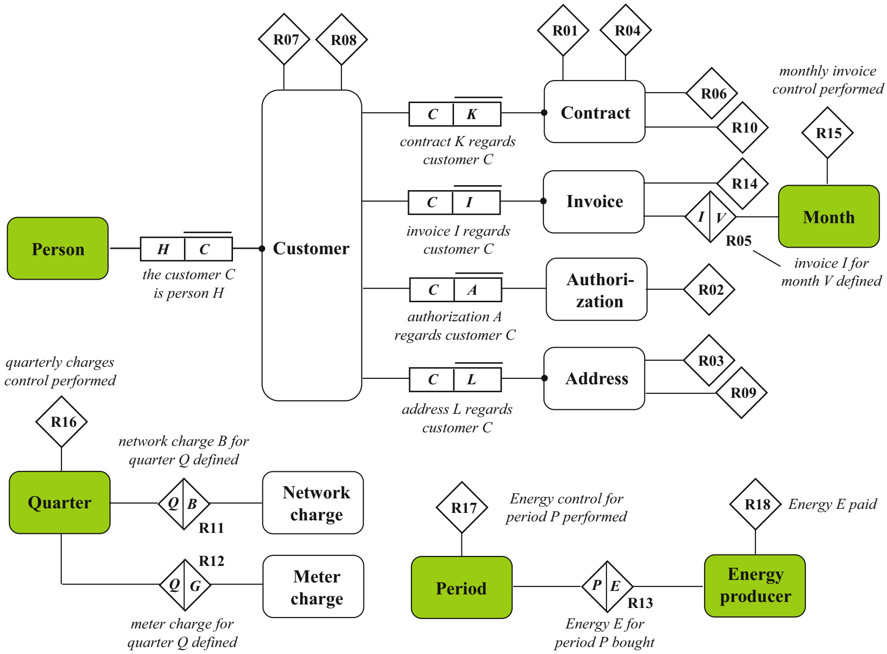

Fig. 5.6 Fact model

5.8.3 *Additional Transactions*

In addition to the transactions shown in Fig. 5.3, the transactions concerning energy trading and the (monthly) transfer of network and meter charges must be included. These transactions are depicted in the interaction model of Fig. 5.7, which must be seen as an extension to Fig. 5.3.

Table 5.12 shows the transaction results. We will not elaborate further on these additional transactions. Since they are rather straightforward, the associated process, state, and interstriction models can be defined easily.

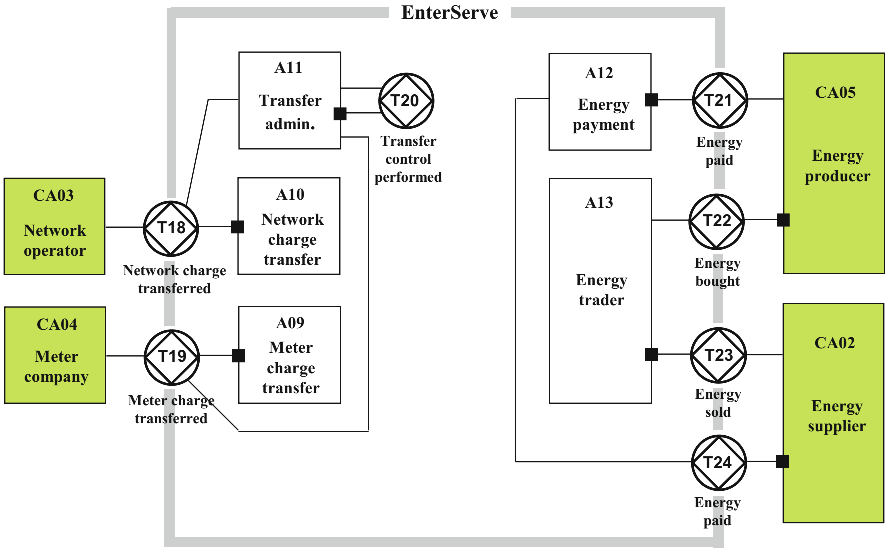

Fig. 5.7 Interaction model with additional transactions

Table 5.12 Transaction-result table

Transaction	Result
T18	R18 Network charge *B* transferred
T19	R19 Meter charge *G* transferred
T20	R20 Transfer control for month *M* performed
T21	R21 Energy *E* paid
T22	R22 Energy *E* bought
T23	R23 Energy *E** sold
T24	R24 Energy *E** paid

5.8.4 *Interstriction Model*

An interstriction model shows the various information links. We will limit ourselves to the interstriction model associated with the interaction model of Fig. 5.3. This model is derived as follows (cf. Sect. 4.8.3):

- Taking the interaction model of Fig. 5.3 and changing the solid lines into dotted lines representing the information links.
- Interpreting the transaction symbol as the combination of two data banks: production data and coordination data associated with a certain transaction (cf. Fig. 4.33 of Sect. 4.8.3).
- Adding links to external data banks. These are data banks not (or not only) created by the transactions shown in the interaction model. The result is shown in Fig. 5.8.

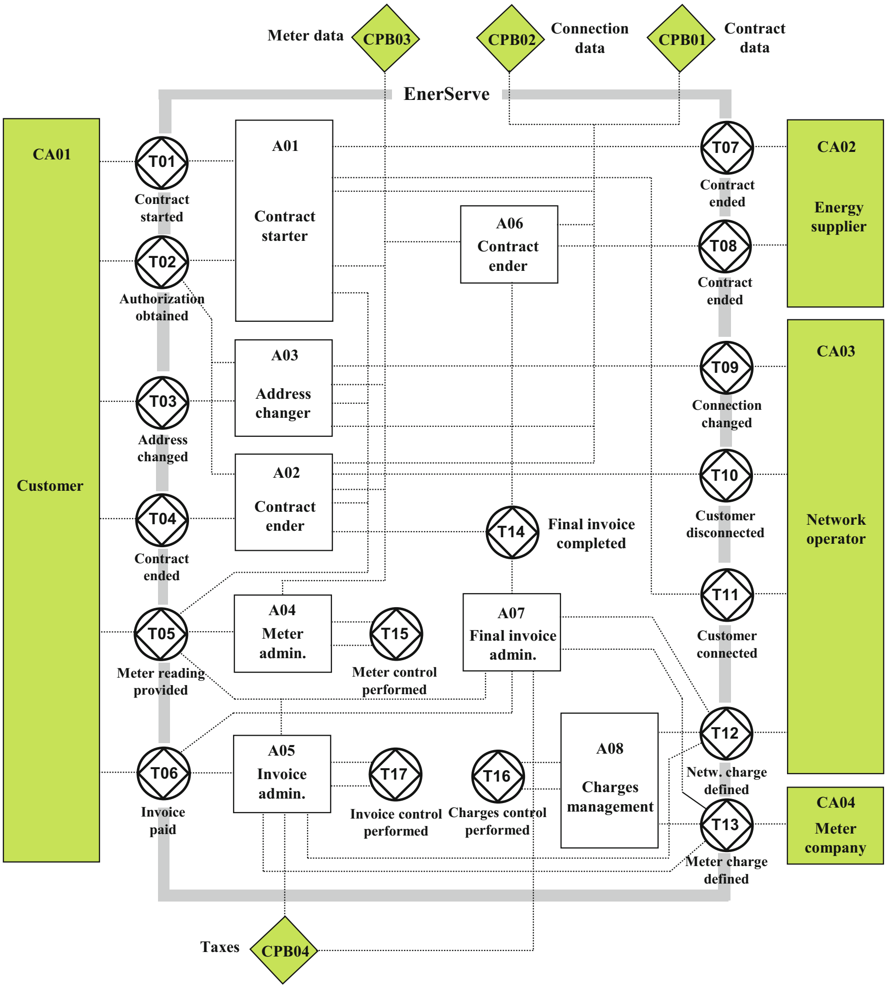

Fig. 5.8 Interstriction model

The nature of the external data banks can be understood by remembering that data banks are about production facts (hence, the diamond shape). The data bank about meter readings is made up of production facts created by the transactions between suppliers requesting the meter readings and customers providing them. Similarly, connection data is produced by internal transactions within the network operator concerning the connection registry updates. Further, contract data is produced by EnerServe (concerning supply) and the network operator (concerning connection and transport). Finally, there is the data bank about taxes produced by governmental agencies. Because there could generally be more than one transaction involved in producing the data bank, the external data banks are identified as composite production banks (CBP).

Since the interstriction model is about information links, the model aids in (1) defining EnerServe's applications (or possibly modifying existing ones) that enable the various actors to acquire the information they need and (2) positioning EnerServe's commodity infrastructure and services that will be discussed below. Both aspects operationalize the notions of business/IT alignment and enablement.

5.8.5 Operational Rules

The coordination activities of the transactions are guided by coordination rules (cf. Sect. 4.8.6). Together with representatives of the operational departments, the operational rules must be defined. As an example, operational rules for transaction T01, in the case of switching, might read:

T01/pm Prior to initiating the switch, inform the customer about contractual conditions and indicate that if the contract with the current supplier exceeds the minimum contract period or is within the 7-day period after contract initiation, switching is possible at no costs or else there will be a fine for premature contract ending imposed by the current supplier.

Request the customer's authorization to end the customer's contract with the current supplier and to arrange the connection and transport agreement. Decline the switch if no authorization is obtained.

Inform the customer about EnerServe's conditions concerning the authorization.

Request the meter reading and request contract ending with the current supplier formally as per date 'd' and provide the meter reading to the current supplier.

Await the formal statement from the current supplier that the contract has been ended and inform the customer accordingly.

T01/st When the current contract has been ended and the customer's connection number is linked to EnerServe, confirm to the customer by e-mail that the contract is operational under the specified conditions. Subsequently send the contractual documents.

T01/ac If switching has been performed adequately, accept by returning the duly signed contract copy or else no formal contract is started. Contact EnerServe's customer care center for follow-up activities.

We will not present the operational rules for all coordination activities. The example given shows the typical nature of these rules.

5.8.6 The Definition of Commodity Services

EnerServe's central governance function observed that more and more IT-based services can be made available for general use. We return to this issue when discussing EnerServe's current complex IT systems. The generally applicable IT services are identified as 'commodity services' and execute parts of organizational processes. Defining the type and granularity of these services is not a simple issue. Proper process design is evidently a prerequisite for the ability to define meaningful services that can also be reused.

For EnerServe, the process models shown in Figs. 5.4 and 5.5 provide a fruitful reference for considerations about services development. For example, in the case of the contract ending process in Fig. 5.5, for the execution of T06/rq and T14/rq the use of services for the execution of tasks might be considered:

- T06/rq: send invoice.
- T14/rq: complete final invoice.

As the process model shows, within the process executed by the 'final invoice service,' the 'send invoice service' will be used. Noticeably, the latter service is used in two processes, initiated by the transactions T14 and T17, respectively.

Notably, many services must be defined that enable EnerServe's operation. All these services are part of the EnerServe commodity infrastructure and services discussed below. Examples are corporate directory services, data archiving services, services for extracting data from operational systems and for transforming and loading them into informational systems, etc. Many of these services operate concealed within the IT domain for ensuring adequate IT system operation. Other services are used directly for executing (parts of) business processes. For example, the execution of transaction T06 by the customer is enabled by (1) services to authenticate users and authorize them to perform certain actions and (2) services that enable electronic payment. As such, these services provide the means for actually implementing the production activities of transaction T06. Finally, we might observe that workflow services (as part of overall collaboration services) aid in controlling the flow of transaction activities, including the associated waiting conditions.

5.8.7 *Clustering of Actor Roles and Functional Units*

As illustrated, the interaction models show EnerServe's essential actor roles. These actor roles might be clustered logically, for example, based on an organizational architecture principle requiring that clustering actor roles into functional units must be based on minimizing external relationships with the functional unit. Cross-unit collaboration is thereby minimized. An example of such clustering is shown in Fig. 5.9.

The clustering shown in Fig. 5.9 identifies four activity domains. In addition to a variety of employee competences that are relevant for the different activity domains, the associated information support (applications) is evidently a crucial aspect. Unwarranted fragmentation of information support by dispersed applications as a result of EnerServe's existing IT arrangements can thus be identified.

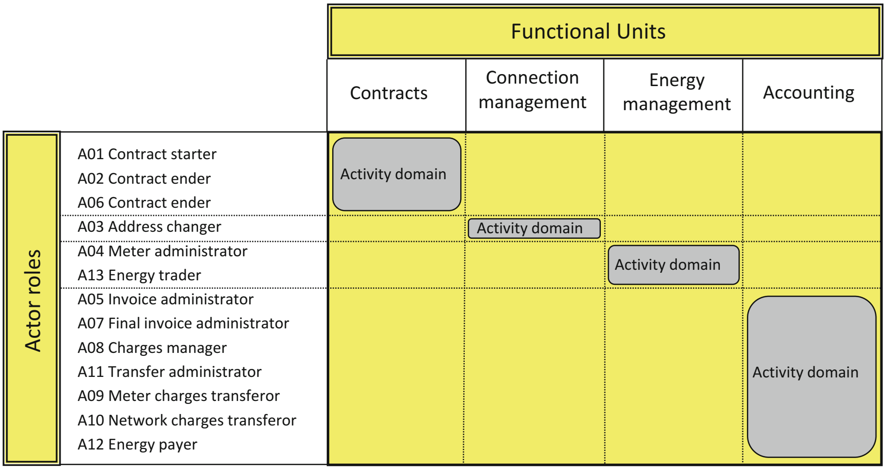

Fig. 5.9 Clustering of actor roles

5.8.8 *Designing Supplementary Transactions*

Our previous approach to devising essential models focused on transactions that concerned EnerServe's core processes associated with the provisioning of energy. As described in Sect. 4.11.3, numerous other enterprise processes need to be defined. Table 4.9 gives an overview of some operational and support processes that are also relevant for EnerServe. Devising all these models exceeds the scope of this case illustration. Nonetheless, in reality the additional models must be devised for defining the exact nature of the transactions, the production results, the operational rules, and the information requirements. All that ensures a coherent and consistent enterprise design of the presumed way of organizing and the conditions for emerging organizing.

5.8.9 *Further Design*

After having defined the essential models, further construction models (artifacts) must be designed that enable the ultimate implementation. Since essential models are fully implementation-independent, it is still unclear how implementation should occur. For example, how should EnerServe implement transaction T01, starting a contract? How should customer interaction occur? Interaction through the Internet leads to another construction model than interaction by having the customer come to an office. Hence, for implementation, further design is required which yields the required artifacts. Design guidance is required in the form of enterprise architecture. Enterprise architecture is defined with reference to areas of concern and applicable to four main enterprise design domains: business, organization, information, and (information) technology (cf. Sect. 4.9). Several subdomains are defined per main design domain (cf. Sects. 4.9.2 and 4.9.3).

The transition from the EnerServe essential models defined previously to additional construction models of a concrete artifact is shown schematically in Fig. 5.10. Four main enterprise design domains are shown with their respective subdesign domains. These are the domains were essential models are actualized: are made concrete guided by architecture and whereby requirements are dealt with and areas of concern are addressed. This results in a set of construction models of various kinds that enable ultimate concrete implementation. For example, the architecture principle that 'the Internet must be the primary customer interaction channel' will lead to an IT-based interaction solution. A screen layout can then be considered as a

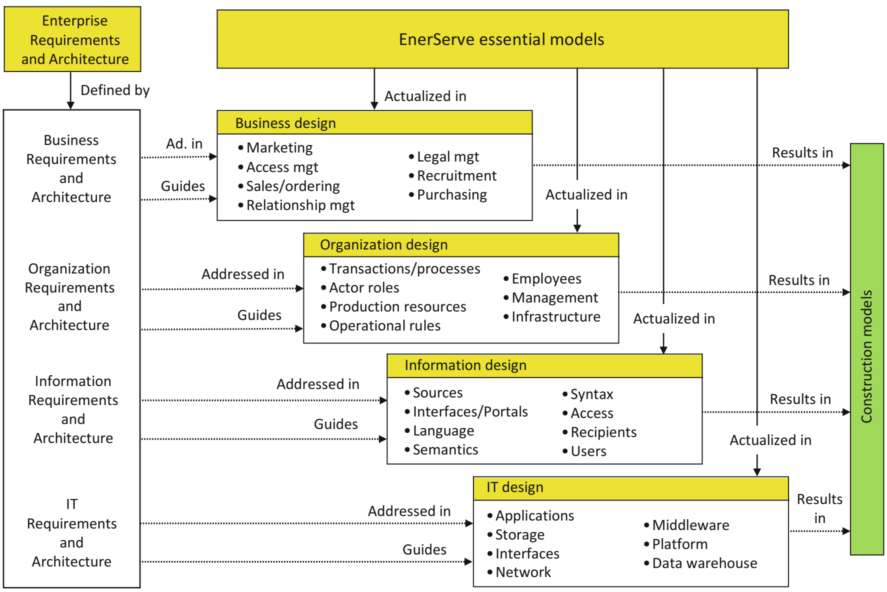

Fig. 5.10 The transition from essential models to construction models

construction model. Other models might be the clustering of actor roles into functional units as shown in Fig. 5.9, the actual arrangement of electronic invoicing and payment, the (management) reporting structure or the structure of functional payment levels, and so on. In summary, next to essential models, examples of concrete artifacts are:

- Organizational units and management structure.
- General employee and management competences and assessment criteria.
- Employment conditions, rights, and obligations.
- Remuneration arrangements, policies, and salary scales for employees and management.
- Job profiles, specific competences, and recruitment and assessment criteria
- Production and offices layouts.
- Layouts for buildings, storage, and archives.
- Drawings for utilities.
- Corporate data dictionary.
- Information life cycle and document policies.
- Data classification and security policies.
- Authorization levels and policies.
- IT system layouts.

Through guiding the actual realization of essential models, architecture has two important goals: (1) ensuring the unified and integrated operation of EnerServe and (2) addressing the areas of concern. As stressed earlier, these two goals are not 'automatically' implied by the essential models. Using different process implementations in different areas of EnerServe would—while starting with the same essential model—impair process integration. Further, addressing areas of concern also needs design in addition to essential design. So for example, customer and service orientation is not an inherent property of essential models, particularly since these models are implementation-independent. Requirements and architecture must thus be defined to make EnerServe customer and service oriented, as those that were given before.

5.9 Addressing IT 'Legacy' Complexity

5.9.1 The Needed Change

The Problems

The current energy company comprises many functional units responsible for performing various activities. These units were optimized based on enterprise unit objectives and interests under the assumption that such an optimization would also lead to optimization of the enterprise as a whole. Understandably, such optimization leads to autonomy regarding developing IT functionality. This decentralized approach resulted in many undesired and detrimental consequences. First is creating an enormous diversity in demand for IT functionality combined with an enormous diversity in IT supply in meeting demand. The existing energy company manifests complex and diffuse relationships between the demand for IT services and their supply: many entities creating demand and many entities providing supply. Numerous divergent, redundant, incoherent, and even conflicting IT developments emerged. This not only increases cost for operation and new developments but also hampers system interoperability. Enterprise units, with their vertical, hierarchical orientation, became organizational ‘silos’ whereby their autonomy also led to technology silos which make establishing a unified and integrated enterprise cumbersome. Many adaptations (couplings, transformations, work-arounds) were developed for arranging a minimal level of process integration. This has created an enormous IT complexity and associated cost level. For the current energy company, the operational IT costs amount to over 80% of the total IT costs. All these problems were aggravated by the fashion to outsource IT services. One might argue, however, that IT complexity is not the *cause* of organizational complexity but the *result* thereof. Indeed, “costs grew out of control not because of the IT department, but in spite of the IT department” (Kaplan 2005, p. 34). In summary, the developments portrayed above have led to:

- Large technology diversity and redundancy with opportunity-driven extensions.
- Many, non-integrated applications, hosted both centrally and decentrally.
- Duplication of data, centralized and decentralized, with gradually degrading integrity.
- Numerous unstructured (point-to-point) connections between systems.

Such a situation entails serious consequences for the enterprise as a whole:

- Continuously growing and barely manageable complexity and costs.
- Inability to integrate different interfaces, data, and (operational) processes pertinent to customers, suppliers, and business partners.
- Disconnected customer and operational data, creating ineffective customer relationship management and operational decision-making.
- Changes creating an avalanche of subsequent effects.
- Questionable scalability, making it difficult to accommodate business growth.
- Serious limitations regarding enterprise agility.
- Disproportionate amounts of human and financial resources must be allocated continuously for keeping the complex IT environment operational and accommodating new business needs.

The Necessary Shift to Central Governance

The notion of ‘IT legacy complexity’ refers to the complexity of historically created IT applications and infrastructure (storage, network, processors, access devices, etc.) as described previously. We will identify these applications and infrastructure generally as ‘legacy systems.’ This common denotation might create the impression that IT legacy system development is a thing of the past that currently cannot take place. Undoubtedly, the aforementioned IT complexity has to do with the historic developments of information technology itself to some extent. However, as we have seen, the historically created IT complexity is first and foremost the result of inadequate governance. Continuation of this inadequacy will thus lead to the continuation and further growth of IT complexity. We will therefore interpret the terms 'IT legacy complexity' and 'IT legacy systems,' respectively, as complexity and systems created by 'legacy-type governance.'

The necessity of central governance has been argued before: enterprise unity and integration can only be established through governing developments from a central position. Local autonomy can only be exercised within an overall (IT) governance context (Thompson 2003). Others have stressed the necessary central character of IT governance comparably (Buchanan 2003; Dragoon 2003). Growing maturity in using architecture is based on a shift from local to overall enterprise optimization (Ross et al. 2006). The discontinuation of this 'legacy IT complexity' in the case of EnerServe thus implies central governance of IT developments. Two other considerations for the necessary shift to central governance can be mentioned. First, as we will further discuss below, is the commoditization of IT services. Many different enterprise units can use the same IT services, such as services for electronic mail or document management. Such commoditization needs central guidance for avoiding numerous instances of essentially the same service. Second, as we have amply argued before, IT governance must be an integral part of enterprise governance. Within EnerServe, this message is clearly understood: IT governance is not established as a separate central competence but is an integral aspect of EnerServe's enterprise governance competence. Only this way safeguards consistent and coherent IT developments and solves the lingering problem of 'business and IT alignment.'

5.9.2 The IT Legacy Trap

IT legacy complexity manifests itself in different ways and with different consequences. It should be stressed that legacy systems are not necessarily an issue. They *are* an issue and need to be addressed insofar as the complexity created by legacy systems inhibits or limits the delivery of required IT functionality or enterprise strategy execution. EnerServe faces these issues. The high operational and (functional) maintenance costs of legacy systems are also an important reason for addressing legacy complexity. Generally speaking, the manner by which the complexity is addressed is contingent upon various factors. Unfortunately, complexity reduction doesn't come easily. Some core underlying problems pertinent to this failure will be discussed.

Reducing legacy IT system complexity most likely involves additional costs. However, all too often reduction of legacy complexity is not viewed as an integral part of time- and budget-restricted strategic initiatives of enterprise units since the additional costs affect the delivery time and financials of those initiatives negatively, which could very well prevent those initiatives from being funded at all. Modifying the existing IT systems, rather than replacing them, is also often cheaper in the short term. Evidently, this behavior leads to a covert continuation and extension of the IT legacy environment, thereby gradually increasing the IT complexity further, as well as increasing the IT operational costs further (Snyder 2002). Rightly, this approach can be termed the 'legacy trap' since short-term gain is obtained at the price of long-term pain (Mayall 2002). Moreover, this covert mechanism entails that the issue of reducing legacy complexity shifts from being an element within strategic funding to being an element of IT operational costs since—from the IT cost perspective—it is here that the gradual extensions of legacy complexity become manifest. Hence, the attention shifts from considerations based on *enterprise strategic* issues to considerations based on *IT operational costs*. Within this latter scope, special legacy reduction initiatives are often initiated autonomously that consequently also require autonomous funding. However, said funding is difficult to justify since the approach is inherently disjoined from enterprise strategic initiatives and therefore virtually always fails (CSC 1994).

Unlike the myth that reducing IT legacy complexity is an IT issue, EnerServe's central governance function has clearly understood that the reduction of IT legacy complexity can generally not be accomplished autonomously within the IT domain. Ultimately, such reduction is driven and justified by enterprise strategic considerations and organizational requirements and hence is determined by aspects concerning enterprise design wherein IT design is an integral part.

As the 'legacy trap' indicates, another core reason for central IT governance lies in creating and managing financial arrangements for IT legacy avoidance and reduction. These considerations must also be elements of the IT strategy. Below, we illustrate that these financial arrangements hold likewise for the non-business-specific IT infrastructure and services.

5.9.3 Assessing IT Legacy Systems

Assessment Dimensions

As said, reducing IT legacy complexity must be based on EnerServe's organizational requirements and more specifically informational requirements that enterprise design ultimately defines. In this way, IT legacy issues are an integral part of enterprise design. Linking legacy reduction to organizational and informational issues and value considerations is crucial since these issues and considerations basically determine to what extent legacy issues exist and in what areas they must be addressed. Moreover, legacy complexity reduction might involve changing organizational processes. Hence, organizational and informational considerations determine the type and priorities of legacy complexity reduction initiatives. Experiences support the necessity to link reduction of legacy system complexity to organizational and informational considerations (CSC 1994; Ziff Davis Media 2002). The inability of legacy systems to support organizational processes or enable strategic goals appears as the main reason for addressing the legacy issue.

Based on organizational and informational considerations, the IT system legacy situation can be assessed by using a grid with two orthogonal dimensions: (1) the

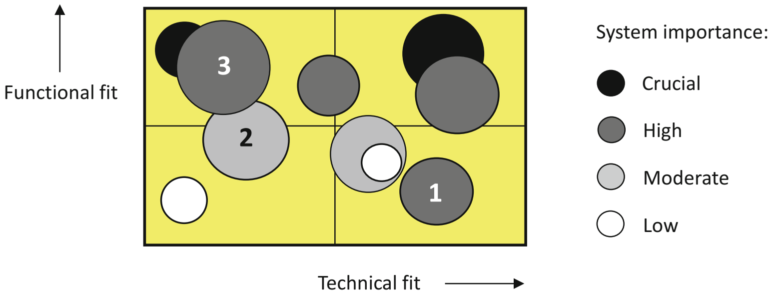

Fig. 5.11 Assessing IT legacy systems

functional fit of the system, expressing the ability of the system to enable EnerServe's strategic goals and organizational and informational requirements, and (2) the technical fit, expressing the level of alignment of the current system technology with the desired technology environment that EnerServe intends to develop. The desired technology environment must also be based on organizational and informational considerations.

EnerServe's central governance function has adopted the basic idea of the 'Information Health Grid' representation defined by Weil and Broadbent (1998). As an illustration, Fig. 5.11 shows the grid with some possible systems that have been rated, whereby the color indicates the system importance for EnerServe's operations and the individual area indicates the yearly costs of the system. Ideally, all systems should be positioned in the upper-right quadrant. If and when migration of particular systems is warranted depends on various concerns. As mentioned, the migration of systems 1 and 2 is based on considerations pertinent to the perceived inability of the systems to deliver the required functionality. The second system has the additional burden of the low technical fit which adds to the core problem (the legacy trap) discussed above. Migration of system 3 is based purely on nonfunctional arguments such as concerning (1) technology end-of-life situation, (2) system reliability, or (3) high operational and maintenance costs. Although an investment case for such a migration might be envisaged, as indicated previously, attempts to reduce legacy complexity through this approach often fail.

The Financials

As far as funding is concerned, three situations play a role within EnerServe:

1. Funding for addressing legacy complexity can be based totally on strategic considerations and organizational and informational requirements. No additional funding outside the initiative of the enterprise unit is required. If activities exceed the mere scope of the specific initiative—because certain infrastructural conditions need to be in place beyond the initiative's scope—then the approach mentioned under point 3 is useful.
2. The operational and maintenance costs of the legacy system justify addressing the legacy situation. Consequently, funding is based on cost-saving proposals.

3. Despite the situations expressed by the previous points, corporate funding might be required to avoid the 'legacy trap.' To cover such situations, financial resources should be created, for example, through a 'removal surcharge' or 'corporate tax' mechanism when new IT systems are developed. In that case, every IT system development contributes to the corporate financial resource.

Of all constraints limiting addressing the legacy issue, a lack of funding is the most prevalent and most difficult to overcome (CSC 1994). A removal surcharge or corporate tax is therefore mentioned in the literature as an effective means to arrange financial resources (Cecere and Leganza 2002; Ramos 2003). Most likely, hybrid funding will occur: enterprise unit funding for unit-specific developments and corporate funding for those developments that are non-business-specific. The latter aspect has to do with commoditization of IT services discussed below. Notably, these considerations point again to the necessity that EnerServe's central governance function should have financial means to address IT legacy complexity and to govern IT commodity services development. EnerServe has solved this issue by reallocating the financial means for non-unit-specific IT developments from individual enterprise units to the central enterprise governance function.

5.9.4 Commodity (IT) Infrastructure and Services

Commoditization

More and more, IT functionality is available for general use. Put another way, the IT functionality offered is not enterprise-specific or (within an enterprise) enterprise-unit-specific. Many different units or functions within an enterprise make use of the same (generic) IT solutions. Increasingly therefore, IT products and services are acquiring a commodity character (Carr 2004). We will identify these products and services as IT commodity infrastructure and services. Various well-known infrastructural arrangements and provisions such as computers, networks, and access devices (e.g., PCs) are part of the IT commodity infrastructure. Multiple infrastructural services can be identified that are required for delivering IT functionality properly, like services related to system and network management (Perks and Beveridge 2003). Services such as e-mail services, content and document management services, electronic purchasing and payment services, e-learning services, security services, video conferencing services, and so on are also all examples of IT commodity services. Unfortunately, the commodity character of these services does not mean that they share the same standard or mode of operating worldwide. For a commodity such as electrical energy, this is also not the case. It does mean however that within one enterprise, different manifestations of essentially the same IT commodity infrastructure and service must be avoided. Notably, the commoditization of IT confirms once more the opinion voiced throughout this book: the value of IT is not determined by technology as such but by unity and integration with the enterprise as a whole.

EnerServe's executive management has understood that the notion of IT commodity infrastructure and services, whereby products and services are provisioned uniformly for various enterprise units, implies that at a central level ('above' the individual units), it must be established what the commodity elements should be. This is an important task of the central enterprise governance function. It is important that this function has the financial means to stimulate commodity developments into the desired direction. For example, the need for a specific commodity service might emerge in a certain enterprise unit, whereby enterprise-wide use necessitates additions or changes to the service that can only be arranged through corporate funding. Financials for IT commodity infrastructure and services should thus rest with the central enterprise governance function. That's why EnerServe has reallocated the financial means for non-enterprise-unit-specific IT developments from individual enterprise units to the central enterprise governance function, as mentioned before. Similar considerations play a role with reducing IT legacy complexity successfully, as has been discussed above. It is important to note that the development of IT architecture contributes for a significant part to the definition of IT commodity infrastructure and services. For example, the IT architecture principle about authentication and role-based authorization for getting network access necessitated, as a key action, the development of authentication, authorization, and access services as IT commodity services.

Legacy Complexity and Commoditization

To a considerable extent, IT legacy complexity is created by local IT system developments that created multiple instances of essentially similar IT functionality with different designs and/or technology. The creation of this complexity is even more problematic in view of the trend towards IT commodity infrastructure and services, as mentioned above. EnerServe focuses on (1) avoiding multiple instances of essentially the same functionality and (2) the provisioning of functionality through commodity infrastructure and services. Hence, the reduction of IT legacy complexity is associated with a transition of enterprise-unit-specific functionality to commodity functionality, even for functionality critical for enterprise continuity and, thus, with a very high level of 'enterprise dependency.' Further, the commoditization of IT also implies that IT as such is not the source of competitive advantage. Rather, as mentioned before, such advantage depends on the manner commodity IT is utilized, which again points to the design of the enterprise as a whole.

The process of commoditization is shown schematically in Fig. 5.12. Taking 'enterprise dependency' and the 'potential competitive advantage' as two orthogonal axes, Fig. 5.12 shows the increasingly enlarging area of commodity IT. Hence, what was formerly an enterprise unit-specific IT solution moves to the commodity area, while the enterprise unit-specific area is shrinking. As can be seen, the commodity character does not necessarily mean that the enterprise dependency is low. Such is similarly the case for commodity services outside the IT domain, like electrical energy. So, most IT infrastructural systems would be positioned in the upper-left area. A custom-made system for 'enterprise intelligence' might be positioned on the lower-right side.

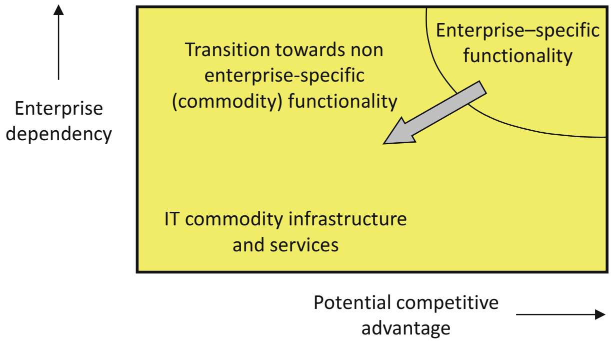

Fig. 5.12 Transition towards IT commodity services

Reducing legacy complexity thus entails attention to an important aspect of the overall (central) IT strategy: the definition of the core elements (building blocks) of IT commodity infrastructure and services that need to be developed. Subsequently, an important IT strategic aspect is the linkage between enterprise strategic objectives and core elements of the IT commodity infrastructure and services. This linkage is effectuated within the context of enterprise governance.

Summary: Guiding Principles

In view of our discussion above, a number of guiding principles for addressing IT legacy systems devised by EnerServe’s central governance function are:

- Addressing the complexity associated with IT legacy systems should be based on organizational and informational considerations pertinent to the current and future value these systems represent. As such, activities for addressing IT legacy complexity must be an integral part of enterprise design and the subsequent definition of projects and their execution.
- Governance by the central enterprise governance function for addressing legacy complexity (and for avoiding the creation of such complexity in the future) is essential and ensures that enterprise and IT developments are strongly linked and integrated, including the relevant issues regarding legacy IT systems.
- IT life cycle management forms the foundation for assessing the functional and technical fit of applications, as illustrated above. An insight into operational costs (total costs of ownership) of applications is also obtained likewise.
- Legacy complexity reduction should be coherent enterprise-wide since the ability to reduce the complexity is often beyond the scope of individual enterprise units and/or initiatives. Again, this calls for central, integrated governance. A step-wise approach is preferred in order to minimize enterprise risks.
- The development of IT commodity infrastructure and services must be a core area of concurrent attention with complexity reduction initiatives.
- There are multiple approaches for addressing legacy systems. Which of the possible approaches should be selected is contingent upon the specific enterprise

requirements and the requirements the new IT environment should address. This must be considered within the enterprise governance competence.

- In order to create central resources that might additionally be required for reducing legacy complexity, corporate funding must be established. The central enterprise governance function should have financial means to govern the development of IT commodity infrastructure and services.
- The ability to make extensions to existing legacy applications must be governed by architecture and possibly by severe (financial) restrictions such that these extensions are unlikely to be pursued.
- All foregoing activities and areas of attention must be part of strategic IT considerations which are an integral part of enterprise strategic considerations.

5.10 The Arrangement of Enterprise Governance

5.10.1 Two Essential Competences

Two enterprise competences were discussed in the introductory chapter: (1) operational competence (‘running the mill’) and (2) governance competence (‘changing the mill’). Enterprise governance is the competence—unified and integrated whole of skills, knowledge, culture, and means—for continuously inciting enterprise adaptive and reshaping initiatives and their unified and integrated operationalization through enterprise (re)design and subsequent implementation. The successful transformation of the existing energy company into EnerServe thus needs developing enterprise governance. As outlined before, enterprise change can only be understood by considering the morphogenic enterprise conceptual system model introduced in Sect. 2.3.9. The limits of the mechanistic model have been amply argued in Chap. 2, thereby substantiating the untenability of the linear, top-down, planned, management-, structure-, and control-oriented approach to governance. The nature of EnerServe’s change outlined above clearly corroborates this viewpoint. Through the notion of distributed governance, the essential characteristics of the enterprise governance competence have been outlined in Chap. 3. These characteristics do not develop overnight and constitute an important long-term area of attention for EnerServe.

A crucial role is reserved for the central enterprise governance function. It is this function that first and foremost must be created. For this central enterprise governance function, two competences are essential. First is the competence for developing/designing. This is the competence for establishing a coherent and consistent set of strategic desirables and their operationalization through unified and integrated enterprise design. It is this competence that carries out the inquisitive process and applies the theories, methodology, and methods of enterprise engineering. The second competence concerns building/implementing. As amply stressed before, this competence plays its role when and only when a design suitable for building

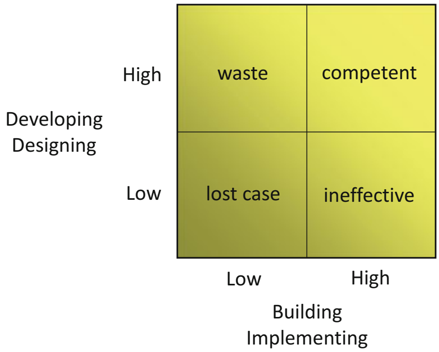

Fig. 5.13 Two essential governance competences

and implementation is available. Project and program management techniques are important for this competence. In other words, both competences are crucial for obtaining the upper-right quadrant in Fig. 5.13. Qualifications for the other quadrants are self-explanatory: the inability to build or implement an adequate design seems wasteful, while the ability to build or implement an inadequate design seems barely effective. Remaining in the lower-left quadrant with no capabilities in either area leaves little hope. For creating EnerServe, both competences must be established. Evidently, creating the competence for development/designing is of vital importance since, as reiterated previously, it is this competence that constitutes and fuels the inquisitive process.

5.10.2 Core Central Governance Processes

As said, the first step in transforming the current energy company into the new company EnerServe is to establish the central governance function, not only in view of the needed two competences, but this central function provides the very foundation for further developing and professionalizing the enterprise governance competence itself.

Obviously, the central enterprise governance function must be positioned such that all multifaceted aspects of EnerServe are covered in order to address them coherently and consistently and to enable unified and integrated enterprise design. We will identify the persons that are concerned with developing and designing as *enterprise engineers* and the persons concerned with governing building and implementing as *project leaders*. EnerServe starts the multidisciplinary central enterprise governance function with eight enterprise engineers and two project leaders. Their roles will be further outlined below. The individual competences of the enterprise engineers must be such that they can collectively cover the functional and constructional design domains introduced in Sects. 4.9.2 and 4.9.3, respectively.

The core central governance processes that EnerServe intends to establish will be explained with the aid of Fig. 5.14.

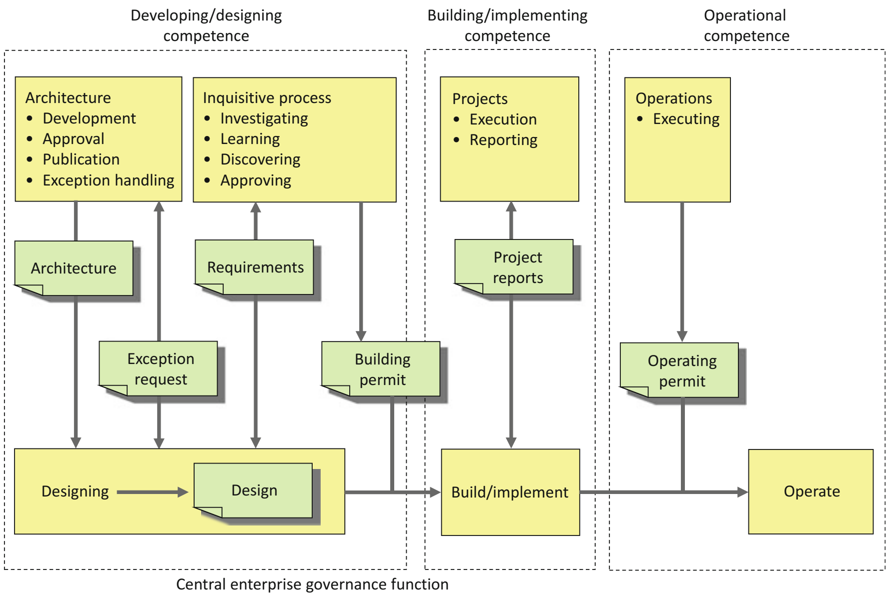

Fig. 5.14 Core central governance processes

Architecture Management
The importance of architecture has been outlined before (cf. Sect. 4.5.2). Since enterprise architecture is a normative concept guiding enterprise design, architecture has a broad 'legislative' character. So, a chief process within the developing/designing competence is *architecture management*, which concerns (1) the development or adoption of architecture, (2) the approval of architecture, (3) the publication of architecture, and (4) the handling of exceptions to approved architecture. These four elements of architecture management can be briefly explained as follows.

As the examples of architecture given previously indicate, developing architecture requires thorough subject matter knowledge. Adopting already existing architecture is probably a good practice, but also this practice requires subject matter knowledge in order to determine whether adoption is justified. Formal approval for architecture is essential since various parties must comply with the approved design guidance. Establishing enterprise-wide consensus and approval can occasionally be cumbersome since stakeholders might have conflicting interests. EnerServe has created an *Architecture Review Board*, representing essential stakeholders, to aid decision-making about architecture. This review board is chaired by the person heading the central enterprise governance function, who reports directly to the CEO of EnerServe. Architecture management is responsible for the process from initial draft publication, the processing of possible comments and formal approval, up to the definitive publication. Maintaining productive relationships with the various stakeholders is an important aspect of architecture management.

As the examples given before about architecture and its publication illustrate, architecture definition might necessitate carrying out various successive key activities of a different nature to effectuate architecture.

In view of the purposes of architecture mentioned in Sect. 4.5.2, compliance with enterprise architecture is crucial. Hence, it must be formally declared that the design takes place in conformity with the published architecture. Nonetheless, it might be that in certain cases, compliance with published architecture is not useful or practical. Designers must then submit an exception request outlining reasons for deviating. If indeed deemed necessary, the development/design competence can grant (temporal) permission to deviate from the published architecture and stipulate the conditions under which the permission is granted. Only through this formal approach can architecture survive as a normative, legislative concept for ensuring enterprise unity and integration as the key condition for successfully establishing enterprise change. Another important task of architecture management thus concerns architecture compliancy and the handling of exceptions to published architecture. EnerServe's central governance function has established biweekly meetings for discussing and handling architecture exceptions. Finally, architecture must be 'maintained': updated to address new insights and developments.

Architecture Publication

EnerServe publishes architecture principles and standards in formal documents. These documents provide an overview of the main enterprise design domain and subdesign domains to which the architecture and standards apply by:

- Explaining the design domain and the concepts germane to the domain.
- Indicating (technology) trends affecting the design domain.
- Presenting architecture in a four-tier structure as outlined in Sect. 4.5.9: (1) the principle statement, (2) rationale for the principle, (3) implications of the principle, and (4) key actions necessary to effectuate the principle.
- Showing the relationships with other design domains and their architecture for ensuring mutual coherence and consistency.

Through these documents, (1) a formal and comprehensive view on architecture is provided and communicated; (2) the nature, rationale, and implications of architecture are outlined and corroborated, specifically in view of strategic desirables; (3) a comprehensive overview of key actions is given which is an important input for the activity portfolio; and (4) unified and integrated EnerServe design is supported. Examples of architecture publications have been given before.

Finally, various architecture documents provide an overview of the product or technology standards relevant for the domain to which architecture applies. These standards are subject to life cycle management since new standards need to be introduced while existing ones need to be phased out. EnerServe's central enterprise governance competence has defined seven life cycle categories:

1. Need to investigate: technology trends require studying the standard's feasibility.
2. Under investigation: the new standard is currently studied.
3. Planned: a formal date for introducing the standard has been defined.

4. Standard: currently used.
5. End of life: although currently used, a date for discontinuing the standard is defined.
6. Obsolete: standard may no longer be used.
7. Restricted: standard may only be used in certain defined areas or instances.

The formal approach shows EnerServe's commitment to enterprise architecture. Design principles and standards are defined or adopted in a heuristic, participative process with the involvement of relevant stakeholders. We must stress that EnerServe's approach to enterprise architecture reflects their first steps of a learning process towards enterprise architecture maturity. Some principles might thus be considered less specific for design guidance. The importance of including these principles is stressed for a number of reasons:

- They act as initial high-level design guidance whereby the notion of design is considered broadly as devising courses of action aimed at changing existing enterprise conditions into preferred ones, as mentioned in Sect. 1.1.1.
- The principles make intentions, opinions, norms, and values explicit and thereby stimulate a productive dialog about issues that would otherwise remain covert and not addressed, which would most likely lead to incoherence and inconsistency.
- They form the basis for making architecture precise through iterative and collaborative learning processes and allowing them to be 'internalized' by the EnerServe community.

The Inquisitive Process

This process, extensively discussed before, is the source for the successful transformation of the existing energy company into EnerServe. All other processes of the central enterprise governance function are linked to or based on the inquisitive process. As Fig. 5.1 resumes, within and through this process and in an emerging fashion, (1) the developments of the open energy market are interpreted, analyzed, and made sense of, (2) fundamental paradigm shifts associated with these developments are identified and addressed, (3) strategic desirables and areas of concern are formulated, (4) requirements that express and address the strategic desirables and concerns are developed in cooperation with various stakeholders, (5) architecture is adopted or developed that guide the design of EnerServe, and (6) clarity is gradually obtained about *how* to operationalize strategic desirables and requirements and address areas of concern.

As mentioned, the inquisitive process ends if, for a given issue, there is clarity about how the issues must be addressed. Thus, a design pertinent to that issue is available. Then and only then can building or implementing begin. Within EnerServe, this is formally expressed by a *building permit*: a document stating that the design is finalized and is architecture compliant or, if not fully compliant, that an exception has been granted.

Development and Publication of Requirements

Within the inquisitive process, the wants and needs of the various stakeholders are investigated and clarified. The enterprise engineers determine which functional and constructional design domains are involved for addressing requirements and identify possible mutual relationships such that requirements are coherent and consistent. Hence, EnerServe's requirements—business, organization, information, and IT requirements—are defined, made specific, and published according to the four-tier publication structure presented in Sect. 4.5.9. Key actions associated with requirements are part of the enterprise activity portfolio. The process defining requirements is thus another core process of the developing/designing competence of the central enterprise governance function.

Management of the Enterprise Activity Portfolio

Our discussion about requirements and architecture in Sect. 4.5.9 indicated that numerous key actions are defined that must be undertaken for effectuating requirements and architecture. The totality of these activities form a significant part of the enterprise activity portfolio, defined as the central comprehensive list of all enterprise activities and their associated data. The other part of this portfolio is defined by projects for implementing finalized designs. Core data of the portfolio concern, for example, reasons for initiating the activities, objectives, progress, possible risks, resources, costs, and relationships with other activities. The notion of a comprehensive enterprise activity portfolio is a necessary consequence of the comprehensive enterprise-wide perspective. Note that this approach fundamentally differs from the ones criticized in Sect. 3.2.10.

Projects are obviously part of the enterprise activity portfolio. Recall from Sect. 3.2.3 that a project is a precisely planned and organized set of activities for realizing a specific onetime objective. A program can be seen as a cluster of projects that must be coordinated in view of a common overarching theme. Based on these considerations, we define *enterprise activity portfolio management* as the totality of actions for ensuring that the portfolio is accurate and up-to-date, such that progress evaluation and decision-making are facilitated.

Project Management

Actually building or implementing a design implies carrying out a project which takes place under the guidance of EnerServe's building/implementing competence. We define *project management* as the coordination of supervising activities concerning the definition of project plans and their subsequent execution according to the respective plans. Within EnerServe, the building/implementing competence has defined criteria for adequately developing project plans and the associated progress reporting. Sometimes, the project management competence of the central enterprise governance function is identified as the 'enterprise (or corporate) project management office,' which "needs to manage all the projects in the company, whether they are IT related or not" (Bonham 2005, p. 23).

When a project is finalized, hence building or implementing is completed, the (re) design can be taken into operation. Experiences teach that this step is not seldom problematic. So, prior to taking a design into operation, an *operating permit* must be issued by the applicable operation department of EnerServe. The operating permit ensures that various operational conditions are properly addressed, such as adequate testing, the availability of skilled staff and equipment, and satisfactory site preparation.

Stakeholder Relationship Management
Many stakeholders are involved in transforming the current energy company into the new company EnerServe: customers, employees, management, business partners, suppliers, government, and the regulators in the open energy market. Successful transformation implies developing productive relationships with those stakeholders. Moreover, the complexity, dynamics, and associated uncertainty of the transformation lead to emerging phenomena that must be addressed in and through the inquisitive process. Developing productive relationships with stakeholders thus also implies involving the stakeholders in the emerging developments, in particular, the progress of transformation and the results of the enterprise design process. Hence, an important aspect of the central enterprise governance function is effective *stakeholder relationship management*: the development and maintenance of productive collaborative relationships with stakeholders concerning enterprise change.

Investment Approval
Certain activities in the transition towards the new company EnerServe require investment approval for obtaining the required financial means. Part of the tasks of the central enterprise governance function is preparing investment proposals and organizing approval. This attention to financial aspects is further important since EnerServe, for reasons explained earlier, has reallocated the financial means for non-business-specific IT developments from individual business units to the central enterprise governance function. For one thing, this reallocation has to do with the commoditization of IT services discussed above.

Formal Meetings
In connection with developing EnerServe's central enterprise governance function, several formal meetings were organized, which for a large part are associated with the core processes briefly described above. In order to express the importance of the central enterprise governance function, the person heading this function is positioned at the executive management level and identified as the Chief Development Officer (CDO). All meetings are organized by the CDO. The meetings are listed below:

- *EnerServe strategy*. Chaired by the CEO, with CDO and operational executive management as participants.
- *Design approval and architecture exception handling*. Chaired by the CDO. Participants are relevant enterprise engineers and possibly the involved stakeholders.
- *Architecture review and approval*. Chaired by the CDO. Participants are relevant enterprise engineers and possibly the involved stakeholders.
- *Project progress*. Chaired by the CDO or his/her representative. Participants are project leaders on a case-to-case basis.
- *Project evaluation*. Chaired by the CDO. Participants are the project leader and others involved or affected by the project.

- *Activity portfolio review*. Chaired by the CDO. Participants are enterprise engineers.
- *Investment approval*. Chaired by the CEO/CDO, depending on the investment level. The participants depend on the nature of the investment proposal.

5.10.3 Governance Maturity Levels

EnerServe must develop its enterprise governance competence over time. Hence, there will be a gradual growth towards maturity. In order to express progress towards maturity, two orthogonal axes are used to define the enterprise governance maturity grid, as shown in Fig. 5.15. The horizontal axis concerns the organizational maturity of the enterprise governance competence, while the vertical axis concerns the output maturity and hence concerns the impact of the enterprise governance competence.

As emphasized earlier, from the initial enterprise governance setup, there will be a gradual increase in governance maturity: not everything can be optimized fully right from the start. For this growth in maturity, the initially formed central governance function competence provides the foundation and is the very source of improvement. The process towards increased maturity is contingent upon various enterprise conditions, such as management buy-in, culture, or the need to solve pressing issues requiring governance. As an illustration, Fig. 5.15 shows the various steps towards increased maturity that can be generally observed. Despite the discrete nature of these steps, increase in maturity takes place in a continuum, whereby not necessarily all aspects associated with a certain level must be satisfied prior to addressing some higher-level activity. The two maturity axes can be outlined briefly as follows.

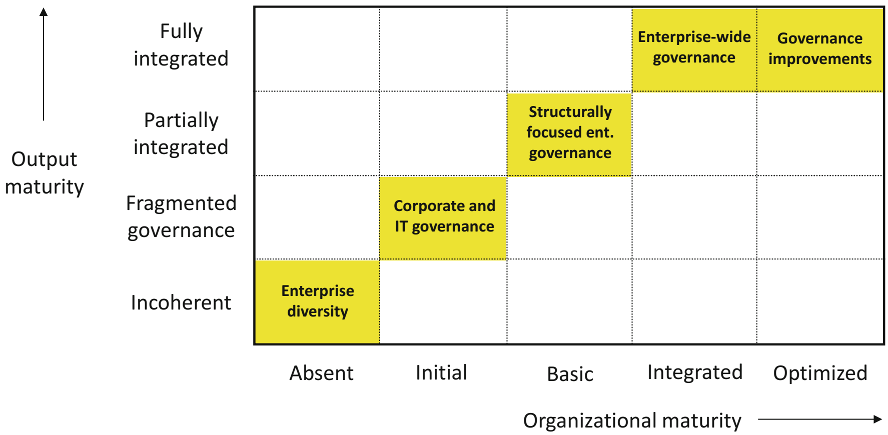

Fig. 5.15 Enterprise governance maturity grid

Organizational Maturity

This concerns the maturity of the governance approach. We have defined five levels, labeled as follows:

- *Absent*. No governance competence exists.
- *Initial*. In this initial stage, the notion of governance is acknowledged but only effectuated fragmentally by paying separate, not integrated, attention to corporate and IT governance.
- *Basic*. The importance of enterprise governance is acknowledged and addressed. Corporate and IT governance are fully integrated within the overarching enterprise governance perspective. The central enterprise governance function and its associated processes are established. However, the focus is restricted to structural functionalist aspects of the enterprise, as discussed in Chap. 2. Within this restricted governance perspective, roles and tasks are outlined and personal employee competences are defined. All core competences within the central enterprise governance function use theories, concepts, knowledge, and methodologies that are relevant within their respective activity domain. Specifically for enterprise design, the concepts of the generic enterprise development framework are used but with the mentioned structural functionalist focus. Enterprise projects are assessed by the program management competence, and project progress is supervised.
- *Integrated*. The central enterprise governance function addresses the enterprise in all its multifaceted aspects. Roles and personal competences are arranged accordingly. The central function is fully integrated in the enterprise (strategic) development processes. Enterprise architecture compliance and exception handling processes are an integral part of enterprise development. Effective relationship management with the various stakeholders is established which enables the notion of distributed governance, introduced in Sect. 3.2.9, to be effectuated. Budget for commodity infrastructure and services is centralized, and ownership rests with the central enterprise governance function. All enterprise change initiatives, also those involving culture and behavior, are governed by the central enterprise governance function.
- *Optimized*. Enterprise learning is fully established within the total scope of distributed governance. Operational and governance aspects are productively intertwined such that continuous improvement and innovation are stimulated.

Output Maturity

The depth, reach, and impact of governance are expressed by the output maturity. Four levels are identified:

- *Incoherent*. Due to the absence of any governance, considerable enterprise diversity exists which prevents the enterprise from operating as an integrated whole.
- *Fragmented governance*. Although corporate and IT governance are topics of attention, their non-integrated approach lead to ineffective or suboptimal results, as discussed in the introductory chapter.

- *Partially integrated.* Enterprise integration is arranged for the essential structural functionalist aspects: the foundational substrate of the enterprise. But crucial aspects that determine the success of enterprise (strategic) change initiatives are not addressed.
- *Fully integrated.* Comprehensive enterprise-wide integration is established, involving all (necessary and sufficient) enterprise design aspects and design domains. The impact of strategic desirables and areas of concern is addressed enterprise-wide and is expressed by requirements and architecture. Crucial aspects that determine the success of enterprise (strategic) change initiatives are addressed.

5.10.4 Dimensions of Personal Competences

For staffing the central enterprise governance function, EnerServe must define the personal competences of the central staff. Competences can be addressed at two levels: the enterprise and personal levels. As mentioned earlier, an enterprise competence is a unified and integrated whole of enterprise skills, knowledge, culture, and means. To a considerable extent, enterprise competences rest on the competences of employees: the competences at the personal level. When discussing these competences within the context of enterprise governance, we will concentrate specifically on the central enterprise governance function. Further, given our focus on enterprise design, the personal competences of the enterprise engineer are of concern. Before addressing these personal competences, we will sketch some general underlying thoughts about the personal competences topic.

Human Resource Management can be seen as the "set of instruments for stimulating optimal performance behavior" (Koopman 2000). Within theories about HRM, the notion of 'competence' has gained specific interest. The reason for this has to do with the topics discussed in Chap. 2: the dynamics and complexity of the internal and external enterprise contexts and specifically satisfying the Law of Requisite Variety. As emphasized, the associated uncertainty does not make it possible, and also not fruitful, to define employee tasks and required employee behavior precisely. Increasingly, the narrowly defined task descriptions of the traditional mechanistic approach are less fruitful. What sort of performance and behavior is required in specific instances must thus be determined to a considerable extent by employees themselves, based on their competences. Precisely these insights have been stressed by the notion of organizing based on the 'total situation,' the idea of organizing as sensemaking, and the notion of enterprises as viable systems, discussed in Sect. 2.3.14. These insights form the essence of the employee-centric way of organizing emphasized in Sect. 2.4.7. As such, the task- or function-oriented HRM changes into competence-oriented HRM (op. cit.).

Comparably with the competences at the enterprise level, personal competences are also formed by the integration of different personal aspects or traits. Various descriptions about personal competences are used. Personal competences are mostly defined in view of what is ultimately manifest in behavior (Kolk 2000). This standpoint is expressed in the following description: "competences are defined in measurable behavior characteristics that determine the ability to function successfully—knowledge, skills, craftsmanship, attitude, social skills, personal traits" (Boelens 1997). However this description contains several overlapping aspects. If skills and attitudes are seen as behavioral characteristics, then personal competences can be considered as the unity of knowledge and behavioral characteristics. Further, competences at the personal level can be distinguished in general and specific aspects of the competence. General aspects, for example, concern the ability to cooperate, to take initiative, or to show customer orientation and decision-making skills. Specific aspects of the personal competence have to do with knowledge and behavioral characteristics associated with the specific enterprise domain (Smid and Rambelje 1997). In our case, the specific enterprise domain is that of enterprise governance and enterprise engineering. Before addressing these specific aspects, we will discuss the general aspects of a personal competence.

As stated, personal competences are ultimately manifest in behavior. According to Kolk, the possession of competences is a necessary but not sufficient condition for certain behavior (2000). Actually manifesting competences through behavior requires the motivation to do so. Hence, within this view, motivation must be distinguished clearly from competences. This is a subtle point, since it is suggested implicitly that competences exist 'autonomously' as a personal trait, while rather, these traits become manifest through behavior and thus presume the motivation to actually manifest that behavior. One might thus argue that motivation is a contributing factor in defining a personal competence. Despite this subtlety, the following description of a personal competence is useful (based on Kolk 2000, p. 29):

- A competence is an integrated whole of knowledge, skills, and traits (intelligence and personality) that is manifest in behavior.
- Competences are recognizable at an individual level.
- Competences can be assessed and evaluated.
- To a greater or lesser degree, competences can be improved through training and coaching.

An initial challenge is to structure and describe competences in an intuitively understandable manner. This means classifying competences under categories that do not overlap, hence that are mutually independent, or put another way, classifying competences under 'dimensions' that are orthogonal. The literature is relatively unanimous in offering three main categories, or dimensions, for classifying competences. Various labels are used, as shown below (Kolk 2000, p. 37):

- *Cognitive* Thinking, intellectual, knowledge.
- *Relational* Feeling, affective, interactive, trust.
- *Action-oriented* Power, acting.

Pertinent to these three categories, the second challenge concerns the formulation of skills and traits that are recognizable at an individual level and are 'atomic.' The latter means that an aspect identified as a personal competence should not be reduced easily to underlying, more basic skills and traits. So, in our view, the capacities of ‘entrepreneurship’ or ‘working methodically’ are not atomic since these capacities are determined by more basic skills and traits. An interesting summary of 21 basic skills and traits is determined by the Laboratory of Applied Psychology (Kolk 2000). We return to this basic set when determining the required personal competences of the enterprise engineer.

5.10.5 Competences of the Enterprise Engineer

Knowledge

As indicated above, personal competences concern the integration of knowledge, skills, and personal traits that is manifest in behavior. The knowledge aspect of a personal competence is evidently contingent upon the specific working area. For the enterprise engineer, this working area concerns the arrangement of the enterprise as a whole, based on generally vague strategic desirables, requirements, and areas of concern. Hence, the knowledge of an enterprise engineer specifically concerns enterprise design and the associated enterprise engineering theories, methodology, and methods that cover all multifaceted aspects of enterprises. Since design concerns the enterprise in its totality, the knowledge domain is likewise broad, comprising multiple areas of attention. The curriculum for enterprise engineering education is thus inherently broad as reflected throughout this book. In addition to the topics discussed in this book, additional curriculum topics might be:

- Reliability theory.
- Technology trends.
- Economy and market aspects.
- Essentials of financial accounting.
- Group dynamics and change processes.
- Report writing and presenting.

Skills and Traits

Alongside the knowledge areas mentioned above, more general skills and traits are required. Skills and traits concerning the cognitive dimension are evidently essential. An important competence aspect has to do with the notion of enterprise unity and integration, emphasized throughout this book. Many different aspects play a role. Integrating these different aspects in a coherent, overall perspective is—other than analysis—a process of *synthesis*. One might argue that analysis has to do with differentiation and reduction. So, as Chap. 3 clarifies, integration cannot be the result of analysis. Besides analytical capacities, the enterprise architect should thus also possess the capacity to synthesize: the ability to integrate various multidisciplinary aspects into a coherent and consistent overall perspective concerning the enterprise as a whole.

Architecturing and requirements definition were identified above as a participative process, involving many stakeholders. This certainly holds for an enterprise since the broad scope of its design involves many stakeholders inherently. Stakeholder relationship management was identified as an important process of the central enterprise governance function. Hence, the enterprise engineer must be able to develop and maintain productive relationships with the diverse group of stakeholders. Skills and traits pertinent to the relational dimension are thus relevant. The coaching role of the enterprise engineer follows from the fact that this engineer, in view of its role, has a more senior position and thus should share knowledge and experience.

The inherent normative, freedom-limiting aspect of architecture implies that architecture must be intentionally defined. For that, the enterprise engineer must take the initiative and manage the process of architecturing in view of general and specific enterprise (strategic) developments and areas of concern. Architecturing is often problematic since stakeholders might have conflicting interests that discourage the acceptance of design principles and standards. Similar aspects play a role concerning the translation of strategic desirables and areas of concern in a concrete (high-level) enterprise design. In view of the many possible stakeholders and the multidisciplinary character of enterprise development, many conflicting interests and goals thus often play a role. Decision-making must often take place under time pressure and with limited knowledge. The competences under 'action orientation' are relevant in this respect.

Table 5.13 summarizes the 21 basic skills and traits defined by the Laboratory for Applied Psychology (Kolk 2000, p. 40), complemented with the capacity for synthesizing under the cognitive dimension. Understandably, not all skills and traits are equally relevant under all circumstances. The specific circumstances or the relative position of the enterprise engineer play a role.

Given our focus on enterprise design, the personal skills and traits that are relevant for the other central enterprise governance activities will not be discussed. In our view, enterprise activity portfolio management is primarily of an administrative nature: activities for ensuring that the portfolio is accurate and up-to-date such that progress evaluation and decision-making are facilitated. The skills and traits shown in Table 5.13 are also relevant for enterprise program and project management.

Table 5.13 Skills and traits of the enterprise engineer

Cognitive	
Analytic capability	Speed of understanding
Planning	Vision
Judicious	Organizational awareness
Resourcefulness	Capacity for synthesizing
Relational	
Empathy	Cooperation
Customer orientation	Coaching
Sociability	Relational management
Action orientation	
Initiative	Resoluteness
Guiding	Risk acceptance
Result orientation	Stress-resistant
Convincing power	Responsibility

5.11 Reflection

When contemplating the EnerServe case, the following observations are noteworthy.

Crucial for transforming the existing energy company into EnerServe is establishing the central enterprise governance function and its two core competences. This function ensures the successful transformation, carries out the processes described in Sect. 5.10, and forms the very foundation for developing enterprise governance maturity. Vital in the processes that the central governance function initiates and sustains is the inquisitive process that deals with, and makes sense of, the various dynamic open energy market developments and their associated complexity and uncertainty. Through the inquisitive process, the fundamental paradigm shifts implied by the transition towards the open energy market are identified and addressed. Gradually, strategic desirables and areas of concern become apparent. In cooperation with various stakeholders, the requirements that EnerServe should fulfill are defined, whereby architecture guidance for the design of EnerServe is developed or adopted. Hence, in an emerging fashion, clarity is obtained about *how* strategic desirables and requirements will be operationalized and areas of concern will be addressed. Various strategic transition barriers will affect the change towards the new situation such as the entangled processes and systems and culture of the existing energy company. All these issues manifest themselves and are addressed in an emerging, iterative, and concurrent fashion and are ultimately resolved through design. As amply stressed before, the inquisitive process ends if, for a given issue, there is clarity about how the issues must be addressed. That is, when parts of EnerServe's design are available. Then and only then, building or implementing can commence. Figure 5.16 graphically summarizes these viewpoints.

The nature of these developments and the way to address them clearly demonstrates the untenability of the strategic planning perspective and illustrates the very essence of strategy development as a learning process: sensemaking and finding the contours of the outlook of the future energy company is a generative thinking and learning process, rather than a management-oriented, top-down, and planning-oriented one, as stressed in Chap. 3.

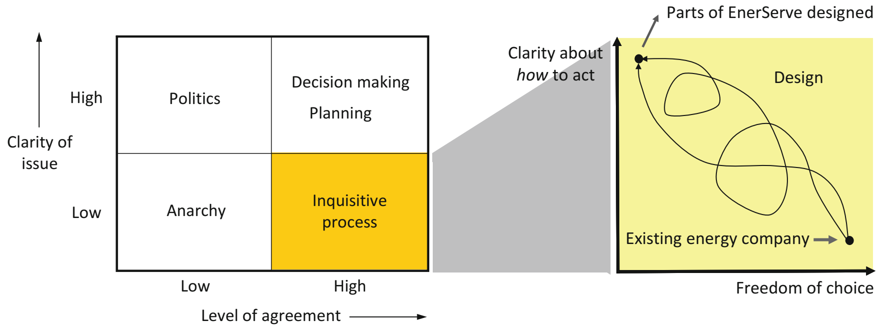

Fig. 5.16 The central role of EnerServe's central enterprise governance function

EnerServe's essential operation in the new situation was clearly expressed by the essential models. Devising these models also aids the process of sensemaking: the dialog about the implementation-independent essence of EnerServe gradually clarifies the core of the future operational and functional arrangements. Transactions and their production actions enabled the precise description of actor roles which form the basis for establishing actor competences and the associated information supply. As illustrated, the explicit identification of communicative actions served as a reference for defining operational rules.

Requirements and architecture were defined and published for actualizing the essential models and (simultaneously) ensuring unified and integrated EnerServe operation. Design—guided by architecture—addressed functional and constructional requirements further. As the architecture examples indicated, they address areas of concern jointly: various principles affect more than one area of concern and thereby provide the coherent and consistent structure for design guidance. Moreover and equally important, the requirements and architecture, respectively, deal with and address the strategic areas of concern such as those concerning quality, service, customer focus, employee-centric organizing, or compliance with external rules and legislation, aspects of corporate governance and thus an integral part of EnerServe's design. Note that the development of requirements and architecture is a further demonstration of the importance of the inquisitive process and the untenability of the mechanistic, top-down, planning and control approach.

The definition of key actions associated with defining functional and constructional requirements and architecture gradually shaped the nature of further (strategic) initiatives that had to be taken. Key actions are thus the bases for initiating further studies or initiatives concerning EnerServe's development. As the case shows, for a considerable part, the key actions determined EnerServe's activity portfolio. Subsequent design further determined the content of the portfolio. All these topics contributed to a coherent and consistent totality of activities. Moreover, the definition of requirements and architecture and their associated key actions appeared to be important for defining the commodity infrastructure and services that can be generally used across EnerServe.

Information supply and IT systems are integral to EnerServe's design. The case illustrates that the specific character of information supply (provisioning system) is determined by the design of the organization (using system). Specifically the focus on quality, service, and customers, as well as employee-centric organizing, makes clear that it is organization design that determines the functional relationships with IT systems. Moreover, EnerServe wants to ensure that information systems act as enterprise regulating variety amplifiers and support employee variety. The notions of business/IT alignment and enablement are thus operationalized and made concrete through organization design, as we have outlined in Sects. 1.4.1 and 4.3.4. As indicated, all kinds of barriers affected the transition to the new situation, among which is EnerServe's IT legacy complexity. In an emerging fashion, the nature and the impact of the IT legacy complexity issues become apparent through the inquisitive process and are assessed and ultimately resolved through design.

EnerServe's change 'management' is implicitly performed by the governance competence: change came from within, not in a top-down fashion. Change became manifest through what the inquisitive process produced as an innate force of action. Governance thus did not appear (primarily) as a capacity to execute top management-defined strategic initiatives. Rather conversely, strategic initiatives were (primarily) the result of governance. Initiatives were defined and executed by the central enterprise governance function in an emerging, concurrent, iterative, and learning fashion. As illustrated, this central function devoted attention to the mutually related activities whereby issues concerning other governance themes (corporate and IT governance) were addressed concurrently.

The successful change towards EnerServe hinged upon the ability to bring about culture and behavior change. For such change, the importance of the enterprise morphogenic conceptual system model has been illustrated since this model expresses the key determinants for successful change. Key in understanding the condition for successful transformation of the existing energy company into EnerServe is the joint and continuous attention to all components of the morphogenic conceptual system model. Coherence and consistency between these components is vital for ensuring a trustful behavioral context as experienced by employees. Through the inquisitive process, any incoherence or inconsistency that could impact the trustful behavioral context is identified and addressed since lack of coherence and consistency jeopardizes change. Moreover, as indicated in Sect. 2.4.11, incoherence and inconsistency breeds low trust and widespread employee cynicism which fuels resistance to change.

In summary, what appeared as an obvious characteristic is that EnerServe's transition was fuelled by the central enterprise governance function and the design activities this competence undertook, not by budget, management and planning processes, or by managing a project portfolio. How could such a portfolio be defined anyway without reference to design? For defining an adequate, coherent, and consistent set of projects that can implement the new EnerServe arrangements, the enterprise governance and enterprise engineering approach thus turned out to be indispensable.

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