

Chapter 2

Business Challenges: And How Enterprise Modeling Helps

Enterprises operating in most industrial and service sectors face a number of business challenges that exceed the scope of the daily operations and routine activities. Examples are continuous process improvements for increased efficiency, adjustments of the enterprise strategy to new market demands, changing business models due to new competition, new regulations and bylaws requiring operational changes, or technological innovations leading to changed customer behavior and new processes. In many cases, improving business processes alone is insufficient for addressing problems of this nature. The overall situation of the enterprise has to be taken into account including relations between strategic goals, business rules, work processes, organization structures, products, services, IT infrastructure, etc.

Enterprise Modeling (EM) is a proven instrument for addressing these kinds of organizational challenges. The area of Enterprise Modeling in general is concerned with techniques, methods, and tools for modeling organizations and for finding and preparing potential improvements. This chapter discusses a number of typical business challenges for illustration purposes (Sect. 2.1) and then shows how EM can help addressing them (Sect. 2.2) followed by an overview on practical guidance for modeling (Sect. 2.3).

2.1 Typical Business Challenges

The aim of this chapter is to discuss a number of typical business challenges in order to show how EM can help in tackling them. The following challenges will be discussed:

- Understanding organizational dependencies
- Finding the need for change
- Improving business processes

- Aligning organizational strategy and IT
- Developing the IT strategy

The challenges will be described in terms of their typical characteristics and put in relation to the EM perspectives with respect to why and to what extent they are needed to understand the problem and to define a solution. Method support for the different perspectives will also be presented in this chapter.

2.1.1 Understanding Organizational Dependencies

Many situations and tasks in enterprises require a clear understanding of the established organizational structures and existing processes, which can be achieved by creating enterprise models to visualize these structures and processes. Such a visualization describes the current situation in the enterprise and helps to clarify relations and dependencies between various parts of the organizational design. Visualizing the current situation usually is the first step towards finding problems (discussed in Sect. 2.1.2.) and improving business processes (see Sect. 2.1.3.), but it can also be applied for other purposes, such as:

- Training new employees and introducing them to the current practices of an enterprise. This activity can benefit from documentation that includes enterprise models. The focus of the documentation will often be on the workflow, e.g., standard operation procedures, and on tasks and responsibilities, e.g., which role or unit in an organization is responsible for what task.
- Planning a new product variant or customer service. In such cases it is important to know the dependencies between new and existing variants of products and services as well as which processes and resources are involved in production.
- Identifying dependencies of the information systems and IT applications in an enterprise and analyzing the IT support for different tasks and work processes. Visualizing these relations is an important input for planning operations and maintenance.
- Setting up the cooperation with a new partner or supplier. In such cases EM is instrumental in showing the business processes that the new partner or supplier will be contributing to and hence what integration activities need to be designed.

The above examples show that visualization of the enterprise may focus on different views of the enterprise, like processes, IT systems, services, or organization structures to serve the specific purpose for the EM activity.

One of the most important features of enterprise models used for visualization purposes is that they have to be easy to understand for the targeted users. This includes a modeling language that is easy to understand and is adequate for the purpose, tool support for easy navigation in the models, as well as a layout of the models supporting illustration of relationships and dependencies.

Furthermore, such models have to reflect the current situation in the enterprise or part of the enterprise under consideration, i.e., accuracy to the required level of

Table 2.1 Features of EM for understanding organizational dependencies

EM for understanding organizational dependencies	
Purpose	Capture and document organizational aspects, such as structures and processes, in an explicit and understandable form
Input required	Scope: which part of the enterprise has to be considered (organization units, processes, divisions, etc.)?
Who should be involved?	Staff knowledgeable about the problem domain from all levels (operations, management, subject matter expert)
Typical outcome	Enterprise model for the part of the enterprise depending on subject and purpose: process, organization structure, IT systems, products
Critical quality issues	Model has to fit the reality (high correctness) Modeling language and the produced models have to be easy to understand for organizational stakeholders (high understandability)
Tool support	Viewing and browsing of models

details is essential. In order to achieve the desired level of accuracy subject matter experts (stakeholders) with deep knowledge of the problem domain should be involved in modeling.

Formality of the models usually is less important since the models are not meant for using them in workflow engines or other execution environments, but only for human audience.

That the purpose of modeling is the visualization is often known from the beginning and the scope of the model is quite clearly defined. More often in such cases, a top-down modeling strategy is applied, i.e., starting with the general structures and processes and elaborating details in increments. Table 2.1 summarizes the characteristics of enterprise models and the modeling process for visualization purposes.

2.1.2 Finding the Need for Change

Daily work in most enterprises does not only consist of running routine processes or standard procedures in a “business as usual” fashion; it also includes troubleshooting and as well as identifying the need for and developing improvements. Problems are often related to several areas of the organization, e.g., different processes, products, organization units, and systems. Finding and analyzing them requires an understanding of the dependencies and relationships, which is often difficult because they are hidden in the complexity of the enterprise. In some cases the symptoms of a problem are visible, but the causes remain hidden and require a careful analysis.

EM can help finding such problems or—to be more precise—finding and analyzing them in order to identify their causes and potential solutions. Depending on the visible effects of the problem, different aspects of the enterprise might have to be modeled. Examples are:

- Variations in the quality of products or services could have their cause in different opinions of stakeholders in the organization about what the most important quality aspect is. Even though standard procedures might be defined, the quality will depend on who is involved and maybe even on the sequence of the involvement. This is difficult to detect unless quality priorities are made clear and the different viewpoints are exposed.
- In many enterprises problems in the information flow cause costly operational problems, such as high failure rates in production and delayed deliveries. In such situations, all roles involved in a process should, in principle, get the right information for their task but in reality the information is partially incomplete or inaccurate without the stakeholders being aware of this.
- Process descriptions are interpreted and followed differently at different parts of the same enterprise, which causes deviations in resource use and process efficiency. The differences in executing the same business process can be caused by specific changes at some of the parts of the organization, which makes the existing process descriptions incomplete. Explanations for these deviations will require creating a joint view of the process by all involved sites.
- Organization finds itself in a changing market situation and needs to adjust its business vision and how the vision is implemented. In such cases the business vision is created and the existing business processes and the IT architecture need to be adjusted as well as new components need to be introduced.
- Different interpretations of the same term or business concept can have an effect on how policies and business rules are handled in an enterprise. Clarification of such terms may seem as an easy task on the outset, but connecting this to operational problems often requires a substantial effort.

When dealing with these kinds of “wicked” problems it is important to have a problem solving approach which is not too rigid in its process but allows for adaptation to the situation at hand. Different ways of gathering information about the situation might be needed, e.g., moderated modeling sessions, observations, and interviews. At the same time, different perspectives need to be analyzed in order to identify dependencies between the various aspects of the problem situation. This may entail creating and analyzing a combined process and service view or considering the involved organization units from the perspective of their position in the value chain. One of the key factors for finding the problem is to include those people in the problem solving process who are involved in daily operations of the area in question. Those who are only responsible for operations might not be sufficient because they might only know how things “should be performed” and not how they are really done in practice. Table 2.2 summarizes features of EM for finding the need for change.

Table 2.2 Features of EM for finding the need for change

EM for finding the need for change	
Purpose	Find the needs for changing the organization
Input required	Where is the problem encountered? How does the problem manifests for itself? Who is involved (staff, role, unit, ...)?
Who should be involved?	Stakeholders familiar with the problem on operational and managerial levels
Typical outcome	Problem analysis in terms of which organization unit, role, process, product, IT system, or information is involved, what are the likely causes, what needs to be done to solve them
Critical quality issues	Model has to include the dependencies between different potential aspects and effects of the problem
Tool support	Capturing different perspective in the same model

2.1.3 Improving Business Processes

Efficient and effective processes are one of the keys to a successful business. If processes do not fulfill this criterion they need to be improved. This is a challenge that many enterprises face and EM is able to support it.

Process improvement projects usually start from an observation that certain activities or workflows in an organization take too much time or resources, that they produce suboptimal results, or that they are performed with many ad hoc adjustments and work-arounds created by the involved staff members. Thus, the starting point for process improvements is often given by such observations. However, when defining the scope for the improvement project a wider view should be taken in order to include potential influences from related process and/or departments. The potential improvements will most likely concern more areas than just processes. It is highly likely that business goals, concepts, business rules, and the IT infrastructure will also have to be changed.

Process improvement has to usually involve three different levels that can be supported by EM:

- The strategic level concerns the definition of the objectives from an enterprise perspective to be reached with process improvements. Questions to consider are: is it more important to shorten the time needed for completing the process, to reduce the resources needed, or to increase the number of parallel process executions; should the improvement contribute to increased customer satisfaction or is the priority on standardizing process execution?
- The conceptual level addresses the design of future processes in accordance with the strategic objectives of the organization. This includes aspects like the flow of activities, the personnel involved, the resources needed, interfaces to related

processes, etc. An important aspect is to agree with the subject matter experts and the staff involved on the future process in order to increase acceptance of the process.

- The operational level implements the results from the conceptual level for everyday use in the enterprise. This can be achieved by using workflow environments for process execution or specific IT support. The step from the conceptual level to the operational level often requires refining the processes (e.g., by describing all possible exceptions from the standard process) and adding more details.

EM is well suited for the strategic and the conceptual level. Here, visualizing and defining objectives and processes, creative design of future situations, and agreements between stakeholders are more important than exact technical specifications and “executable” process descriptions. For the operational level, many specific workflow languages and execution environments were developed, which fit better to the purpose of implementing the process. However, these specific workflow tools often have shortcomings in supporting the creative and design part of the process improvement. EM can also be used for more exact operational specifications of the conceptual level, but since it is not meant for process execution, different modeling languages may need to be used.

The typical outcome of a process improvement project in the first stage is an inventory of the most important processes with a short textual description but without detailed specification of the activity flow. The processes to be improved have to be defined in more detail including the sequences of activities, alternative activity flows, actors, and resources involved. The future process descriptions should be captured as visual models and agreed on between the stakeholders involved.

Table 2.3 summarizes the feature of EM for process improvement.

Table 2.3 Features of EM for process improvement

EM for process improvement	
Purpose	Improving business processes
Input required	Processes to be improved including the relevant actor dependencies, such as the process owner
Who should be involved?	Management level for defining strategic objectives; process owner and involved staff for designing future processes; operations manager and technical support for process implementation
Typical outcome	Strategic objectives guiding process improvement; future process with roles, resources, and supporting IT; action plan for implementing the change process
Critical quality issues	Fulfillment of strategic objectives; feasibility of future process in practice; acceptance by staff involved; integration with other processes and systems in the organization
Tool support	Modeling of processes at several levels of abstraction, using the process decomposition principle

2.1.4 Aligning Organizational Strategy and IT

Alignment of business and IT is often considered to be a serious challenge in enterprises since the business environment and organizational practices continuously change and in turn so does the IT of an enterprise. The pace of change and the time frame needed to implement the changes are different in both areas. Furthermore, business professionals and IT professionals often have different backgrounds, use different terminology, and set different priorities for development. In this context of multitude of influences and contradicting needs, reaching an agreement about how to set priorities for the enterprise is difficult, because there is not enough understanding of the “other side.” EM is able to deal with situations where different stakeholder views and requirements need to be consolidated and consensus achieved. For the purposes of business and IT alignment, the following directions of work are commonly taken:

- Goal modeling and problem modeling involving business and IT professionals in order to create a better understanding for the concerns, limitations, and priorities from a business or an IT perspective. In particular, using a participatory way of working consisting of modeling sessions leads to creating common understanding of dependencies between goals and problems as well as resolution of inconsistencies and conflicts between the goals, the measures for reaching them, as well as the IT requirements and architecture design.
- For the most important future business areas or the most relevant strategic developments, the dependencies between products or services and IT can be modeled as well as the dependencies between the core business processes and IT systems can be visualized. Knowledge about these kinds of dependencies will help to plan the forward development of IT proactively and to influence the priorities that are assigned on the business side.
- In cases when business and IT development is congruent EM is used to elaborate and compare different strategies for achieving the business intentions.

For all of the above purposes it is important to involve business and IT professionals responsible for the areas under consideration and for implementing business or IT changes. This kind of stakeholder involvement increases acceptance of the designed solution and reduces potential tensions during implementation and deployment of the solution.

With respect to the modeling language and the tool to be used, the stakeholders should not be forced to learn new languages or to get acquainted with modeling tools, since this might negatively affect their willingness to participate in the modeling process. Enterprise-wide modeling tools and languages that are already used within the organization should be applied to ensure compatibility with the existing designs and solutions. If the organization does not have experience with EM and/or other model-based ways of working, less formal approaches and easy-to-use tools, like modeling on large plastic sheets, should be preferred. In many cases, the actual models produced will be less important than the process performed and the agreements or advances reached during the process. Table 2.4 summarizes the features of EM for aligning business and IT.

Table 2.4 Features of EM for aligning business and IT

EM for aligning business and IT	
Purpose	To achieve congruence of business and IT
Input required	Business challenges and IT challenges to be coordinated. Existing business visions and designs, existing IT architecture
Who should be involved?	Business and IT professionals responsible for the areas under consideration or for implementing business or IT changes
Typical outcome	Examples: joint understanding of business and IT regarding goals and problems; dependencies between products/services and IT; comparison of different solution alternatives
Critical quality issues	Joint understanding of business and IT professionals regarding problems, goals, and dependencies, integration of models
Tool support	Depending on the actual purpose, e.g., support for requirements management, integration with IS development tools (e.g., CASE or MDD tools)

2.1.5 Developing the IT Strategy

In general, an IT strategy defines the long-term objectives that the IT in an enterprise is supposed to reach in order to contribute to the enterprise strategy as well as the measures and planning for reaching these objectives. Depending on the importance of IT for the enterprise and on the size of the enterprise, an IT strategy can be quite complex and encompass strategic, tactical, and operational parts. EM is well suited to support developing the strategic and tactical levels and can even contribute to the operational level.

On the *strategic level* the organizations formulate the goals to be reached in the long term and the problems to be solved. A prerequisite for this task is to have a clear picture of the current situation of the IT and its support of the enterprise operations. The current state of affairs can be modeled as described in Sect. 2.1.1 “understand organizational dependencies.” However, the enterprise application architecture, i.e., the different IT applications and information systems including their interfaces, and the IT infrastructure (servers, networks, locations, etc.) have to be in focus of modeling. This should also include the IT support for the core business processes and functions, e.g., what roles and business processes use which applications or information systems. Based on the knowledge about and the analysis of the current situation the existing problems and aims for the future IT of the organization can be identified and made explicit. This task should include all enterprise stakeholders involved in defining and implementing the strategy. The stakeholders to be involved are the IT Management of the enterprise, representatives of the corporate management, and representatives of the different divisions and business lines in the enterprise. An important input for this process is the overall “corporate” strategy for the enterprise or, alternatively, long-term objectives/challenges of the enterprise from business perspective. If the corporate strategy is not explicitly documented, then modeling it might be a part of the IT development project.

EM supports establishing a common understanding and an agreement among the stakeholders about such business problems and objectives. Strategy development will usually have to include the definition of priorities and solving conflicting intentions and/or implementation alternatives. EM can support this by linking goals and problems to the current situation and among each other. By doing this, it usually becomes clear what problems need to be solved with priority to reach certain goals and, in turn, what IT applications, infrastructure components, business processes, and organization units will be affected. The IT strategy as such will have to be documented in a suitable manner that should include the goal and problem models as well as the parts of the IT and the enterprise that will have to be changed in the future (Table 2.5).

Enterprise Modeling activities on the *tactical level* translate the long-term strategic objectives into midterm planning steps to be implemented. Often, this is prepared as a road-map defining one or several packages of changes in the information system architecture or IT infrastructure. EM is a valuable technique for defining the “to be” situation and the different change packages. This can include defining, for example, the following:

- Initial plans for the required change projects for IT applications and information systems, e.g., introduction of new systems, replacement of existing IT, forward development of custom-made software, integrating of enterprise applications, etc.,
- The necessary changes in business processes and/or new management services and functions to be introduced,
- Changes in the organization structure and role distribution of the IT department.

At this stage not only the decision makers from business areas and IT driving the changes and the experts from business and technical perspective should be involved, but the responsible roles for all affected processes and functions. The aim of the modeling is to reach a common understanding and agreement about the future situation. The enterprise models for the future situation should be more detailed for the tactical planning than for the strategic planning.

If a comprehensive model of the IT architecture exists or was developed for the strategic level, this has (a) to be enriched to accommodate information about planned changes and (b) prepared in several versions showing the planned status at different stages of organizational transition to the desired future state. For this kind of roadmap planning, specialized tools in the category of IT portfolio planning exist.

The *operational part* of an IT strategy has to include very detailed short-term objectives and corresponding plans as well as instructions for their implementation. This usually is a refinement of the tactical planning and, hence, the enterprise models developed for the tactical stage can form the starting point for the operational planning of the implementation. In the same way the operational objectives should be directly contributing to the goals defined in the strategic level. However, for the actual operational planning of day-to-day work the organization should use project management tools in combination with—depending on the planned activity—workflow management tools or software development tools. Tables 2.5 and 2.6 summarize the feature of EM for business and IT alignment.

Table 2.5 Features of EM for IT strategy development, strategic level

EM for developing the strategic level of an IT strategy	
Purpose	Define the long-term objectives for the IT in an enterprise and how to reach them
Input required	Corporate strategy for the enterprise (if defined) or long-term objectives/challenges of the enterprise from business perspective
Who should be involved?	IT Management of the enterprise; representative of corporate management; representative of different divisions or business lines in the enterprise
Typical outcome	Strategic objectives for the IT in an enterprise and how they contribute to corporate objectives; problems to overcome with respect to strategic objectives; long-term plan of IT changes to be implemented and rough analysis of processes and functions affected
Critical quality issues	Clearly defined realistic and controllable objectives; acceptance by stakeholders; long-term plan for IT changes has to show stages with accepted priority
Tool support	Traditional modeling on paper and plastics for objectives/problem modeling

Table 2.6 Features of EM for IT strategy development, tactical level

EM for developing the tactical level of an IT strategy	
Purpose	Refine the planning and measures defined on the strategic level into midterm planning steps
Input required	Results of the strategic level of IT strategy development
Who should be involved?	Decision makers from business areas and IT driving the changes; experts from business and technical perspective; responsible roles for all affected processes and functions
Typical outcome	Planning of changes in IT applications and information systems; planning of changes in processes and functions affected; update of information system architecture
Critical quality issues	Clearly defined contribution to strategic objectives; feasibility of planned change projects in time, budget, and quality
Tool support	Enterprise modeling tools; enterprise architecture management tools

2.2 How Does EM Help?

Enterprise Modeling helps to tackle the challenges discussed in Sect. 2.1 by offering a flexible but systematic way of working (i.e., a method), tools of different kinds supporting this way of working, and experience-based recommendations for how to do things and how not to do things, so-called practices. This support with methods, tools, and practices provided by EM can be used for a variety of different tasks and situations due to the different perspectives of modeling, which are supported.

The perspectives urge the modeler to look at the enterprise from a specific angle and guide the modeling process in a way that specifically captures and analyzes the specific perspective. All perspectives are equally important because they allow building a holistic view on a problem situation, solutions, and the enterprise as a whole. For specific purposes, one perspective may be guiding the work; hence it might be practical to start modeling with that perspective. The different perspectives at first may seem independent and produce different models—one for each perspective. This is a false impression; all perspectives are mutually dependent on each other and modeled in an integrated way since they all reflect the same modeling subject, i.e., the same enterprise.

The most important perspectives used in EM are the following:

- The goals and problems perspective: future development and daily operations in enterprises should be guided by clearly defined goals, which can be set on general enterprise level or specifically for certain enterprise functions, business areas, or parts. In order to achieve the goals, problems, weakness, threats, and challenges have to be solved. Relationships and dependencies between goals and problems need to be understood.
- The business process perspective: value creation activities, management, and support tasks often are conducted in business processes which have to be continuously improved in order to support the business goals. In many process-oriented enterprises, business processes, and their systematic management are considered the key for efficiency.
- The organization structure perspective: the different organizational functions are provided by organization units forming the organizational structure of the enterprise. Within these units, actors and roles with defined tasks and responsibilities perform the business process.
- The technical components perspectives: both business processes and roles are connected to resources used within the process or for fulfilling the responsibilities. These resources can be IT systems and applications, information resources, or other types of machinery.
- The product perspective: products of enterprises can be physical products produced with enterprise resources or services provided by the enterprise. To visualize and understand the components or parts of these products or services can be essential for understanding the business.
- The concept perspective: when sharing knowledge about dependencies and relationships between processes, roles, products, and services of an enterprise, it is important to use essential terms with exactly the same meaning. Thus, these concepts should be expressed and defined explicitly.
- The business rule perspective: in order to achieve certain business goals or to control the business processes, definition of specific rules to apply often is inevitable. Such business rules also are related to the concept perspective.

Table 2.7 Importance of the different perspectives for the business challenges

Business challenge	Guiding perspective	Complementary perspectives
Understand organizational dependencies	Organization structure	Business processes, products, business rules, technical components
Find the need for change	Goals and problems	Concepts, business processes, organization structure, technical components
Improve business processes	Business processes	Organization structure, business rules, technical components, concepts
Align organizational strategy and IT	Goals and problems	Concepts, business processes, technical components, organization structure
Develop the IT strategy	Technical components	Concepts, business processes, organization structure

Table 2.7 illustrates which of the perspectives introduced above is of highest importance for the different challenges discussed in Sect. 2.1 (“guiding perspective”) and which other perspective form important complementary perspectives. This makes clear that it depends on the modeling purpose which guiding perspective has to be used.

Tools for EM support capturing the above perspectives either only for specific perspectives or for an integrated view on all perspectives. Furthermore, different tool categories support the complete EM life cycle from early phases like scoping or project definition to use of models developed for process improvement or information system development.

Many EM activities require a clear objective, participation of several stakeholders from the enterprise, an adequate resource allocation, and a thorough time plan. They should not be performed “on the side” of daily business, but organized and treated as projects. Setting up such projects has many similarities to other kinds of organizational change, system introduction, or development projects, but there also are specifics of EM which have to be taken into account. Thus, support for EM also has to include activities for preparing and organizing EM projects.

2.3 For Enterprise Modeling (4EM): An Example EM Method

During the long history of EM, several hundred methods have been proposed, most of them in a scientific context without ever reaching a level of maturity that is required to be used in practice. Among the established methods, only a few are thoroughly documented and publicly available; many are proprietary knowledge of consultancy firms or system integrators. All perspectives presented in Sect. 2.2 are represented in the most of these methods, but only some methods cover all perspectives. For this book, an EM method was needed which includes all perspectives, is openly available, and has a high maturity. Only introducing EM on a

conceptual level, i.e., without a concrete way of working, was not an option since this would lack sufficient practical advice.

We decided to use the 4EM method in this book and to introduce it when discussing the perspectives and the way of working in Chap. 5. The 4EM method is rooted in both academia and practice, but it is not a commercial product. This book does not intend to focus on the method as such; the method is used to illustrate the different perspectives and a systematic way of working with EM. Hence, 4EM serves as a vehicle to transfer this kind of knowledge. Experience shows that it is easy to switch from 4EM to another method, since most concepts and perspectives used in 4EM are also available in other EM methods. Furthermore, in many industrial contexts and enterprises, certain ways of working, and specific modeling languages are already established, i.e., models, tools, and practices exist. In such cases it is important to be able to switch to the existing enterprise standards.

4EM is presented in much detail in Chaps. 6, 8, and 9. More information about the origin of 4EM can be found in Sect. 7.5.