Chapter 4
Theorising

4.1 What Is Theory?

Chapter 3 took us through the steps of designing a research inquiry, the *planning* stage of the research. Chapters 4 and 5 address two key challenges in *executing* the research, by discussing **theory** and **method**. Let us start by looking at theory.

Earlier in this book, we stated that scientific knowledge is the collection of theories built, derived, and tested using methods for scientific inquiry, and theories are our current explanations for how our world looks and how phenomena in it behave and function.

So why are theories important? Theories are at the core of any research process. As scholars, it is our job to develop theories, evaluate them, reject them when necessary, and revise, extend, or modify them. Theories represent the main element in the accumulation of our body of knowledge. Therefore, we can only do science if we work *with* the existing theories or find a way to discard them or replace them with new ones.

In addition to being the core *outcome* of scientific research, theories are important to the *planning* process in research: to scholars, a theory can provide guidance in terms of where to direct the attention of study. An existing theory serves as a framework for where current, past, and future empirical work can be incorporated. From a larger perspective, theories can be the material that integrates sets of individual studies into a larger research program (Burton-Jones, 2009).

Theories also have plenty to offer to the *execution* process in research as they provide a framework for synthesising, analysing, and integrating empirical findings and observations; aid us analysing empirical data and observations by identifying patterns and themes in the data; and help us explain our findings or observations so we can make sense of the data we collect. Theories are also the basis for the derivation of hypotheses that can be examined in subsequent scientific, empirical work. As such, theory is a key component that adds rigor to the research process

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(Steinfield & Fulk, 1990) and can be of help when we have observations and evidence that seem contradictory, anomalous, or inconsistent.

Definition of Theory

Simply put, theories are proposed explanations of empirical natural or social phenomena, constructed in a way that is consistent with the principles of scientific inquiry. For example, a theory in medicine involves understanding the causes and nature of health and sickness, which is what we call *explanatory theory*. Foreshadowing our discussion of different types of theories below, let me add that medicine also contains *design theories*, which are about making people healthy. Note here that explanatory and design theories are related but can also be independent: One can research health and sickness (explanatory theory) without curing a patient (design theory), and one can cure a patient without knowing how the cure worked.

Still, most would argue that theories contain an explanatory component, that is, a logic about the mechanisms that connect phenomena and a story about *how and why* actions, events, structure, and thoughts occur. In that sense, theory emphasises the nature of causal relationships, identifying what comes first and the timing of events. Therefore, a more formal definition is that theory is a system of constructs and relationships between constructs that, taken together, present a logical, systematic, and coherent explanation of a phenomenon (Bacharach, 1989).

It may be helpful to explain what theory *is not* to explain what theory *is*:

- Theory is not *data*: sets of evidence, observations, or arguments do not make up a theory. Think of raw materials and the design of a building: we need bricks, mortar, or perhaps wood to build a house, but these materials themselves are not the house, just as data, evidence, or observations are not theories.
- Theory is not *idiographic*: an explanation of a single situation or phenomenon, in whatever detail, is not a theory as it cannot be generalised to other situations, events, or phenomena. By extension, therefore, theory is *nomothetic*; that is, it pertains to classes of events, behaviours, situations, or phenomena as it is broader than one instance or one example. Some even say that the more general a theory is, the better.
- Theory is not *description* or *prediction* only: a mere description or classification of a phenomenon does not constitute a theory because such descriptions (taxonomies, typologies, classifications, and so forth) operate at the empirical, observational level. A theory delves into underlying processes to explain the systematic reasons for a particular occurrence or non-occurrence. It comes with suggested explanatory mechanisms that tell not only *that* a phenomenon occurs but also *how* and *why* it occurs in the way we observed it. Similarly, prediction alone, without explanation, is typically not considered a theory. With advances in machine learning, algorithms can generate fairly accurate predictions of future behaviours

based on past behaviours, but they do not explain the mechanisms that yielded these behaviours in the past or will yield them in the future.

- Theory is not *design*: the construction of an artefact, however novel and useful it is, is in itself not a theory. Just as we may be able to predict future events without understanding why the events will occur, we may be able to construct artefacts that operate well without understanding how and why. However, it is possible that a design artefact embodies knowledge, and so is a manifestation of theory if it informs us about why this artefact is constructed in a particular way and why it provides the utility or novelty that it provides; in such a case, a design may involve or yield a theory.
- Theory is not *self-perpetuating*: theory is not an activity that is an end in itself such that it is important to you only because you think it is important, not because it will help you achieve something. Instead, theory has implications that inform our current and future understanding of a phenomenon.
- Theory is not *universal*: some scholars in the natural sciences (e.g., physics) have long searched for one universal theory of everything—the current candidate is super symmetric string theory—but a universal theory does not exist in the social sciences, nor is one necessarily needed. While striving for comprehensiveness, theories have their share of limitations in the form of assumptions and boundary conditions, which specify the limits to which the theory is held. For example, some theories pertain only to large and complex organisations rather than to all types of organisations.

Equipped with this basic understanding of what a theory is and is not, we can turn to examining the elements that make up a theory and to the structural components that are common to all types of theories.

4.2 Building Blocks of Theory

Constructs, Relationships, Mechanisms, and Boundary Conditions

Independent of what a theory is, the phenomena to which it pertains, and the goals it strives to reach, several structural components occur commonly across all theories. Whetten (1989) called these the building blocks of theory:

1. *What* (constructs)
2. *How* (relationships)
3. *Why* (justifications), and
4. *Who*, *where*, and *when* (boundary conditions)

The most fundamental components of theory are the constructs of which it is composed. In Chap. 2, we defined constructs as operationalised concepts, which meant that we attempt to take the abstract meaning of a concept (such as education) and operationalise it to something in the real world that can be measured. Typically, constructs relate to properties of things, both tangible and intangible, in the real world, so our theory can explain or predict what happens to the thing if one of its properties changes. For example, we may theorise about how users' perceptions of an e-commerce website change depending on how data are represented on that website (e.g., as texts, as graphics, as animation).

Which constructs compose a theory is a fundamental question. The choice of constructs determines both the locus (the domain addressed) and the focus (the level of abstraction) of the theory. The number of constructs determines the theory's comprehensiveness (how much does the theory account for?) and parsimony (what is the simplest account possible?), but the fundamental question goes deeper than that. For example, above I said that constructs relate to the properties of things, both tangible and intangible, in the real world, but this view assumes that the world is made up of things, a substantialist view of the world. A relationalist view would be that the world is in a continuously unfolding process and that the dynamics of this process are its fundamental building blocks (Emirbayer, 1997). Therefore, our constructs are often about things with properties, but they could also be about changes to relationships in a dynamic process. Either way, theory needs constructs that describe its essential elements.

Thinking about theoretical constructs in this way allows us to define at least two key ways we can contribute to advancing theory:

- We can articulate *new constructs* as the basis for a new theory regarding previously unknown phenomena or as a new way to look at existing phenomena. Alternatively, we can articulate new constructs to form part of an existing theory. For example, scholars have introduced the constructs of habit and inertia to explain why some people continue to use an old information system rather than accept a new one (Polites & Karahanna, 2012). The concept of habit is by no means a new one, yet its operationalisation as a construct in the nomological net of technology acceptance was a novel addition to theory at that time.
- We can *delete constructs* from a theory to increase the parsimony of the account offered by the theory. A good example is an early work around the technology acceptance model, which showed that the effects of the construct "attitude" are fully mediated by the other constructs in the theory, so they could be omitted (Davis et al., 1989).

Typically, constructs can be specified further in terms of their importance to the theory. We distinguish between *focal* constructs and *ancillary* constructs, where focus constructs are those that are the key components in our theory and determine its locus and focus. Other constructs might describe other phenomena or properties of interest and be associated with the focal constructs in some way, perhaps because they moderate or mediate some constructs' effects on another construct. It is also possible not to have a focal construct.

Having identified a set of constructs that describe *what* the theory is about, the next question is *how* the constructs are related to one another. In this step, we describe the relationships between constructs. A typical example of a relationship is how changes in the state of one property (e.g., a person's level of happiness) change the state of another of that thing's properties (e.g., a person's ability to sleep peacefully) or another thing (e.g., the level of happiness in a person with whom they engage often). Through relationships, we are essentially describing *laws of interactions*, that is, patterns for how the values of one construct change in accordance with changes in the values of another construct.

These laws of interactions are typically attempts to define a sense of causality in a conceptualisation of some phenomenon, in that we describe certain patterns of behaviour for the properties that are captured in our theory. The nature of the relationship depends on the purpose of the theory and may be any of several types, such as associative, compositional, unidirectional, bidirectional, conditional, or causal. In a sense, specifying the form of the relationship between constructs provides a key step towards explaining the mechanisms that explain how and why the constructs behave the way they do or the way we expect them to.

Thinking about relationships between theoretical constructs allows us to identify three other ways in which we can contribute to theoretical advancement:

- We can articulate *new laws of interaction* in the relationships among existing or new constructs.
- We can *delete laws of interactions* among the constructs of a theory.
- We can *redefine the existing laws of interaction* among constructs in a different way.

In general, the laws of interaction can be specified with varying levels of precision. For instance, some theories merely state that the values of their constructs are associated with one another by showing that high values of one construct are associated with high or low values of another construct or that the existence of one value of a construct signals the existence of a certain value of another construct. In some cases, the functional relationships between constructs can be specified more precisely, such as when a certain value range of one construct mediates, mitigates, or moderates the value range of another construct or the relationships between two or more other constructs.

The next step is then to ask *why*—why are the chosen constructs relevant and complete, and why are the laws of interactions as specified? This part of theory relates to the justificatory or explanatory mechanisms: the reason that a theory is a credible account of the phenomenon to which it pertains. Justificatory mechanisms are the key vehicles for the credence of the particular account that the theory offers, and they describe the logic of the key assumptions that underlie the theory. They also provide the basis for gauging whether the proposed conceptualisation is reasonable.

This focus on mechanisms is probably the most essential but perhaps also the most difficult part of theoretical development. There are several ways to identify these mechanisms.

Historically, justificatory mechanisms for theories in information systems were often deductively drawn from existing fundamental, general theories of human behaviour, organisational behaviour, or social behaviour. For example, the technology acceptance model (Davis, 1989) builds on premises from the theory of reasoned action (Ajzen & Fishbein, 1973), which describes human volitional behaviour in terms of the individual's attitude towards that behaviour and the beliefs about the consequences of performing it. We can see how such a theory of human behaviour can provide a logical assumption about how people might behave when confronted with new information technology. It is a good example of deductive reasoning. You may also get a sense that the theoretical advancement is, well, limited: by deducing a theory about an information systems phenomenon from broader, more abstract theories about the same but more general phenomena (how humans behave in principle), the research essentially demonstrates the validity of the broader theory in the information systems context: it corroborates existing knowledge but does not yield entirely novel knowledge. On the other hand, this way of constructing theories and mechanisms is perhaps easier to do (because the building blocks of our explanation are provided) and less risky (because we can typically rely on evidence that already supports the theory).

A different approach to developing justificatory mechanisms is through decisively inductive research. One prominent example of such an approach is grounded theory (Glaser & Strauss, 1967). We discuss grounded theory in more detail in Chap. 5. Here it suffices to say that the idea is to identify and understand through systematic empirical research justificatory or explanatory mechanisms that manifest in the setting(s) we examine and to propose or develop claims to causality that can be generalised beyond the setting we study.

Finally, a third—and probably the least understood—approach is abduction. Accounts of the history of science include many stories about when scientists "had a hunch," "took a guess," "had an epiphany," or other kinds of ways in which they found out how a particular phenomenon worked. I think this is an entirely valid way of constructing theory: if we figure out what the mechanisms are and find evidence to support or corroborate that view, who cares where the ideas, explanations, and logic came from? In the history of science, the question concerning how a hypothesis arose in the first place or what the explanatory mechanism that underlies some phenomena is has not been of interest because it is not itself part of a scientific process (Popper, 1959): the understanding or idea could be the result of a creative process, a psychological process, or luck. In this interpretation, science should then be concerned with systematically testing and justifying the idea, not developing the mechanisms in the first place. Still, in information systems and many other disciplines, scientists have a strong interest and emphasis on the justificatory mechanisms that explain how and why constructs and relationships are proposed in the way they are.

Thinking about justificatory mechanisms allows us to identify two additional ways in which we can contribute to theoretical advancement:

- We can *articulate new justificatory mechanisms* for the constructs or relationships of a new or an existing theory. A good example in the vein of studies on the basis of the technology acceptance model is expectation-confirmation theory (Bhattacherjee, 2001), which demonstrates a logic based on the cognitive-

dissonance theory, which explains why people might perceive technology to be useful and then be inclined to use it.
- We can *delete a justificatory mechanism* that underlies a theory by showing that the assumptions contained in it are violated, unrealistic, or otherwise deficient.

Let me reiterate the importance of justificatory mechanisms: they describe the intellectual logic of a good theory on which the trust is built that others (other academics, reviewers, readers, practitioners, policy makers, and so forth) will believe in our theory. Gradually, in the research process, the logic built on the key assumptions can be supported or corroborated by research data that show that the constructs and relationships behave as expected. Still, a theory will always be challenged to explain *why* its assertions should hold, and, indeed, an answer to this "why" question is often what separates a primarily empirical contribution of a study, in which scholars discovered qualitatively/quantitatively that certain relationships between certain constructs exist, from a strong theoretical contribution, where scholars can offer an explanation for why such is the case.

A final component of theory is the set of boundary conditions. Boundary conditions describe the circumstances under which the theory is expected to hold—that is, the scope and limitations of a theory. The scope of a theory is specified by the degree of generality of the statements of relationships signified by modal qualifiers, such as "some," "many," "all," or "never," and other boundary statements showing the limits of generalisations. These limits can be uncovered by specifying conditions of "who," "when," and "where," all of which place limitations on the propositions articulated through the chosen set of constructs and the laws of interaction between them. These contextual, spatial, and/or temporal factors set the limits of generalisability; they thus define the scope of the theory.

The boundary conditions of a theory can be specified, for example, when the constructs are selected for the theory (e.g., *experienced* computer users, as opposed to *all* computer users). They can also be specified by considering only certain value ranges of one or more constructs (e.g., computer use during *business hours*, as opposed to computer use *at night*).

Boundary conditions allow us to identify two additional ways in which we can contribute to theoretical advancement:

- We can *articulate new conditions* that specify where a theory will or will not hold.
- We can examine our theory thoroughly in *situations that violate some condition*s of the original theory to explore whether the theory will hold.

Boundary conditions are often not explicitly considered or explored at first in theory-building efforts. Typically, we see how work concerning that theory over time adds to our understanding of the boundary conditions. Again, perusing the work around the technology acceptance model as an example, over time scholars have explored the boundary conditions under which the premise of the original theory holds, such as in situations of mandated versus voluntary technology use (Brown et al., 2002); in usage scenarios, such as for work or enjoyment purposes (van der Heijden, 2004); or in different cultural contexts (McCoy et al., 2005).

Constructs Can Play Multiple Roles in Theories

Equipped with an understanding of constructs, relationships, justificatory mechanisms, and boundary conditions, we can further dissect a theory by focussing on the role of the constructs in the theory. Depending on their intended position in the theory, we can classify constructs as *independent*, *dependent*, *mediating,* or *moderating* variables. This classification of constructs is called a nomological net of constructs, a representation of the constructs of a theory, together with their observable manifestations and the interrelationships among and between them. An example is shown in Fig. 4.1.

One construct in our theory might be affected by another construct if a change in the property values in one construct, the independent variable, will invoke a change in the property values of another construct. If so, we denote this construct as the dependent variable in our nomological net (Fig. 4.1a). For example, our theory could stipulate that age (the independent variable) leads to memory loss (the dependent variable). Both constructs have a clear position. For example, it would be illogical to assume that memory loss is the independent variable (memory loss does *not* lead to ageing).

It could also be that a relationship between an independent and a dependent variable is intervened upon by a third construct. We call such a construct a mediating variable. In the example given in Fig. 4.1b, for instance, we see that the effect of age on confusion is mediated by memory loss. In other words, an increase in age can increase the chance of memory loss, which then contributes to confusion. Mediating variables typically add to the explanatory power of a theory because we can specify the exact causality between constructs better. For example, we realise that age per se does not necessarily lead to confusion, but it might lead to memory loss, which can, in turn, lead to confusion. We can also interpret that confusion is a likely consequence of memory loss, which allows us to extend the conceptualisation of our initial nomological net (in Fig. 4.1a).

Finally, other factors might be present that moderate the strength of the relationship between two or more constructs. We call such constructs moderating variables. For example, we might envision how the positive effect of age on memory loss (a negative consequence, of course, but the relationship between age increase and memory loss increase is positive because both are increases) might be strengthened when an individual experiences stress. In turn, stress moderates the relationship because memory loss *also* depends on the stress levels experienced; for instance, between two equally old people, the one who has the higher stress level will have a higher chance of memory loss.

Nomological nets—the description of constructs as well as their manifestations, consequences, and interactions—are important tools with which researchers can argue a theory's soundness and reasonableness. A good theory is one that can be embedded and mentally visualised in a net of constructs that specify antecedents (independent variables that cause some changes in the values of the constructs),

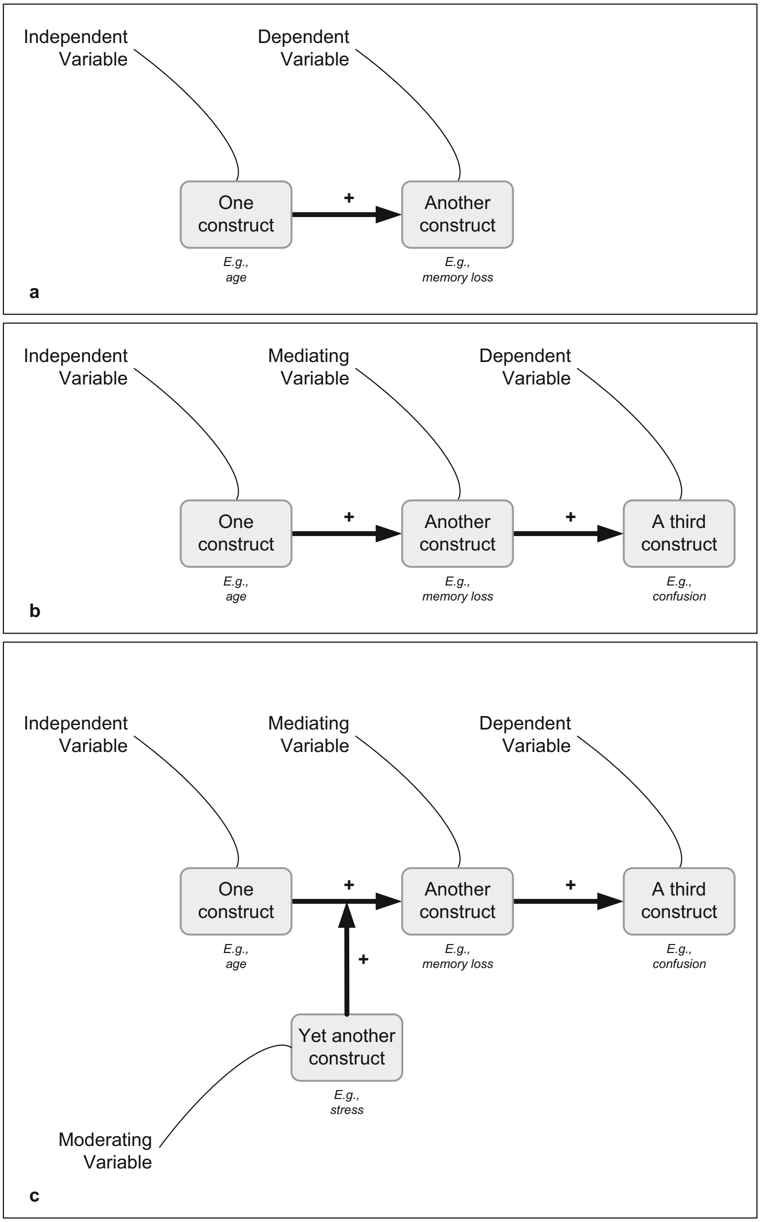

Fig. 4.1 Roles of constructs in a nomological net

consequences (dependent and mediating variables), and interactions (through moderating variables).

4.3 Types of Theory

Having discussed the structural components of theory, let us look at how theories have been developed or used differently in information systems research.

Why are there types of theories? The answer lies in the nature of the information systems discipline as an applied research field. In such research fields, research usually begins with a problem to be solved, some question of interest, or a newly emergent phenomenon that is relevant to some audience, such as researchers, practitioners, or policy makers. A theory that is developed as part of a research process should depend on the nature of the problem, question, or phenomenon that is being addressed.

Thus, theory in this interpretation must have a *causa finalis*, that is, an ultimate goal that specifies what the theory is for based on the problem or phenomenon that the research addresses. Gregor's (2006) essay on the nature of theory suggests that theory typically has one or more of four aims:

- **Analysis and description**: the theory provides a description of a phenomenon of interest, an analysis of relationships among its constructs, the degree of generalisability in constructs and relationships, and the boundaries within which relationships and observations hold.
- **Explanation**: the theory provides an explanation of how, why, and when things happen, relying on varying views of causality and methods for argumentation. This explanation is usually intended to promote greater understanding or insights by others into the phenomenon of interest.
- **Prediction**: the theory states what will happen in the future if certain preconditions hold. The degree of certainty in the prediction is expected to be only approximate or probabilistic in the information systems domain.
- **Prescription**: a special case of prediction exists when the theory provides a description of the method or structure (or both) for the construction of an artefact (akin to a recipe). The theory's "recipe," if acted upon, will result in an artefact of a certain type.

If we combine these four goals, we can then distinguish five types of theories that pertain to information systems as a research discipline. Gregor (2006) described them as summarised in Table 4.1.

Analysis theories are the most basic types of theories; they describe "what is" by classifying specific dimensions or characteristics of phenomena, like individuals, groups, situations, or events. Such theories are needed in particular when little or nothing is known about the phenomenon in question. We know these theories as taxonomies, typologies, classifications, schemas, frameworks, or even ontologies. A well-known example of an analysis theory is the DNA double helix, a model that

Table 4.1 Types of theories (Gregor, 2006)

Theory type	Description
Analysis	*Says what something is* The theory does not extend beyond analysis and description. No causal relationships among phenomena are specified, and no predictions are made.
Explanation	*Says how, why, when, and where something is* The theory provides explanations but does not predict with any precision.
Prediction	*Says what is and what will be* The theory provides predictions but does not have well-developed justificatory mechanisms or other causal explanations.
Explanation and prediction	*Says how, why, when, where, and what something will be* The theory provides predictions and has both testable propositions and causal explanations.
Design and action	*Says how to do something* The theory gives explicit prescriptions (e.g., methods, grammars, principles of form and function) for constructing an artefact

describes the structure of the genetic instructions used in the development and functioning of all known living organisms. The theory makes no statements about *why* living organisms function a particular way or *how* their development takes place. Other examples include the classifications of species and animals drawn up by Darwin after his voyage on The Beagle.

Explanation theories focus on how and why some phenomenon occurs. Such theories also function as models for understanding because they often present a view or conceptualisation of some real-world phenomena or domains. The emphasis lies on explaining some phenomenon but not necessarily predicting future phenomena or variations of phenomena. A prime example is given in Yin (2009): the Cuban Missile Crisis. Allison and Zelikow (1999) develop a new explanation, in the form of an organisational process and governmental politics model, for the confrontation between the Soviet Union and Cuba with the United States in October 1962. They also demonstrate that the then-prevalent explanatory model (mutually assured destruction as a barrier to nuclear war) was unfounded. As this example shows, explanation theories can be used to expound a particular event and the processes that unfolded at that event; but such theories do not necessarily predict a second event. For example, the explanation of the Cuban missile crisis cannot readily be used to explain other crises, such as the Israel-Palestine conflict.

Prediction theories describe what will be without focussing on why that might be the case. Such theories use a range of independent variables to predict an outcome without including the justificatory mechanisms that would explain the causal connections between dependent and independent variables, perhaps because the "internal workings" of the phenomena have not yet been found or because an understanding of the causality is irrelevant to the theory's purpose. As an example, consider Moore's Law, which predicts that the number of transistors that can be placed inexpensively on an integrated circuit doubles approximately every two years. This law also holds for most other electronic devices and attributes, such as processing speed, memory capacity, sensors, and even the number and size of pixels in digital cameras. The law has been deduced empirically by plotting the graph of the log of the number of components per integrated function against the years from 1959 to 1965 and even farther, but no causal model or nomological net is offered that explains why the number of transistors doubles rather than triples or quadruples.

At this place, I should point out that, personally, I disagree with Gregor's (2006) inclusion of prediction as a type of theory. I argued already above that I find predictions not to be theories. In my interpretation, predictions alone do not yield a sense of understanding or explanation. This is my own view of what a theory is (an explanation) and what it should do (help me understand). Others, including Gregor, view the matter differently. You might agree with me or with Gregor or with neither of us.

Explanation and prediction theories predict and explain the underlying causal conditions that lead to a predicted outcome. This type of theory focuses on understanding underlying causal mechanisms and predicting a phenomenon. Explanation and prediction theories are the most common type of theories in the information systems research field. The often-cited technology acceptance model is a good example of a model that attempts to predict whether individuals will accept new technologies and offers an explanatory account of why that should be the case. (Acceptance depends on positive beliefs about usefulness and ease of use.)

Explanation and/or prediction theories often take the form of variance or process theories (Burton-Jones et al., 2015; de Guinea & Webster, 2014). Process theories look at the unfolding of events and actions over time and explain the unfolding of such a process and/or a prediction about future events in or outcomes of that process. Variance theories look at the degree to which one variable can predict changes in another variable and why that would be the case. Good examples include the theory of evolution, which explains and predicts the process of change in all forms of life over generations. The causal mechanisms identified by the theory are mutations, genetic drift, and natural selection. An example of a variance theory in information systems is the theory of representation (Wand & Weber, 1990, 1995; Weber, 1997), which models the desirable properties of information systems at a deep level and predicts consequences when these properties are not present.

Finally, design and action theories are theories that specify how to do something. These theories give normative, prescriptive rules, such as principles of form and function, methods, and techniques, along with justificatory theoretical knowledge about how to construct an artefact (e.g., a type of information system). Good examples are widespread in many applied research disciplines. For instance, the design theory in architecture consists of all the knowledge that an architect uses in his or her work, from how to select the best site and the most suitable construction materials to advice on how to design practical buildings to designing for ease of maintenance and repair. In software engineering, Gamma et al. (1995) described a set of design patterns that specify recurring solutions to common problems in software design. In education, progressive learning theory builds on the view that humans are social animals who are highly interactive with other members of their species to the point of having a recognizable and distinct society. Based on this view, the theory asserts that humans should learn best in real-life activities with other people. From this assertion, the progressive learning theory offers prescriptive advice for the construction of teaching materials: teaching materials should provide not only reading and drill but also real-world experiences and activities that centre on the students' real lives. In information systems research, the focus on design-type research has led to the formulation of many instances of design theories. Examples that I know include theories for designing tailorable technologies (Germonprez et al., 2007), systems that support emergent knowledge processes (Markus et al., 2002), systems that support convergent and divergent thinking (Müller-Wienbergen et al., 2011), or social recommender systems (Arazy et al., 2010).

Having reviewed different types of theories, we should address their logical and temporal interrelationships. For example, analysis theories are useful for the development of all other theories because they offer systematic accounts of the constructs and attributes that are relevant to describing phenomena. Explanation or prediction theories can provide the basis for the development of a theory for explanation and prediction, and both analysis and explanation theories can inform a design theory. A design theory and theory for explanation and prediction can also be closely related as a design can be informed by an explanation of how a phenomenon works. In the same way, designed artefacts can be examined in terms of the changes in events, processes, and behaviours they induce.

To conclude, remember that a doctoral thesis may (but does not have to) include one or many types of theories. Doctoral research often focusses on developing a theory for explanation, along with an attempt to collect evidence systematically in support of that theory. Other theses might offer an analysis theory about a previously unknown phenomenon or as a first contribution in an emerging domain. Of course, contributions have and will be made in the form of design theories and artefacts as instantiations of that theory. It is also possible to do research that is entirely atheoretical. For example, research could be carried out that systematically collects and reports data on new phenomena without attempting to conceptualise the data in some theoretical format or to identify or develop any explanatory or predictive mechanisms. Such work is being done and has its merits, but you will find that the information systems field, like many other fields, has a strong institutional interest and emphasis on theory.

4.4 Theorising as a Process

We have discussed what a theory is, what some of its common structural components are, and how we can distinguish different types of theories. That should equip us with a good understanding of theory as the outcome (or artefact) of the research process. What we still need to discuss is the process that leads to the generation of theory, the theorising process.

Theorising refers to the application or development of theoretical arguments to make sense of some real-world phenomenon. One of the first characteristics of that

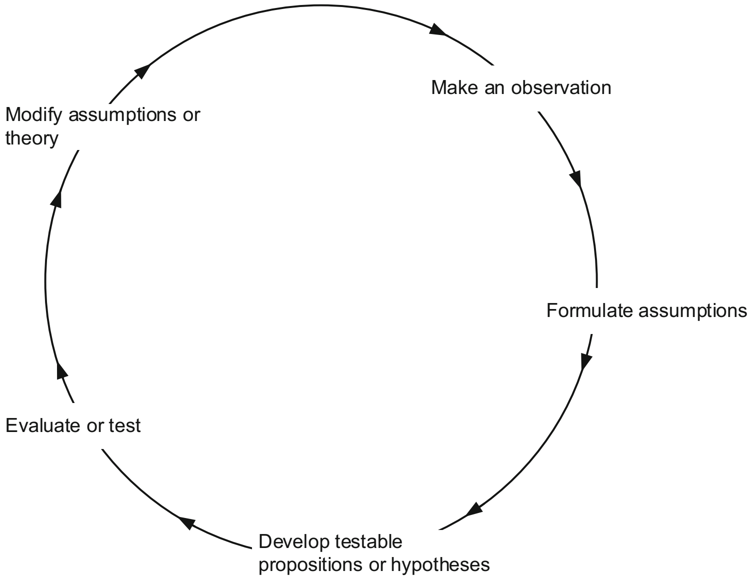

Fig. 4.2 The theorising process

process is that theorising is cyclic (Fig. 4.2), meaning that we typically carry out the steps in theorising over and over again; we usually develop, test, refine, or discard theoretical ideas iteratively. Cyclic also means that we can enter the cycle at any stage and we can stop at any point or we can repeat the cycle of formulation, testing, and modification forever.

As shown in Fig. 4.2, theorising usually involves making observations and formulating assumptions at some point. It does not specify what form or structure the observations or the assimilated knowledge should have as they may or may not be derived through scientific inquiry. In fact, they may depend on rigorous data analysis, happenstance, creative thinking, inspiration, or simply good luck.

Theorising can involve induction, deduction, or abduction. Using inductive reasoning means that in theorising, we would move from a set of facts to a general conclusion. For example, we may gather some observations and inductively develop assumptions or propositions from this data, an entirely plausible and accepted way of theorising. Although induction is impossible to prove, it is an accepted pathway towards theory construction because (interim or final) arguments are informed by data from which they were induced.

We might also proceed deductively in our theorising, deriving arguments as logical consequences from a set of more general premises. For example, we could start with a theory from the literature and deduce a new proposition about a phenomenon or context from the assumptions of a broader theory that is already available. That, too, is an entirely plausible and accepted way of theorising, and it is also a strategy that is often followed in information systems research (Grover & Lyytinen, 2015).

Theorising may also be done through abductive reasoning, a logical inference that leads to an explanatory hypothesis or proposition through "informed guessing." Abductive reasoning occurs when an inquirer considers a set of seemingly unrelated facts and thinks that they are somehow connected. Consider the example of the observation "the lawn is wet." There might be an unlimited set of potential reasons for the lawn's being wet, although it would be unsurprising that the lawn is wet if it had rained the night before. Therefore, by abductive reasoning, the most reasonable theory for why the lawn is wet is that it rained the previous night.

Abductive reasoning reduces the search space for reasons through informed guessing, such that the "leap of abduction" is characterised by simplification and economy. Despite the danger that abductive reasoning offers no means to prove that a proposed reason is indeed a causal factor, it is a useful tool for reducing the solution space to the most likely or economical reason for an observed phenomenon.

Whatever the intellectual reasoning employed, theorising typically proceeds by arriving at a plausible set of propositions or hypotheses between concepts or constructs that are situated in a nomological net and tightly coupled through justificatory mechanisms.

Research often proceeds at this stage through some sort of an evaluation or test of the theory against data, often called the validation stage of the research process. In information systems research, this stage typically, but not necessarily, means subjecting the theoretical propositions to empirical examination, where data are systematically collected and analysed to contrast the observations (the data) against the theory in development. Research methods are the tools scientists use for that purpose. However, you will also find many theories that are proposed but not (yet) evaluated. In management science, for example, an entire journal, *The Academy of Management Review*, is a forum for proposing new theoretical ideas without the need to evaluate or falsify them.

In the cyclic model of theorising, shown in Fig. 4.2, the process of theorising continues with modifying the theory in development based on the outcomes of testing and evaluation. Modification could mean anything, from discarding constructs or relationships to updating the justificatory mechanisms to expanding the set of boundary conditions to refuting the entire theory. It is not the typical outcome of theory testing to support a theory in its entirety, at least not in the first iteration of the cycle. It is much more likely that theoretical ideas will be initially entirely refuted until, over time and over many iterations of the cycle, the ideas, logic, and expectations behind them match reality more and more closely and their evaluation against data shows more and more support until, at some stage, we believe we can step out of the cycle.

An Example

Consider an example of theorising that explains this cyclic, iterative process and introduces a number of attributes that allow us to gauge the quality of our theorising, such as its generality, circularity, fertility, and falsifiability. My example is based on Borgatti's (1996) adaptation of Lave and March's (1993) textbook on theories in the social sciences. Think through each step of the following illustration before proceeding with the suggested theorising outcomes.

We start with an observation. For example, imagine you are in college and attending a class, and the guy next to you, a member of the football team, says an unbelievably dumb thing. You ask yourself, "Why?"

Theorising about reasons might lead to a leap of abduction. For example, one of the first ideas for an explanation that I would come up with is as follows:

- Football players are dumb.

This statement can be considered a theory, an assertion of belief. It is not a good one, but it is a start. What would make it better?

One problem with this initial draft of a theory is that it is not **general** but narrow. It refers only to football players. Theories that are too narrow are not particularly useful, even if they are correct. (What good does it do anyone to theorise that you choose the blue nail polish because the bottle was closest to your hand?) Instead, generalisation (towards universality) is a key attribute of a good theory.

This is not to say that all theorising must strive for wide generalisation or even universality. The generality of a theory is usually classified as one of three types depending on its breadth of focus: *Substantive theory* is developed for a specific area of inquiry, while *abstract* (also called *general or meta*) *theory* is developed for a broad conceptual area. Between these extremes, *mid-range theory* is moderately abstract and has a limited scope. Many theories in information systems, like the technology acceptance model, are mid-range theories. Examples of general or meta theories include complex systems theory, system dynamics theories, and others. The statement "football players are dumb" is an example of a substantive theory.

Let us explore how a more general theory would look. To develop a mid-range theory, we might state the following:

- Athletes are dumb.

The range of this statement is broader than the previous one as it refers to all sorts of athletes, not just football players, but it is still limited in scope since it is restricted to athletes only, not every human being. Thus, it is a mid-range theory.

You probably still do not like this theory much, and rightfully so. Our proposition has no sense of *process* and no sense of *explanation*. It says athletes are things that have the property of being dumb, and that is why they say dumb things. It does not account for why they say dumb things.

Another problem with our statement is that it contains **circularity**. What do we mean when we say that a person is dumb? It means that he or she consistently behaves stupidly. The problem with being dumb as a property is that it cannot be observed or measured directly. It is a latent construct, intangible in nature, like so many other constructs in the social sciences. The only way we can know whether people are dumb is by examining what they say and do. Since what we are trying to explain is the dumb thing someone said, in effect our statement is that athletes say dumb things because they say dumb things. Circularity is a problem because it prevents theories from being *falsifiable*.

We can avoid circularity and the problem of falsifiability by building into our theory so-called **explanatory and justificatory mechanisms** as an account of the processes that explain how things unfold to cause a particular phenomenon to occur or to behave in a particular way. Every good theory provides such a sense of explanation and contains mechanisms that describe the process by which A makes B happen, like the way a car's gears transfer the rotation in the engine to the rotation of the tires. In this sense, theorising involves imagining an observation as the outcome of a (hidden) process that has produced the outcome. This process is called a **mechanism**.

What is an explanatory mechanism that we can build into our athlete theory? Try to develop your own suggestion before reading my suggestion:

- To be a good athlete requires practice time, while being smart in class requires study time. Available time is limited, so practicing a sport means less time for studying, which means being less smart in class.

The focus of this version of our theory now is a **mechanism**, not an enduring **property** of a class of people (in our case, athletes). You can also probably see how much more thinking had to go into identifying this mechanism that we ascribe to the behaviour we witnessed. Identifying the explanatory mechanism of a theory is probably the hardest part of theory building.

Although we moved away from examining how one property begets another property, using mechanisms in a theory means that we can apply the same reasoning to other people and other situations. I can expand the range of our mid-range theory to be broader (and hence more generalizable and more useful) because I now have fewer boundary conditions:

- There is limited time in a day, so when a person engages in a time-consuming activity, such as athletics, it takes away from other time-consuming activities, such as studying.

An implication of this version of the theory is that it can be generalised more easily (because we refer to a time-consuming activity rather than just athletics), which means we can apply the logic to more situations. This scenario is a good one for empirical researchers because more ability to generalise suggests that there are more settings from which we can collect data to test our theory. For example, we can observe whether good musicians, who also practice many hours a day, also say dumb things in class, and if such is not the case, our theory is wrong. Otherwise, we may extend our observations to include other classes of people who engage in time-consuming activities and use that data to continue testing the theory. A good theory is general enough to generate implications for other groups of people and other contexts, all of which serve as potential testing grounds for the theory. If such is the case, we call the theory **fertile** as it creates many opportunities to expose our theory to data that can be used to falsify our theory.

We have now conceived a potential explanation for the phenomenon we are studying by imagining the observation as the outcome of a (hidden) processual mechanisms. We stated our theory in a way that is reasonably general, has a sense of process, is falsifiable, and is fertile. It carries implications for a range of scenarios that we could formalise as hypotheses and test against data. Therefore, we have many of the building blocks of theorising covered. Of course, our limited time theory is but one possible explanation for the observation we started with. Good theorising involves moving forward and not only supporting our theory through data but also **ruling out alternative theories**. For example, through the same theorising process, we could have ended up with other theories:

- The "excellence theory": everyone has a need to excel in one area. Achieving excellence in any one area is enough to satisfy this need. Football players satisfy their need for accomplishment through football, so they are not motivated to be smart in class.
- The "jealousy theory": we are jealous of others' success. When we are jealous, we subconsciously lower our evaluation of that person's performance in other areas, so we *think* football players ask dumb questions.

These alternative theories also provide an explanation for our initial observation. Much like the limited time theory, they are also general and fertile because they generate implications for other groups of people, such as musicians and beauty queens.

A theory that is general, fertile, and non-circular has a decisive advantage for making our theorising even stronger by ruling out alternative theories through testing or evaluation. Simply put, if we have competing general and fertile theoretical arguments, we can throw them into a real-world scenario where they each yield different predictions about what will happen. Then we can observe reality to see which prediction was correct and which alternative theoretical predictions can be ruled out.

If a theory is specific enough, a situation can be plugged into the theory to determine the outcome. The idea is to collect a set of situations that, when applied to different theories, would result in different predictions.

Consider, for example, how football players should behave (or appear to behave) in class when it is not the football season. Will they still be asking dumb questions? According to the limited time theory, football players should not ask dumb questions out of season because there is plenty of time to study. However, according to the excellence theory, members of the football team should continue to ask dumb questions out of season because they are still football players and are still getting recognition, so they still don't feel the need to excel academically. The jealousy theory would also yield the expectation of continued dumb questions because we are still jealous, and jealousy may not be dependent on the football season.

Table 4.2 Expectations generated by each theory

Question	Limited time theory	Excellence theory	Jealousy theory
Do football players ask dumb questions out of season?	No	Yes	Yes
Do athletes who do not look like athletes ask dumb questions?	Yes	Yes	No

Studying football players' behaviour out of season could thus help to distinguish between the limited time theory and the other two, no matter how the data turn out. If football players appear to be smart out of season, then the excellence and jealousy theories are likely wrong, and we can rule them out. If football players appear to be dumb out of season, then our original limited time theory might be wrong. In that case, however, we still do not know whether excellence or jealousy is the better explanatory account for our observation.

What we can do is to conceive another scenario by which we can distinguish all our competing theoretical accounts. For example, consider athletes who do not look like athletes because they are not unusually large (like football players), tall (like basketballers), or heavy (like sumo wrestlers). Would those athletes appear to ask dumb questions? The limited time theory will again say "yes" because practice time required for these sports is unaffected by physical appearance. The excellence theory will also say "yes" because, even if people can't recognise them on the street, they are still fulfilling their need to do one thing really well, so they will still not feel the need to excel in class. However, the jealousy theory would say "no" (for most people anyway) because if the athlete is not recognizable as such (by virtue of being large, tall, or heavy), we would not realise that we are in the presence of an athlete.

What we have done here is to conjure situations for which we have different expectations as to the propositions of our theory, and these situations were sufficient to reach a verdict about the theories (Table 4.2).

You should see now how this set of expectations would allow us to collect data that, on analysis, should allow us to rule out two theories in favour of one remaining theory. In other words, we have created testable hypotheses that allow us to determine the validity of our theories.

Of course, this example is simplistic, but it still demonstrates important principles of theorising. You should have also noted that in each theorising instance, we made a set of **assumptions** on which our theory is based, such as that there is a time (out of season) when football players are not consumed by the sport, which might not always be true. The jealousy theory also builds on an assumption that we ascribe negative characteristics to people who look like they have high social status. Assumptions are always critical components of any theorising.

4.5 Guidelines and Techniques for Theorising

We end this chapter by reviewing some general guidelines about the act of theorising. One guideline is not to underestimate the significance of theorising in scholarly work. Many of the editors of prominent journals stress that reviewers of scholarly work expect your method to be sound and rigorous and your research plan and execution to be effective and appropriate. As a result, a paper will not be accepted simply because you executed the survey or case study method well. Carrying out procedures well is a necessary but not sufficient criterion for successful research. Papers are inspected primarily for novelty and theoretical contribution. As Straub (2009), former editor-in-chief of *MIS Quarterly*, explained:

> *Theory is King and it is in the evaluation of the theoretical contribution that most reviewers become convinced, or not.*

You might already glean from this statement that theory is viewed in a particular way in the information systems field. Rivard (2021) called it a romantic view:

> *The romantic view of a theory portrays it as a complete, detailed, flawless, deep, and exhaustive explanation of a phenomenon, an object that* Weick (1995) *refers to as "Theory That Sweeps Away All Others"* (p. 386).

You might recognise here that this romantic view is not particularly helpful for engaging in theory development. It is full of intimidating expectations about the explanatory or predictive power of a theoretical account, and one would have to be all but omniscient to meet these expectations. As a result, I do not think this view is actionable in any sense: it does not tell me what I should be doing when developing a theory; it just formulates outrageous expectations about the outcome.

To help demystify this romantic view of theory, several scholars have worked to formulate procedures and templates to assist with theorising. Rivard (2021) suggested a spiral model that involves the activities read-reflect-write in iterations that move from erudition to motivation, definition, imagination, explanation, and presentation. Hassan et al. (2019) suggested a procedure for theorising that involves moving between generative practices, like analogising or metaphorising, and foundational practices, like problematising or discourse forming, to construct theorising components like frameworks, concepts, and boundaries.

Such procedural models add clarity and systemacity to the opaque and messy activity of theory development. However, I do not believe there is such a thing as one procedure for theorising that we can all follow nor that following one such procedure will guarantee good theory as an outcome. To me, theorising is not a mechanical process in the sense that following certain guidelines or steps closely will guarantee that you develop a theory. Instead, theorising involves having a good idea as an outcome of systematic or structured ideation or design processes, but they can also occur spontaneously. Weick (1989) called theorising an act of disciplined imagination—generating ideas, followed by systematic processes for selection and evolution—which is an example of adding some systemacity to "having a good idea."

Let me reiterate that I still see value in models like those of Rivard (2021) and Hassan et al. (2019). They draw attention to several elements that can be helpful with theorising and provide suggestions for practices like metaphorising and mythologising, which we can use to generate ideas. They also emphasise that a good idea is still not enough as there is considerable craftsmanship and hard work involved in developing a theory: it must be defined well, it must be explained well, and it must be presented well. Aspects of high-quality theory, like generalizability, fertility, and circularity, are not obvious or automatic; they must be carefully explicated.

Aside from such procedural suggestions, I have found a number of techniques and tools helpful during theory development as ways for constructing mental schemas and cognitive aids. Three the tools I find particularly helpful are counterfactual thinking, thought experiments, and constructing mystery.

1. *Counterfactual thinking* (Cornelissen & Durand, 2014; Roese, 2000) refers to imagining "what might have been" in a given situation by reflecting on the outcomes and events that might have occurred if the people in the situation had acted differently than they did or if circumstances had been different. We can use counterfactual thinking to generate hypotheses and competing predictions as mental representations of alternatives to an experienced or observed past.
2. *Thought experiments* (Folger & Turillo, 1999) are mental exercises in which we zero in on problematic assumptions and construct imaginary worlds to draw out the implications of new assumptions. We give one such example in von Briel et al. (2018), where we theorise about how one emergent venture could have carried out its product development process in different ways.
3. *Constructing mystery* (Alvesson & Kärreman, 2007) relies on the idea of discovering or else creating a mystery by (re-)framing empirical materials in different ways such that a mystery manifests, and then subsequently constructing a theory by solving the mystery. This approach rests on the assumption that facts and evidence are themselves constructed so they can be reconstructed: empirical material is not discovered but interpreted, so it is possible to identify or formulate a mystery that requires solving. In their paper, they use the example case of an advertising agency where a mystery involved how male and female work colleagues carried out their work.

In concluding this chapter, I want to share four tips I have received over the years from other colleagues and senior scholars.

First, theories should be well argued. Theorising relies heavily on building trust in your account of a phenomenon. That we go out and test our theory against empirical data does not change the fact that the theory itself should be built on solid arguments and logical conclusions. Therefore, theorising should be inspired by data or theoretical/logical arguments.

Second, theorising should be insightful. By engaging in theorising, we should come to develop a new perspective on a new or existing phenomenon. Theorising becomes striking when we know instantly that we have not read something like this before, at least not from this perspective. It should give us a new idea about how to look at the world or how to solve a problem.

Third, theorising should challenge existing beliefs and offer a set of new beliefs. Our theoretical account should be characterised by novelty—a new lens through which to see the world differently. The case of the Cuban Missile Crisis shows how the organisational process and governmental politics model of the theory challenged the widely held belief that a nuclear war would not occur because the threat of mutual destruction acted as a barrier.

Fourth, theorising should have (surprising) implications that make sense and are intuitively logical. A good theory is often characterised by a sense of "obviousness"—the feeling that the consequences of the tenets of the theory are what is truly happening in the world, which is what a theory aspires to do!

In aspiring to meet these four key attributes of good theorising, these several suggestions might be useful:

1. *Do not hide unique findings; focus on them.* When you set out to collect and examine data and you find something that is inconsistent with prior research, chances are that this finding can lead to a new account of that phenomenon—and to a new theory in turn. We often seek to ensure that our findings are in line with current theories, so propositions and hypotheses that are not supported by data are a bad thing. However, the opposite might be the case: if your data shows findings that you cannot explain through the existing body of knowledge, then surely there is something to theorise about.
2. *Use easy yet convincing examples* in your theorising. Theorising is like storytelling (Dyer & Wilkins, 1991; Eisenhardt, 1991), so theory development can be argued using simple examples that can be described in a narrative. The idea here is to use examples that any reader can follow. The case of the dumb football player is an example.
3. *Be familiar with reference theories.* Reference theories are theoretical accounts from research disciplines related to the domain of inquiry. For example, if you study the organisational adoption of social media technology, a reference discipline could be organisational psychology, the study of work with and within global organisations. Reference theories are often formal theories that can provide a framework with which to identify the types of constructs that are probably relevant to the phenomenon you are studying. Being able to relate to such theories allows you to build your theory and also to contrast your account to others in an effort to rule out competing theories.
4. *Iterate between theory and data.* Build, read, apply, evaluate, reiterate, build, read, apply, evaluate.... This suggestion assumes that there is some sort of close connection between rationalisation and exploration (and perhaps even validation, as per Fig. 3.1), which might not always be the case or always be required, but let us assume it is true for a moment. Theorising is often a close cyclic and iterative interaction between an idea that is forming in your head and the data you are collecting about a phenomenon. A new development in the theory might cause you to re-analyse your data or collect more data, and you may revise or extend

parts of your theory based on your findings. In this process, reference to other theories is often woven in.

In closing, a few guiding questions may help you determine whether you are finished with theorising because you have developed a good theory:

- Is your account insightful, challenging, and perhaps surprising, and does it seem to make sense?
- Does it connect disconnected or disconnect connected phenomena in a new way?
- Is your account (your arguments) testable (falsifiable)?
- Do you have convincing evidence and arguments to support your account?
- Is your account as parsimonious as it can be?
- What can you say about the boundary conditions of the theory?
- How general is your theory?

4.6 Further Reading

Theorising is of interest to many scholars, so a large variety of literature about theory and theorising is available. It would be futile to try to list all of it, so I suggest a few historical and recent classics to get you started:

- Gregor's (2006) essay on the nature of theory in information systems research
- The debates on the role and position of theory in information systems research (Avison & Malaurent, 2014; Gregor, 2014; Silverman, 2014)
- A good historical debate about theory building outside of information systems (Dyer & Wilkins, 1991; Eisenhardt, 1989, 1991)
- Attempts to define theory and its constituting elements from Wacker (1998), Weber (2003a, 2003b, 2012), Bacharach (1989), Weick (1989, 1995, 1999), and Whetten (1989).

Textbooks about theorising are also available. A simple introduction is Reynolds' (1971) primer on theory construction. Other good reads are Dubin's (1978) *Theory Building* and the articles on some of the processes that have been developed based on Dubin's account (e.g., Holton & Lowe, 2007). Several papers have also provided accounts and guidelines on how to theorise (e.g., Borgatti, 1996; Byron & Thatcher, 2016; Compeau & Olivera, 2014; Cornelissen & Durand, 2014; Hassan et al., 2019).

There is also a growing literature on techniques and tools that facilitate creative thinking and theoretical development. I mentioned counterfactual thinking and thought experiments as examples. Others include thickening thin abstractions (Folger & Turillo, 1999), contrastive explanations (Tsang & Ellsaesser, 2011), problematising assumptions (Alvesson & Sandberg, 2011), concept bricolage (Boxenbaum & Rouleau, 2011), a combination of scientific logics (Kilduff et al., 2011), event narration (Pentland, 1999), storytelling (Shepherd & Russady, 2017), and the borrowing and blending of reference theory (Truex et al., 2006). All these techniques have one thing in common—they provide guidelines on how to identify or promote a new theory.

This chapter does not deal comprehensively or exhaustively with every type of theory that scholars distinguish. It introduces the general building blocks of theory, such as construct, associations, and boundary conditions, because concepts and relationships are needed regardless of the type of theory we are developing. However, this nomenclature is associated most often with the explanatory and predictive theory and with a particular theoretical perspective that is called the *variance theory* (e.g., Bacharach, 1989; Dubin, 1978). Variance theories focus on properties of conceptual entities that have varying values and try to identify the variables that explain that variance. Other common perspectives of theory include the *process perspective* (e.g., Langley, 1999; Pentland, 1999) and the *systems perspective* (e.g., Churchman, 1972; von Bertalanffy, 1968). A process perspective emphasises changes in concepts over time and the sequence of events that is involved in these changes (Pentland et al., 2017). A systems perspective emphasises collections of interacting elements that form a holistic whole. It focusses on wholes, parts, and emergent properties that arise from interactions among them (Demetis & Lee, 2016). There is not enough room in this book to pay due attention to these and other perspectives of theory (design theory perspectives, for example). A good overview of these perspectives is in Burton-Jones et al. (2015). Other good readings about this topic include de Guinea and Webster (2017) and Thompson (2011).

Finally, many experiential accounts of senior researchers exist in which they reflect on their attempts to develop a theory (e.g., Byron & Thatcher, 2016; Grover & Lyytinen, 2015; Henfridsson, 2014), and editors often give advice from years of dealing with article submissions that attempt at theory development (Lee, 2001; Rivard, 2014; Straub, 2009). A particularly good book is the edited volume *Great Minds in Management*, which collects accounts of ideas and theories by influential scholars (Smith & Hitt, 2007).

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