On the Realization of Strategic Success

A Paradigm Shift Needed: Enterprise Governance and Enterprise Engineering as essential concepts

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On strategic success: a paradigm shift needed
Motivation for a paradigm shift in thinking about enterprises

Frederick Taylor formulated his ‘Principles of Scientific Management’ more than a hundred years ago [1911]. During this period, (management) thinking about enterprises – our general term for companies, organizations or (governmental) institutions – did not change very much. However, change in thinking about enterprises is urgently needed. The enormous impact of enterprises on individuals and society at large will not go unnoticed. As a customer, employee, citizen, patient, student, or shareholder, the positive or negative influences of enterprises are experienced in personal and working life. Optimal performance of enterprises pertinent to the various stakeholders should thus be of central concern. Unfortunately, that performance is all too often questionable as can be noticed in various areas, ranging from inefficient use of resources to unmotivated employees and disgruntled customers. Paramount among these manifestations is the inability to successfully transform strategic intentions into reality. These problems linger on for quite some time. Remedies are thus not likely to be found in management hypes or other ineffective approaches that passed in revue. A paradigm shift in thinking about enterprises is thus needed. Two themes underpin this shift: Enterprise Governance and Enterprise Engineering. The essentials of both themes will be discussed after placing these themes in perspective in order to corroborate their importance.

1.1 About enterprise failures: the core issue

1.1.1 Strategic success

The track record regarding successfully implementing strategic initiatives is rather poor. Some publications speak about less than 10% success rate [Mintzberg 1994]. This rather low figure compares with other sources. According to Kaplan and Norton, many studies prove that between 70% and 90% of strategic initiatives fail, meaning that the expected result is not achieved [2004]. Failures can be noticed pertinent to a large array of topics: Activity-Based Costing, Balanced Score Card, Business Process Management, Business Process Reengineering, Customer Relationship Management, E-business, End-to-End (Supply) Chain Management, Enterprise Resource Planning, Lean Production, Learning Organization, Mergers and Acquisitions, Quality Function Deployment, Six Sigma, Total Quality Management, and so on. Since the introduction of information technology plays an important, if not crucial, role in many strategic initiatives their failures are thus often associated with failing introductions of IT. Numerous publications attest to that [Scott Morton 1991, Galliers and Baets 1998, Rechtin 2000]. The topic of ‘business and IT alignment’ is a case in point. The idea that a formal theory and methodology underpins the endeavor towards business and IT alignment seems – given the high failure rate – untenable [Ciborra 2002]. Rather remarkably, research over a lengthy period of time did not prove any positive relationship between IT investments and measurable improvements in enterprise performance [Strassmann 1990, Pisello and Strassmann 2003]. Others have similarly identified this IT ‘productivity paradox’ [Haes and Grembergen 2009]. All too often, failure is conveniently attributed to unforeseen or uncontrollable external events. However, failure is seldom the result of external events that cannot be properly addressed, nor the inevitable consequence of an inherently poor strategy, but first and foremost the avoidable consequence of poor strategy operationalization. Since, as indicated, failures are manifest pertinent to a large array of topics, fundamental underlying causes are likely to play a role. In our view, these causes are: (1) lack of enterprise unity and integration, and (2) inadequate and dysfunctional perspective on governance and subsequent arrangement. The second cause significantly contributes to the first cause [Hoogervorst 2009].
With respect to the first fundamental cause, indeed, a plethora of literature indicates that the key reason for strategic failures is the lack of coherence and consistency, collectively also called congruence, among the various components of an enterprise, which precludes the enterprise to operate as an integrated whole [Beer et al. 1990, Kaufman 1992, Kotter 1995, Galliers and Baets 1998, Hoogervorst 1998, Pettigrew 1998, Leinwand and Mainardi 2010]. Similar observations have been documented pertinent to IT introductions. Excellent performing enterprises use information technology such that unity and integration is established between the possibilities of IT and the enterprise context where these possibilities should be productive. This assertion is confirmed by MIT research regarding the effect of IT on enterprise performance. Only enterprises that in conjunction with the introduction of IT also changed the arrangement of the enterprise – hence established unified and integrated enterprise design – realized significant productivity improvements [Brynjolfsson and Hitt 1996]. Enterprise performance “is optimized when both the technology and the organization mutually adjust to one another until a satisfactory fit is obtained” [Laudon and Laudon 1998, p.15]. Said adjustment is crucial since “information systems and organizations have a mutual influence on each other” [o.c., p.75].

Enterprise performance thus has not primarily to do with the use of modern technology, but with unified and integrated enterprise arrangements, of which technology is an integral part. Rightly so, “the introduction of a new information system involves much more than new hardware and software. It also includes changes in jobs, skills, management and organization” [Laudon and Laudon 1998, p.385]. Many investigated cases showed that the new organizational arrangements that IT offered were the drivers for significant performance improvements, not IT as such [Strassmann 1990]. So, better enterprise performance “would tend to come not from the technology itself but from organizational, people, and process changes made in the wake of installing technology” [Brynjolfsson, In: Carr 2004, p.156]. This calls for integrated enterprise design, whereby the context in which technology must operate is brought into the overall design perspective. We will further elaborate on this insight when discussing the ‘business and IT alignment’ theme.

Creating a unified and integrated enterprise is by no means simple. An enterprise is an intentionally created entity of human endeavor [Robbins 1990, Daft 2001]. Enterprises are organized complexities [Weaver 1967, Weinberg 2001]: highly complex, as well as highly organized.

<table>
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<tr>
<th>Level</th>
<th>Complexity</th>
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<tbody>
<tr>
<td>1</td>
<td>Static structures</td>
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<td>2</td>
<td>Machines, clockworks</td>
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<tr>
<td>3</td>
<td>Machines with feedback control mechanisms</td>
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<td>4</td>
<td>Self-maintaining (open) systems (e.g. a biological cell)</td>
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<td>5</td>
<td>Simple organisms (e.g. a plant)</td>
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<td>6</td>
<td>Animals</td>
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<td>7</td>
<td>Human beings</td>
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<td>8</td>
<td>Socio-cultural systems</td>
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<td>9</td>
<td>Transcendental systems</td>
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Table 1.1. Boulding’s hierarchy of complexities.

On Boulding’s nine-level hierarchy of complexities (table 1.1), enterprise rank among the highest complexities: level eight [1956]. The ninth level he called ‘transcendental systems’: the inescapable unknowables of human and cosmological existence that are beyond scientific capturing. Hence, from
a practical perspective, enterprises (in general socio-cultural systems) are the highest complexities. Within these complexities, aspects like roles, communication, norms and values, and the interpretation and development of social reality, play an important role. Despite the enormous difference between the complexity of enterprises and level-three complexities, much thinking about enterprises remains on this lower level. So, we are supposed to believe that “like controlling a room temperature, if actual profitability (as measured through the accounting systems) differs from the desired profitability, an error signal triggers the ‘management controller’ which is subsequently fed into the organization to bring the error signal to zero” [Jenkins 2003, p.215]. Although higher level complexities exhibit characteristics of lower level complexities, such as structure and feedback, the higher level complexities cannot be addressed solely with the concepts of lower level complexities. Hence, for enterprises we must seek for a theory, concepts and methodology that can be employed at level eight. We will elaborate on this issue in Chapter 3. Another categorization of complexities is given by Weinberg [2001]. Next to the category of organized complexity category already mentioned, Weinberg speaks about ‘organized simplicity’ and ‘unorganized complexity’. Unlike the problems of organized simplicity that can be dealt with analytically (like technical artifacts), or problems of ‘unorganized complexity’ that can be addressed statistically (like traffic issues), the large problem area of ‘organized complexity’ is in need of a formal approach. The apparent lack of a theory for addressing the problem of organized complexity was mentioned decades ago as a core problem confronting modern science [Weaver 1967, Bertalanffy 1969].

The seriousness of the inability to realize enterprise unity and integration will become increasingly detrimental. New developments under labels such as network economy, e-business, supply chain management, extended enterprise etc., require significant processual integration of various business, organizational, informational and technology aspects. Such integration again points to unified and integrated design, since technology will not realize integration in and of itself. As indicated in the above, a unified and integrated design is conditional for enterprise success. In fact, it is of primary concern. A study about implementing strategic choices reported that the ability to actually implement strategic choices coherently and consistently, turned out to be more important than the quality of the strategic choices itself [Kaplan and Norton 2001]. A fairly recent McKinsey publication confirmed this observation: rather than the traditional management focus on structural changes for strategic success “they would be better of focusing on organizational design” [Bryan and Joyce 2007, p.22]. The report emphasizes that “most corporate leaders overlook a golden opportunity to create durable competitive advantage and generate high returns for less money and less risks: making organizational design the heart of strategy” [o.c., p.21].

1.1.2 Common and special causes for enterprise failures

The conclusions drawn in the previous paragraph can be underlined by considering the following. Edward Deming, one of the founding fathers of quality thinking dedicated his landmark book Out of the Crisis to investigating root causes of poor enterprise performance [1986]. He questions the often practiced exclusive focus on output performance indicators. On the contrary, it seems intuitively clear that enterprise performance necessitates a focus on the inherent enterprise capabilities, rather than merely the enterprise output. Focus on the latter amounts to saying that paying attention to a car’s speedometer is sufficient for securing the ability to deliver speed, instead of paying attention to the car’s inherent capabilities (its construction) that deliver speed. The definition of relevant performance indicators about, for example, process quality (linked to process capabilities) is evidently important. But results and the capabilities to produce them are two fundamentally
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1.2 Enterprise unity and integration

As indicated previously, enterprise unity and integration is a crucial condition for enterprise success. That is not to say that by satisfying that condition enterprise success is secured. Indeed, a chosen strategy might turn out to be flawed. However, violating the crucial condition will imply full or partial failure in realizing strategic intentions. Recall that enterprises are complex entities with many different aspects like employee behavior, management behavior, culture, communication, accounting, security, safety, employee assessment and rewards, motivation, and so on. Various performance criteria play thus a role, such as customer satisfaction, employee satisfaction, quality, efficiency, and productivity. Hence, a multitude of different topics and perspectives must be effectively addressed and integrated for obtaining enterprise unity and integration. That is no easy task. For successfully performing this task, our core concepts of enterprise governance and enterprise engineering are essential. We will introduce these concepts with the aid of figure 1.1 below. Central in figure 1.1 the notion of enterprise unity and integration is depicted. This notion is about coherent and consistent (conceptual) relationships between all enterprise aspects (unity) that collectively express, define, and realize intended enterprise behavior and performance (integration). In the section about enterprise engineering we will return more formally to the various enterprise aspects and address how they can be methodically brought into a unified and integrated perspective, such the a unified an integrated enterprise design is realized.

Understandably, the first area where unity and integration is required is that of strategic intentions and areas of concern. Indeed, it seems highly unlikely that incoherent and inconsistent strategic intentions and concerns would be conducive to enterprise success and performance. Next, the actual enterprise arrangement and operation should operationalize the strategic intentions and areas of concern in a unified and integrated manner, while conversely, strategic intentions and concerns must be manifest in the enterprise arrangement and operation. Unfortunately, that is all too often not the different aspects and should not be confused. Hence, as Deming emphasizes, “focus on outcome is not an effective way to improve a process or activity” [1986, p.76]. Numerous publications and empirical data have corroborated this fact [Oakland and Porter 1994, Zairi 1994, Eckes 2001, Seddon 2005]. This perspective concurs with Deming’s investigation about causes of poor enterprise performance, categorized in two types of causes. First, common causes whereby poor performance is the inherent result of the enterprise ‘system’. Hence, is the inevitable result of the way the enterprise is arranged and operates. Second, special causes, whereby poor performance is attributable to inadequate employee conduct. Deming’s analysis showed the striking result that 94% of poor performance is attributable to common causes, whereas only 6% of poor performance is attributable to special causes [1986, p.315]. Put differently, virtually all causes of poor performance have to do with enterprise design.

In view of the output focus mentioned earlier, attention to employee performance targets is nonetheless the preferred way to ‘secure’ enterprise performance. Underlying the attention for individual performance targets is the uncritically adopted assumption that employees are the primary causes of good and poor performance, not the enterprise ‘system’ in which they work [Seddon 2005]. Hence, people are virtually always held responsible for inadequate enterprise performance. As Sterman observes: “The tendency to blame the person rather than the system is so strong, psychologists call it the fundamental attribution error” [2000, p.28]. As a consequence, the far more relevant category of common causes remains unattended. Put differently, the area that matters most, that of enterprise design, is virtually outside the management scope.
case: what is being desired is not realized. For example, the actually experienced enterprise might not reflect the espoused strategic intention about, and concern for, customer satisfaction.

In view of the high rate of strategic failures mentioned before, the question of how strategic intentions and concerns can be successfully addressed requires an well-grounded answer. It seems unlikely that without an adequate theory, concepts and methodology strategic intentions and concerns can be adequately addressed. This evident truth is acknowledged in many areas. Indeed, one would probably not board an aircraft manufactured by a company with a concern for safety, but without an adequate theory and methodology to address that concern. Hence, as figure 1.1 depicts, the theory, concepts and methodology must be able to address the strategic intentions and areas of concern. Conversely, formulation of these intentions and concerns must be possible within the theory and concepts. So, we consider a theory, concepts and methodology as inadequate that, for example, cannot effectively address the concern for motivated employees or a customer oriented culture. Ultimately, the organizational arrangement and operation of the enterprise is determined by its design: the very way the enterprise ‘is put together’. Conversely, enterprise arrangement and operation are embodied in enterprise design. These observations must be emphasized: except for the special causes discussed in Paragraph 1.2, enterprise design is the only source for, or origin of, enterprise behavior. Poor performance is thus attributable to enterprise design (common causes). Enterprise engineering is the overall label for the theory, concepts and methodology for enterprise design. In view of the multifaceted aspects of enterprises, the theory and concepts of enterprise engineering are likewise multifaceted. Finally, all activities from the initial development of strategic initiatives and areas of concern, until their ultimate operationalization concerns enterprise governance. Both enterprise governance and enterprise engineering will be further elucidated in this white paper.

Figure 1.1. Unity and integration as the central concept.
1.3 Theoretical and methodological completeness

1.3.1 Is adequate enterprise design possible?: two fundamental questions

Level-eight complexities manifest a multitude of different cultural, economical, social, political, psychological, anthropological, and technological aspects. These aspects likewise hold for enterprises. In view of our previous discussion, the question might be raised whether the level-eight complexity of enterprises can be adequately brought into the enterprise design perspective, such that strategic intentions and concerns are successfully addressed and enterprise unity and integrated is ensured. Moreover, as we will further discuss in the section about enterprise governance, level-eight complexities also manifest a property called ‘emergence’: the occurrence of unforeseen and unpredictable developments. Emergence springs from complexity, dynamics and uncertainty associated with multiple (partly yet unknown) phenomena having multiple (partly yet unknown) relationships, which bring forward developments that cannot be presupposed, prestated, let alone predicted [Casti 1997, Kauffman 2008]. Human beings obviously play an essential role in emerging developments, since they are the essential actors within level-eight complexities. Further, through communicative relationships (emerging) phenomena are discussed and given meaning, while norms and values (culture) are developed and maintained. This concerns sense-making about reality through social interaction, whereby reality is both shaped and interpreted. There is mutuality and reciprocity: “people are both products of their contexts and participants in shaping those contexts” [Hosking and Morley 1991, p.7]. Put differently, reality is socially ‘constructed’ [Berger and Luckmann 1967]. Again, all these considerations likewise apply to enterprises. Core notions for level-eight complexities (hence enterprises) are renewal, adaptation and innovation. Adding to our previous question, a second one becomes important: can the notion of emergence be successfully brought into the enterprise design perspective such that enterprise renewal, adaptation and innovation is enabled?

1.3.2 Conditions for an adequate enterprise design approach

Our answer to the previously given two questions is based on the premise that it seems highly imprudent to leave the operationalization of strategic intentions, successfully addressing strategic concerns, as well as the realization of enterprise unity and integration merely to incidental developments. Enterprises are intentionally created entities with certain purposes. Intention and purpose assume affirmative action. That action is design. In the words of Herbert Simon, design must thus be broadly seen as “courses of action aimed at changing existing situations into preferred ones” [1969, p. 111]. Hence, the issue boils down to developing an enterprise design approach that can adequately address the two questions raised in the previous paragraph.

In addressing the latter issue, let us first dedicate a few words to (design) approaches that essentially cannot work adequately. One might observe that various approaches are not, or inadequately, concerned with design. Examples are theme’s like, value chain analysis, knowledge management, balanced score card, customer relationship management, bench marking, or process reengineering, to name but a few. Further, in view of the multifaceted enterprise aspects, a design approach must be able to address all aspects. As indicated in Paragraph 1.2, formulation of strategic intentions and concerns must be possible within the enterprise design theory and concepts. All too often, enterprise design is based on four traditional design domains: processes, information relevant for these process, the IT applications that supply the information, and finally the infrastructure supporting the applications. We fail to see how by paying attention to these four domains one could effectively
address the concern for motivated employees or a customer oriented culture. Although the mentioned design domains are evidently relevant, the approach is theoretically and methodologically incomplete. As a consequence of incompleteness, enterprise unity and integration cannot be realized. Indeed, unity and integration is not to be expected if relevant enterprise aspects are not brought within the design perspective. Many approaches concerning enterprise design can be noticed with a focus on models and representations, whereby adequate attention to all relevant enterprise aspects can be questioned [Dietz and Hoogervorst 2011].

As indicated in Paragraph 1.1, the issue of adequately addressing organized complexity was mentioned decades ago as a core problem confronting modern science [Weaver 1967, Bertalanffy 1969]. It is argued that the only meaningful way to address the problem is considering the organized complexity (enterprise) as a system [Bertalanffy 1969, Bunge 1979, Gharajedaghi 1999, Rechtin 2000, Jackson 2003]. Various system definitions exist. Jackson sees a system as “a complex whole the functioning of which depends on its parts and the interaction between these parts” [2003, p.3]. Maier and Rechtin define a system as “a set of different elements so connected or related as to perform a unique function not performable by the elements alone” [2002]. Von Bertalanffy speaks of “a set of elements standing in interrelation among themselves and with the environment” [1969, p.252]. Essentially, a system is a unified whole of elements that operates in an integrated manner pertinent to a certain goal. Unity and integration are core concepts within the system approach.

Conversely, the system approach is required for achieving unity and integration adequately. Herein lies the importance of viewing the enterprise as a system. System thinking is holistic rather than reductionistic [Jackson 2003].

The general study of systems is argued to be relevant for every system type: “Thus, there exist models, principles, and laws that apply to generalized systems or their subclasses irrespective of their particular kind, the nature of their component elements, and the relations or ‘forces’ between them. It seems legitimate to ask for a theory, not of systems of a more or less special kind, but of universal principles applying to systems in general” [Bertalanffy 1969, p.32]. This perspective is relevant for all system complexities of Boulding’s hierarchy (cf. table 1.1). Since higher-level complexities contain aspects of lower-level complexities, enterprises have characteristics that can be associated with both mechanisms and organisms [Hoogervorst 2009]. We will briefly discuss these characteristics in the section about enterprise governance. For now, it suffices to say that the system perspective allows to address both ‘mechanistic’ and ‘organismic’ enterprise viewpoints. Specifically the latter viewpoint enables to effectively address the interpretative aspect of social reality, and the notion of emergence, as discussed before. These two viewpoints will be further discussed in the chapter about enterprise governance.

When discussing the discipline of enterprise engineering, we aim show how the system perspective on enterprises is operationalized, and how the inevitable phenomenon of emergence – hence the enablement of enterprise renewal, adaptation and innovation – can be effectively addressed. As indicated earlier, enterprise design is multifaceted, whereby many different topics play a role, such as employee behavior and motivation, process design, information supply, accounting, reporting, communication, security, safety, etc. These topics have their roots in various (academic) disciplines. Despite their different nature, these topics must be treated in a coherent and consistent manner in order for the enterprise to operate as a unified and integrated whole. An adequate enterprise design approach must thus offer a multidisciplinary perspective, whereby all relevant topics can be coherently and consistently addressed. Enterprise engineering must thus be positioned as the unifying and integrating discipline. In doing so, the challenge for both enterprise engineering theory
and practice lies in acknowledging the individual theoretical, knowledge, and skill domains of the various disciplines, while at the same time providing a theory and methodology that enables effective communication with the respective disciplines, and utilize and integrate that part of their knowledge domain such that a unified and integrated approach for enterprise design is created. This approach, we feel, creates the conditions for affirmatively answering the two questions raised in Paragraph 1.3.1, as we will verify in Paragraph 3.1.9.

1.4 Design science and natural science

Under the label ‘natural science’ research is identified that seeks to obtain theoretical knowledge about, and law-like relationships between, natural phenomena. Unlike the ‘ideographic’ perspective on science whereby phenomena are described that are considered unique and not guided by underlying general principles, natural sciences are ‘nomothetic’; they are ‘law giving’ [Nagel 1961]. Thus, natural sciences are concerned with understanding and explaining why phenomena manifest themselves as they do: it is about how and why things are. Examples of natural sciences are physical, biological, social, and behavioral sciences. Specifically regarding enterprises, social and behavioral sciences seek to understand, explain and predict organizational and human phenomena [Hevner et al. 2004]. Next to natural science, another important scientific domain is identified as ‘design science’ [Simon 1969]. The latter type of science is concerned with devising artifacts or other intentionally created results. To further illustrate the distinction between natural and design science, one might say that natural science is about finding out what is true, hence describing how things are, whereas design science is about finding out what is effective [Hevner et al. 2004]. Put differently, design science is about prescribing how things have to be created [March and Smith 1995]. Well-known examples of design sciences are engineering sciences, such as electrical or aircraft engineering. Important aspects that are relevant for both types of sciences have been identified along the axes of the grid devised by March and Smith, shown in figure 1.2 [1995].

![Figure 1.2. Aspects of design and natural sciences.](image-url)
An effective design science has its fundaments in the natural sciences. So, proper aircraft design rests on theories and concepts from aerodynamics, metallurgy, chemistry, and so on. Likewise, the design of enterprises must be rooted in the natural sciences. In view of the multitude of aspects relevant for enterprises, the theoretical basis for enterprise design is inherently broad. Various natural sciences thus play a role. One might think of disciplines like Organizational Behavior (micro and macro level), Work and Organizational Psychology (behavior, learning, culture, motivation, leadership, etc.), Sociology (group processes, communication), Language/Action Theory, System Theory, and Computer Science. Topics of some of these disciplines are identified in figure 1.2. All these topics contribute to the theoretical and methodological completeness of the enterprise design approach. A few of them will be discussed in the chapter about enterprise engineering.

Arguably, a design science without a firm rooting in the natural sciences poses a threat. When using, for example, aircraft, trains, automobiles, bridges or buildings, one trusts that the design has been adequate. Also within the enterprise context the danger of not maintaining an adequate ‘theory base’ has been identified [Hevner et al. 2004]. In line with our observations in Paragraph 1.3.2, many approaches concerning enterprise design can be noticed with a focus on models and representations, whereby adequate attention to the theory base can be questioned [Dietz and Hoogervorst 2011]. Under the label Enterprise Engineering an approach will be discussed later in this white paper, that aims to avoid aforementioned danger.

### 1.5 Enterprise unity and integration: the theme of ‘business and IT alignment’

For decades, the ‘business and IT alignment’ theme has taken a prominent place in the literature about ensuring enterprise success with IT deployment. This theme is a specific example illustrating the importance of enterprise unity and integration. Within the business and alignment perspective, the term ‘business’ denotes that part of the enterprise using the IT services, while the term ‘alignment’ refers to a state of perfect fit between the possibilities of IT and the enterprise context where these possibilities are to be made productive. Despite decades of attention, alignment continues to be problematic [PWC 2006, Haes and Grembergen 2009]. Unfortunately, much of the literature about business and IT alignment advocates IT governance as the preferred means to establish alignment [IT Governance Institute 2003]. We submit that the focus on IT governance is not conducive to bringing about alignment. In fact, this focus might be the very reason why this theme is still discussed. We will argue this assertion using the following example.

Consider a ‘supplying’ system $S$ that delivers a certain functionality to a ‘using’ system $U$. For example, a generator ($S$) that delivers electrical energy to a car ($U$), as illustrated in figure 1.3.

![Figure 1.3. Focus for car and generator alignment.](image-url)
It is impossible to derive the functionality of the generator ($S$) from the functionality of the car ($U$). The knowledge that the car is used for driving does not give any clue as to the required functionality of the generator. Understandably, the only source for the generator function is the construction of the car. Generalized: the only source for the function of a supplying system $S$ is the construction of the using system $U$. Indeed, it is the car’s construction — its arrangement and operation — where the function of the generator is used. Hence, the functional design of the generator proceeds from the constructional perspective of the car. In other words, car/generator alignment is first and foremost an issue of the car’s construction: its design. There is no need for knowledge about the internal construction of the generator, the only relevant knowledge is about the generator’s mechanical and electrical interface. And that knowledge is determined by the construction of the car. Speaking of governance and design: it is primarily ‘car governance and design’ and not ‘generator governance and design’ that determines car/generator alignment. This evident insight is practiced by all design disciplines, except so it seems, in case of IT systems. Figure 1.4 shows the analogy whereby the car is replaced by an enterprise, and the generator by an IT system.

![Figure 1.4. Focus for Business and IT alignment.](image)

In this case, the IT system ($S$) delivers a certain functionality to the enterprise as the using system ($U$). Similarly as before, the function of the IT system can only be determined from the construction of the enterprise. Likewise, functional design of the IT system proceeds from the constructional perspective of the enterprise. There is no need for knowledge about how the IT system is developed. As for governance and design, business and IT alignment is thus first and foremost an aspect of enterprise governance and enterprise design. Nonetheless, experiences show that attention is virtually only paid to IT design and IT governance. Maybe from sheer necessity because of an apparent lack of attention for enterprise governance and enterprise design. However, this situation will prolong the problematic issue of business and IT alignment. Insight in the nature of this issue makes also clear that the often introduced function of information management will not solve the core problem of business and IT alignment, because of the continued lack of focus on the design of the enterprise. Ultimately, alignment concerns the central theme of enterprise unity and integration. Hence, concerns enterprise engineering whereby information supply and IT design are integral aspects. Note that the picture in figure 1.3 and 1.4 merely aim to illustrate the constructional perspective. For both the car and the enterprise constructional design diagrams are needed to clarify how the car as a system and the enterprise as a system are arranged and operate. Examples of constructional design diagrams will be given in the chapter about enterprise engineering.
1.6 Summary

Lack of enterprise unity and integration has been identified as the core reason for not successfully operationalizing strategic initiatives and areas of concern. Realization of this crucial condition does not develop spontaneously or incidentally (rather the opposite develops that way), but must be intentionally designed. Additionally, enterprise design is important since virtually all causes for poor enterprise performance are systemic (common causes): are caused by the way the enterprise is designed. Also the notion of business and IT alignment was shown to be primarily an enterprise design issue. Since enterprises are very complex systems with multiple facets, enterprise design must be comprehensive for properly addressing strategic initiatives and areas of concern. Enterprise design as a design science must therefore be firmly rooted in the theory base of the natural sciences. That is what the enterprise engineering theory, concepts, and methodology aims to provide. This approach to enterprise design must be embedded in proper enterprise governance. Both topics will be discussed in the next chapters.
2 Enterprise Governance: the Competence View

Due to failing enterprise strategic initiatives and questionable enterprise performance, the plea for governance is still strong, and is manifest under various labels: corporate governance, IT governance, and enterprise governance. Unfortunately, aforementioned plea is virtually always answered through governance arrangements that are largely ineffective, if not counterproductive. For establishing effective governance, a fundamentally different approach is argued in this white paper. This approach aims to address the complexity, dynamics, and uncertainty associated with enterprises, and to satisfy a fundamental law relevant for every governance system. Both intentions are associated with deep-seated convictions about the essence of enterprises and the way they should be arranged and operate. Moreover, an integrated and comprehensive view on enterprise governance is required for the ability to successfully define and address strategic enterprise initiatives on the one hand, and ensuring their embodiment in the enterprise arrangement and operation on the other hand.

2.1 Enterprise change: governance

The term ‘governance’ stems from the Latin word *gubernáre* (in turn borrowed from the Greek language), meaning to control or steer, in the original meaning, the steering of a ship. Governance can thus be associated with guiding and giving direction. It is important to distinguish governance from management. The latter term has its origin in the Latin word *manus* (hand). Both terms are relevant within the enterprise context. To differentiate management from governance we will view the notion of ‘management’ in an operational, executing sense, and use the term ‘governance’ in the context of enterprise change. Put another way, governance guides developments that lead to a new (or partly new) enterprise. Figure 2.1 schematically illustrates the distinction.

![Figure 2.1. Governance versus management.](image)

Left in figure 2.1 an administrative office is depicted, which is managed in an operational sense, focused on the continuation of the office in all its aspects. Hence, this concerns the office its ‘being’. The office on the right carries out the same basic tasks, but in a different manner using other technologies. Put differently, the new office has a different design. Again, in the new situation there is operational management focused on office continuation. Governance has to do with the transformation from the original office design to the new office design. In other words, governance has to do with ‘becoming’. Below we will further clarify how the notion of governance within an enterprise context must be operationalized. An important aspect of such operationalization concerns
enterprise engineering: the theory and methodology that creates the new office design. In this chapter we will focus on enterprise governance. Enterprise engineering – the design of the enterprise – will be discussed in the next chapter.

2.1.1 Governance themes

Probably IT governance is the most widely known governance theme. This theme emerged in the 1980s of the former century in response to the problematic, ineffective use of information technology (IT) in enterprises. Central to IT governance is the (still problematic) notion of business and IT alignment. In addition to our discussion in Paragraph 1.5 we note that the term ‘alignment’ refers to two aspects: the process towards achieving a correct relative position, as well as refers to the state of being in the correct relative position. Business and IT alignment thus concerns the process towards, and the state of, unity between business and IT (strategic) initiatives and their implementation. Realizing alignment between IT and ‘the business’, such that IT creates business value, is seen as the core objective of IT governance [IT Governance Institute 2003]. Understandably, the state of alignment does not develop spontaneously. For that, specific activities (the alignment process) are required. We will talk about these activities later. For years, the business and IT alignment theme has taken a prominent place in the literature. Meanwhile, and decades later, this situation seems not to have changed. A fairly recent worldwide survey among CIO’s indicates that business and IT alignment is still seen as the most important driver for IT governance. Moreover, the survey shows that success in that area remains poor [PWC 2006]. Hence, actual practiced IT governance seems largely ineffective. Core reasons for ineffectiveness are outlined below.

Next to IT governance, two other governance notions are mentioned in the literature: corporate governance and enterprise governance. Briefly stated, corporate governance regards directions for internal (managerial) control that aim to arrange financial transparency and prudent financial conduct in order to safeguard the interests of shareholders [Coley et al. 2005]. Hence, corporate governance has a strong financial/accounting focus, and received prominent attention due to serious cases of financial misconduct by enterprises. Compliance with rules and legislation that aim to ensure proper financial behavior is a central issue within corporate governance. Proponents of corporate governance have also advocated the enterprise governance notion. Reason for that lies in the insight that fraud and the publication of misleading (financial) information evidently do not benefit shareholders, but failing strategic developments and implementations likewise – and probably even more so – form considerable risks for shareholders. So the performance of the enterprise is therefore of concern and included in the governance perspective, under the label ‘business governance’ [IFAC 2004]. So, within this view we have: (1) corporate governance which concerns compliance with financial/accounting rules and legislation, and (2) business governance which concerns enterprise performance. The totality of both governance approaches is identified as enterprise governance. Since these governance notions originated from within the financial/accounting domain, shareholder interests are central. Not surprisingly therefore, enterprise performance is to be expressed by financial indicators. What effective and reliable financial indicators are, remains however an issue of considerable debate. Although shareholders have an interest in enterprises, they are just one of the many stakeholders. Hence, we feel that enterprise performance must be defined by indicators pertinent to the various stakeholders, specifically the customers to whom products and services are delivered. Ultimately, enterprise performance as expressed by indicators like the quality of products and services, customer satisfaction, employee satisfaction, productivity, throughput time, and so on, is determined by enterprise design, which ultimately also determines financial performance.
Focusing primarily on the latter performance is of not much help: one cannot make money by merely counting money (cf. Paragraph 1.1.2).

2.1.2 Mutual relationships between governance themes and the overarching enterprise governance perspective

![Three governance perspectives](image)

Figure 2.2. Three governance perspectives.

Figure 2.2 shows the three governance themes discussed. Contrary to the previously introduced accountancy perspective, enterprise governance is in our view the overarching type of governance that encompasses corporate and IT governance. Note that enterprise governance is essential for addressing the relationship between corporate governance and IT governance. Said relationship is intense since IT systems are for a considerable part, if not exclusively, involved with initiating, authorizing, handling, storing, and reporting of financial data. Put another way, adequately arranging corporate governance rests on adequately arranging IT systems, such that corporate governance requirements can be satisfied. Moreover, effective corporate governance also depends many other enterprise (design) aspects, such as the arrangement of processes or employee behavior. Also these aspects have relationships with information supply, hence, with the design of IT systems [Hoogervorst 2009]. Arguably, these aspects can not be properly addressed by treating corporate governance and IT governance as separate activities, as is often the case, but can only be properly addressed from the holistic, all-inclusive, enterprise governance perspective.

2.2 The mechanization of governance: planning and control

Review of the literature about governance reveals that all three governance approaches share the same underlying characteristics. These characteristics relate to the traditional arrangement of enterprises – the legacy of the industrial revolution – which manifests a strong focus on formalization. Within this view, enterprise performance as assumed to be higher the more employees – in an instrumental manner – behave according to predefined tasks, rules and procedures. Emphasis is given to internal (managerial) control, planning, budgets, performance contracts, targets, and the associated reporting. Mintzberg has labeled enterprises that operate according to aforementioned principles as ‘machine bureaucracies’ [1989]. One might speak of a mechanistic way of organizing. This way of organizing is still rather dominant. Doz and Thanheiser observe that “despite the ‘modernization’ of corporate structures and systems, the mindset of
managers appears to have remained remarkably similar to the Taylorist model developed at the beginning of the century [1993, p.296]. Principles that follow from “a machine-like concept of the organization still dominate managerial practice” [ibid]. Ten years later not much seems to have changed: “corporations continue to operate according to a logic invented at the time of their origin, a century ago” [Zuboff and Maxmin 2002, p.3]. Others have collected evidence that illustrate how mechanistic thinking has infiltrated and perverted public institutions like health care, education, and public administration [Brink et al. 2005, Peters and Pauw 2005].

Not surprisingly therefore, the perspectives on governance that are presented in the literature have a strong, if not exclusive, mechanistic character, and are therefore also strongly coupled with enterprise (top) management responsibilities and tasks. Recalling the problematic business and alignment issue mentioned earlier, for some the recipe is rather simple: “What does it take to control IT costs and produce higher IT impact? Simply, we need effective planning processes, appropriate resource decisions, and workable budgets” [Benson et al. 2004, p.5]. It is all about decision making and accountability structures. It is argued that IT’s failure to realize ‘business value’ lies in the fact that enterprises lack a formal structure for managing and monitoring IT decisions [Weil and Ross 2004]. Associated with that is the conviction that business and IT alignment necessitates viewing IT “through the lens of an investment portfolio” [Weil and Broadbent 1998, p. 25]. IT governance is primarily viewed as “the process by which decisions are made around IT investments” [Symons 2005].

Management is considered crucial for establishing the deterministic causal chain from strategy to the ultimate financial gain: “The key to cause and effect on the bottom line is management action” [Benson et al. 2004, p.35]. The top-down, decision-making management hierarchy is viewed as the key to enterprise performance: “Once the corporate planning system had been has been set up, immediate and lasting benefits will percolate downwards from it and exert a unifying influence on the efficiency of the whole organization” [Jenkins 2003, p.215]. Unlike the high percentage of strategic failures suggests, it is believed that implementing strategic choices is merely an administrative affair: “The implementation of strategy comprises sub-activities that are primarily administrative. If purpose is determined, then the resources of a company can be mobilized to accomplish it” [Andrews 1999, p.77]. In a similar vein, corporate governance is viewed as a system of internal management control [Solomon and Solomon 2004, Coley et al. 2005], while enterprise governance is seen as “the set of responsibilities and practices exercised by the board and executive management with the goal of providing strategic direction, ensuring that objectives are achieved, ascertaining that risks are managed appropriately and verifying that the organization’s resources are used responsibly” [IFAC 2004, p.10]. As to be expected, the realization of enterprise performance supposedly follows from planning, decision-making and risk management. Research conforms that the majority (> 80%) of enterprise change is initiated through planning and control, be it with little success [Boonstra 2004].

As illustrated, structural, planning, and (management) control oriented aspects are central to many governance approaches, that would supposedly bring about compliance, business and IT alignment and enterprise performance. Said approach neatly fits within viewing strategy development as strategic planning: a mechanistic causal chain, starting with determining strategic goals and ending with their implementation, all that associated with, and controlled by, measurable performance indicators. Surely, there are many instances where planning and control are essential and useful instruments. Successfully organizing a wedding, building a house, or assembling a car, evidently benefit from planning and control in the final stage of realization. Nor are we advocating inadequate attention to, and decision-making about, budgets, investments, and other financial aspects. These
aspects are rightly so relevant within the realm of governance [Haes and Grembergen 2009]. In view of our discussion in the previous chapter however, we submit that planning and control structures are not principal for successfully defining, developing, and realizing enterprise change initiatives, since these structures in and off themselves cannot ensure enterprise unity and integration. Moreover, as we will argue below, within the realm of governance the approach that has been discussed in this paragraph manifests serious limitations and drawbacks. Paradigm shifts are needed.

2.3 Paradigm shifts: new thinking about governance

Numerous reasons can be given to question the effectiveness of the structural, planning, and (management) control oriented, governance perspective. We will limit ourselves to discussing three reasons: (1) refuting or ignoring the complexity, dynamics and uncertainty that is associated with enterprises and enterprising, (2) disregard for strategic transition barriers that impede strategy implementation, and (3) no attention for the core reason for failing strategic initiatives.

2.3.1 Complexity, dynamics and uncertainty

The mechanistic approach is deterministic, with a unquestioned belief in the predictability of enterprise and environmental developments, and a disregard for the ever present internal and external complexity and dynamics, and the inherently associated uncertainty. There is a vast amount of literature showing that predictability and control vanish in complexity and dynamics [Gleick 1988, Wheatley 1994, Stacey 1992, 1996, Sterman 2000, Kauffman 2008]. All too often, unforeseen developments, opportunities and threats, complex and hardly discernable interdependencies and relationships between numerous phenomena – further complicated by various forms of non-linear feedback – make predictability and control an illusion. Clearly, these characteristics hold for societal, economical, commercial, political, technological, and scientific developments. Events associated with these developments are hardly predictable, while showing considerable dynamics. A survey under 500 top-managers indicated that they qualified the dynamics in their business domain as high to very high [Prahalad and Krishnan 2002].

Numerous examples can be given that illustrate fundamental unpredictability. The recently experienced political and economical crises are obvious cases. Predictability appears problematic even for people who must be considered rather knowledgeable in the domain where the prediction is about. A few historic examples are:

- The famous British mathematician and physicist Lord Kelvin remarked in 1895 that “heavier than air flying machines are impossible”.
- Despite this apparent impossibility, Oliver and Wilbur Wright started experimenting. After some disappointing results with flying, Wilbur Wright stated in 1901 that “man will not fly for fifty years”. Nonetheless, they realized their first successful flight in 1903.
- One year later, a professor at the French Ecole Supérieure de Guerre declared that “airplanes are interesting toys, but of no military value”.
- Albert Einstein stated in 1943 that “there is not the slightest indication that nuclear energy will ever be obtainable”.
- The ENIAC computer was operational in 1946 and contained 18.000 vacuum tubes and weighted 35 tons. Three years later, Popular Mechanics Magazine predicted that future computers might be equipped with only 1.000 vacuum tubes and weigh only 1,5 tons.
Yet unforeseen progress was made: in 1971 the complete ENIAC computing power was embedded on a single micro chip. Still the question ‘what is it good for?’ lingered on, even in companies highly involved in making computers and micro chips.

Under the label ‘disruptive technologies’ examples are given of technologies that, in a totally unpredictable manner, take over successful existing technologies, such as the transistor taking over the vacuum tube, or digital photography taking over chemical photography [Christensen 1997]. Most likely, electric cars will be a disruptive technology for fuel-driven cars. How that will happen remains unpredictable. Common to all these examples is the notion of emergence introduced in Chapter 1: the unexpected manifestation of phenomena and occurrences that in and of themselves violate no natural laws, but are nonetheless fundamentally unpredictable [Kauffman 2008].

Additionally, fundamental uncertainty and unpredictability can be argued as follows. Note that mechanistic, planning and control thinking views strategy development as a planning process, whereby the predefined sequence of activities must be controlled to secure outcomes. Apart from the insight that strategic choices cannot be the outcome of a planning process [Mintzberg 1994], the planning approach to strategy development further assumes that strategic choices can be implemented in a top-down, planned manner. Both the incapability of a planning process to provide strategic choices, and the unlikelihood of an unproblematic top-down implementation-planning can be corroborated further in view of strategic transition barriers formulated by Weil and Broadbent in relation to IT strategic choices [1998]. Three barriers are identified. The first barriers are labeled expression barriers, and have to do with the difficulty to articulate clearly and explicitly the strategic direction and goals pertinent to various business, organizational, informational and technology developments. Indeed, high-level statements about creating a flexible enterprise, customer orientation, or the innovative use of new technology are vague and a far cry from understanding what these notions precisely mean. The second barriers are specification barriers identifying the difficulty to specify what the expressed enterprise strategy intentions specifically must accomplish. That is, specifically enough as input for enterprise design. Moreover, within design processes one is confronted with the (often unforeseen) third barriers, labeled as implementation barriers. These are caused by various restrictions and limitations following from the current enterprise environment, such as the existing way of working, rules and regulations, culture or technology. Furthermore, we might point to other issues the strategic planning perspective ignores [Wit and Meyer 1999]. So, the fourth type of barriers we label as completeness barriers. Given the dynamics, complexity and associated uncertainty, the issues facing an enterprise can hardly be captured completely and unambiguously, and analyzed such that analysis provides the necessary and sufficient set of further actions. That set has to be defined in an emergent manner, as we will discuss in the paragraph about the inquisitive governance process. Finally, as the fifth type of barriers we introduce the context-dependency barriers. The planning perspective assumes that implementation of planned actions is context-independent. But plans and their implementation are interactive: they affect one another mutually since plans and their content are not received in a neutral context. Unforeseen reactions to plans may thus emerge, necessitating yet unforeseen actions.

All barriers are ever so comprehensible and also to be excepted. Indeed, how could one – in view of the complexity, dynamics and uncertainty mentioned earlier – simply define the strategic direction and goals with such specificity that the discussed barriers are avoided and all strategic directions and goals can be operationalized through budgets, plans and targets? Management’s credo is planning and control. The maxim thereby is that if something cannot be measured, it cannot be controlled. However, this credo and maxim are naïve in the face of the complex, dynamic and uncertain
enterprise context [Ciborra 2001]. Other than the linear, analytical, top-down perspective suggests, strategy development is characterized by “incrementalism, muddling through, evolutionary development, improvisation and experimentation” [Ciborra 2002, p. 35]. Comparably, others observe that “strategies are derived and emerge from the firm’s complex set of business, competitive, organizational, and environmental circumstances” [Weil and Broadbent 1998, p. 30].

Key notions in our previous discussion are unpredictability and emergence. In other words, the occurrence of the unexpected. All that begs the important question: what are the implications of complexity, dynamics, and uncertainty – hence emergence and the unexpected – for the arrangement of governance? Before answering this question, discussion about a fundamental law is essential.

2.3.2 The Law of Requisite Variety

![Diagram of the Law of Requisite Variety](image)

*Figure 2.3. Illustrating the Law of Requisite Variety.*

We will introduce this fundamental law by means of a simple experiment, illustrated by figure 2.3. Consider a system like the lamp in the upper right part of figure 2.3. The lamp can have two states or varieties: on or off. For controlling the lamp, a switch is used as the controlling system (upper left). Also two states or varieties apply: closed or open. The match between the varieties of the controlling system (switch) and the system to be controlled (lamp) implies that the switch can control the lamp. Suppose that the system to be controlled is made slightly more complex by having two lamps (lower right part of figure 3). In this case, the number of states or varieties is four. Having the same switch as before, we observe that the switch cannot control the new lamp-system properly, since the number of varieties the switch offers is lower than the lamp-system requires. Note that the original lamp can in fact have an infinite number of states, depending on the applied voltage ranging from zero to maximum. The switch cannot handle that, but a dimmer can match the required variety in this case.

Insights gained from the previous example are expressed by the Law of Requisite Variety formulated by Ashby [1958]. This law states that the variety of a control system must be larger or equal than the variety of the system to be controlled. In view of our discussion about enterprise governance, we reformulate this fundamental law as:
Since enterprises are very complex entities, the variety of enterprises is enormous. This not only holds for the current situation of an enterprise, but moreover, for future variety of which the precise nature is yet unknown. In that light, the Law of Requisite Variety has profound implications for the arrangement of enterprise governance.

2.3.3 A serious mismatch

We illustrated the planning and control dominance in the realm of governance, strategy development, and the subsequent operationalization of strategic intentions. The essence of this approach can be revealed as follows. A plan is a precisely defined, detailed method and/or scheme of activities, worked out beforehand, for accomplishing a clearly defined objective. Since the scheme is worked out beforehand, there are assumed action-outcome relationships. Planning is thus the devising of a plan, whereas control concerns securing that everything progresses according to plan. Obviously, the latter means: no surprises. The unexpected must be avoided. Hence, planning and control as a governance mechanism offers little (ideally no) variety: the plan dictates the sequence of activities and behavior.

As we have seen, enterprises are very complex entities confronted with considerable dynamics and uncertainty. Emergence, the occurrence of the unexpected necessitate enterprises to be able to react to yet unknown issues. Put differently, enterprise variety is enormously high. Governing enterprises thus necessitates maximum possible variety in order to satisfy the Law of Requisite Variety.

As figure 2.4 illustrates, there is a serious mismatch between the minimum variety that planning and control offers as a governance mechanism, and the variety required in view of the complexity, dynamics, and uncertainty — hence emergence of the unexpected — faced by enterprises. A fundamentally different perspective on enterprise governance must thus be introduced.

Figure 2.4. A serious mismatch.
2.4 Organismic perspective: the basis for a different view on governance

Within the mechanistic perspective discussed before, enterprises are basically seen as machines. Hence, are considered as level-two or level-three complexities, as discussed in Paragraph 1.1.1. Although machines can reliably produce products and services, machine characteristics of enterprises have unfavorable consequences, such as the instrumental view on employees and the inability to adapt. Yet the ability to change and adapt seems key in view of the emerging developments discussed before. Complexity, dynamics and uncertainty require the capability to change and adapt, and the creativity to do so, typical aspects that the organization as a machine essentially cannot offer.

Opposite the mechanistic way of organizing is the organismic way of organizing. Said distinction is discussed in the general organizational literature [Burns 1963]. Within the limited scope of this white paper, we can only briefly discuss some essentials of this perspective. An elaborate overview is presented in [Hoogervorst 2009]. Central notions within the organismic perspective are flexibility, innovation and renewal. Employee involvement and commitment are, contrary the mechanistic perspective, crucial. The enterprise is viewed as an social entity, with a focus on relationships between organizational members. Not merely an objective system view plays a role, but also the subjective, interpretative system view. Shared meaning, norms and values are created through social interaction. Unlike the machine metaphor, the core metaphor is that of an organism that can learn and adapt. For easy comparison, the typical characteristics of the mechanistic and organismic perspective are summarized in figure 2.5.

<table>
<thead>
<tr>
<th>Mechanistic</th>
<th>Organismic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise complexity can be mastered through knowledge about fundamental</td>
<td>Enterprise behavior is emergent and cannot be defined from constituent parts</td>
</tr>
<tr>
<td>parts</td>
<td>Enterprise reality is socially constructed</td>
</tr>
<tr>
<td>Enterprise reality can be objectively captured, measured and controlled</td>
<td>Cause and effect relationships vanish in complexity, dynamics, and the</td>
</tr>
<tr>
<td></td>
<td>associated uncertainty</td>
</tr>
<tr>
<td>Measurements define reality</td>
<td>Enterprises are cognitive systems that learn and develop knowledge</td>
</tr>
<tr>
<td></td>
<td>Enterprise strategy is not the result of planning but of learning (emergent)</td>
</tr>
<tr>
<td>Events have identifiable causes that determine the current state of affairs</td>
<td>Detailed task and job descriptions are unproductive; self-control and self-</td>
</tr>
<tr>
<td></td>
<td>organisation are essential for enterprise performance, Innovation and the</td>
</tr>
<tr>
<td></td>
<td>capacity to change</td>
</tr>
<tr>
<td></td>
<td>Employee involvement is crucial for dealing with complexity, uncertainty,</td>
</tr>
<tr>
<td></td>
<td>strategic transition barriers, and enterprise learning</td>
</tr>
</tbody>
</table>

Figure 2.5. Mechanistic-Organismic distinction.

The general organizational literature emphasizes that increased complexity, dynamics and uncertainty necessitate a shift from the mechanistic towards the organismic way of organizing: “as environmental uncertainty increases, organizations tend to become more organic, which means decentralizing authority and responsibility to lower levels, encouraging employees to take care of problems by working directly with one another, encouraging teamwork, and taking an informal approach to assigning tasks and responsibility” [Daft 2001, p. 144]. This perspective has fundamental consequences for the arrangement of governance, as well as for the development and
On strategic success: a paradigm shift needed

implementation of the enterprise strategy [Hoogervorst 2009]. Figure 2.6 schematically depicts the necessary shift towards the organismic way of organizing. Note that this necessary shift is also a consequence of the Law of Requisite Variety. Even in the operational domain the (often unforeseen) variety is so large that an exclusive focus on planning and control fails [Hoogervorst 1998, 2009].

Understandably, the shift towards the organismic way of organizing, hence the organismic way of enterprise design, implies coherence and consistency of every enterprise aspect pertinent to the organismic viewpoint. Hence, all facets of enterprise engineering, to be discussed in the next chapter, must be addressed from the organismic viewpoint. That is not to say that nowhere ‘mechanistic’, planned activities should occur. Surely, in addition to the remarks made earlier, certain activities must be executed in a planned order, for example to uphold safety, ensure the proper operational execution of certain tasks, or to execute clearly defined projects. This concurs with the observation that higher-level complexities contain characteristics of lower-level complexities, as discussed in Paragraph 1.1.1. Nonetheless, the organismic perspective implies employee involvement for all these planning and control activities.

In view of the argued limitations of the mechanistic, planning and control governance mechanism, we advocate the organismic governance perspective. As we will illustrate below, such a governance perspective can only be effective if the enterprise as a whole operates accordingly. Hence, is only effective if enterprise design is based on the organismic view, which is essential for satisfying the Law of Requisite Variety.

2.5 Enterprise governance as an organizational competence

2.5.1 Enterprise governance defined

An organizational competence is a unified and integrated whole of knowledge, skills, and technology [Prahalad and Hamel 1999]. Key words are unified and integrated. Note, that these key words similarly apply in case of enterprise strategic success. A core reason, if not the reason, for strategic failures is the lack of unity and integration, which precludes the enterprise to operate as an unified
2.5.2 The enterprise governance competence

One of the typical characteristics of traditional mechanistic organizing is the monopolization of ‘knowing and wanting’. Management was seen as the locus for knowledge and decision making. The introduction of an enterprise governance competence giving guidance to enterprise developments might be interpreted as a new form of ‘Taylorization’ in disguise: the renewed monopolization of ‘knowing and wanting’. This must be avoided. We will use figure 2.7 to illustrate how.

Comparably as with figure 2.2, we have symbolically drawn enterprise operations and the governance function. The latter function might be labeled Enterprise Governance Office, or Enterprise Development Office. Operations, including operational management, in this respect concerns everything not related to governance. Hence, everything that regards the current enterprise ‘being’ as discussed in Paragraph 2.1. For the sake of simplicity, we focus on the delivery of products and services by various employees (symbolized by circles) having all kinds of collaborative relationships (symbolized by arrows) for producing the products and services. Within the organismic perspective, employees are not viewed as instrumental ‘parts’ carrying out operational tasks, but viewed as thinking individuals who can not only act prudently pertinent to unforeseen operational contingencies (Law of Requisite Variety), but moreover, can reflect, learn,
and generate ideas about process, product, or service improvements, such as through the use of new technology. As such, employees are sensitive to all kinds of external or internal stimuli. Next to, and in conjunction with, operational relationships, employees thus also have mutual cognitive, reflective, and learning relationships, as expressed by the dotted arrows.

Of course, the same organismic characteristics hold for the governance function, responsible for formally constituting the guiding authority for new enterprise developments. As argued in Paragraph 2.1, enterprise governance has to do with enterprise change. Hence, has to do with a new operational arrangement. In view of enterprise dynamics, change is inevitable. So, change must be stimulated but also guided. Two important roles can be identified. First, the guidance role is essential since enterprise unity and integration, as we have seen, must be ensured as a critical condition for enterprise strategic success and adequate enterprise performance [Hoogervorst 2009]. Said unity and integration can obviously only be effectuated through an central, overarching governance authority that, for example, precludes the use of different system or technology choices that hamper seamless process execution. In view of the complexity of enterprises, ensuring unity and integration requires guidance over multiple areas through the definition of enterprise architecture that guides enterprise design. Carrying out enterprise design is also a core activity of the governance function [o.c.]. Second, the enterprise governance function is essential for providing the foundation and stimulation for enterprise developments. Both roles play concurrently and iteratively a role. Within these roles also the relationships with employees concerned with operational activities must be made effective. Creativity and ideas of employees must be stimulated and nurtured, but developed in ways that do not jeopardize enterprise unity and integration. Such development is obviously not the core task of employees concerned with operational activities, but must be accomplished by employees competent in enterprise design. Conversely, ideas and developments from within the enterprise governance function must be productive and effective within the operational environment. Hence, must be developed with the involvement of employees within the operational domain. It is this mutual relationship between the enterprise governance function and enterprise operations that avoids the monopolization of ‘knowing and wanting’. All these relationships make the overall enterprise governance competence effective. When we speak of the enterprise governance competence, we commonly refer to the central enterprise governance function, but the relationships with, and among the employees within the operational domain must always be taken into account. Nonetheless, the foundational and stimulating role of the enterprise governance function is essential. Let us reiterate our key observations.

We have emphasized that the mechanistic, planning and control governance approach manifests a serious mismatch with the complex, dynamic and uncertain enterprise reality. Experiences show that events progress unpredictably, while activities have an iterative and concurrent nature, rather than sequential and planned nature [Mintzberg 1994, Ciborra 2002]. Herein lies the advantage of the competence-oriented view on governance: complexity, dynamics and uncertainty make it unfruitful to precisely define (non-operational) activities in advance. A skilled governance competence is the very foundation for dealing with complexity, dynamics and uncertainty, and the ability to determine the nature of activities, and when and how they are to be performed. This competence is essential, given the complex and largely unpredictable, hence emerging, character of strategy development and the ultimate implementation, as we have outlined elsewhere [Hoogervorst 2009].

In summary, it is this competence that – through an inquisitive process – interprets the, partly technology-driven, environmental dynamics, and operationalizes, details and works out vague, generally formulated (macro) strategic intentions into possible strategic developments and their operationalization. It is this competence that – other than the top-down, planning control view
suggests – initiates strategic developments bottom-up, which anticipate possible enterprise developments and their associated dynamics (enterprise enablement). It is this competence that constitutes and shapes the strategic dialog, and the (in)formal social interaction and participation of stakeholders. It is this competence, that ensures a unified and integrated enterprise design and the implementation thereof (cf. business and IT alignment as process and state). Hence, it is this competence that effectuates enterprise transformation (cf. figure 2.1). Finally, it is only this competence that provides the necessary variety to satisfy the Law of Requisite Variety discussed in Paragraph 2.3.2. Of crucial importance thereby is the organismic way of organizing mentioned before, which rests on the individual competencies of employees.

2.6 The inquisitive process of enterprise governance

The importance of the enterprise governance competence can additionally be corroborated as follows. Enterprise change always involves two important facets. First, the level of agreement about the objective: what must be accomplished. Second, the clarity of the issue. That is, full understanding about how to realize the objective. These two aspects are depicted in the matrix of figure 2.8.

Four typical situations can be identified. The situation with a low level of agreement about what to accomplish and also no clarity about how to accomplish anything, has been labeled as ‘anarchy’. In certain cases there is full understanding about various ways to accomplish an objective, but there is low agreement about which way to prefer. For example, governmental budget deficit can be reduced in various ways, but disagreement exists about which manner to select. So, the quadrant can be labeled as ‘politics’. Sometimes the agreement about what to accomplish and the clarity about how to do that are both high. Then the situation is relatively simple: make a decision and plan the execution of activities to realize the objective. An example is repairing a faulty system with a known fault cause. However, very often there is high agreement about what to accomplish, but low clarity about how to do so. For example in case of an unknown cause for system failure. In this case investigation is necessary: an inquisitive process.

\[\text{Figure 2.8. Clarity and agreement.}\]

\[\text{Inquisitive process}\]

\[\text{Politics}\]

\[\text{Decision making}\]

\[\text{Planning}\]

\[\text{Anarchy}\]

\[\text{Evolutionary}\]

\[\text{Emerging}\]

\[\text{Unfolding}\]

\[\text{Low}\]

\[\text{High}\]

\[\text{Level of agreement}\]

\[\text{Clarity of issue}\]

\[\text{Low}\]

\[\text{High}\]

\[\text{Original source of the matrix unknown.}\]
We submit that enterprise objectives must nearly always be positioned in the lower-right quadrant of figure 2.8. For example, there is likely to be a high level of agreement that customer satisfaction or employee motivation must be increased, employee absenteeism must be reduced, quality deficiencies must be reduced, compliance or security must be enhanced, process inefficiencies must be eliminated, product failures must be avoided, or new technology must be successfully introduced (to name but a few issues). But it is highly unlikely that it is precisely known how to accomplish these objectives. Hence, only through an inquisitive process of analysis and synthesis issues are gradually understood and made clear. Once that is the case for certain aspects, the upper-right quadrant applies: the content of certain tasks can be planned and executed. In view of our discussion in the previous paragraph, it is the enterprise governance competence that carries out and enables the inquisitive process and translates aforementioned objectives into enterprise (re)design. Again, if and only if through this process issues become clear – thus through re(design) it becomes apparent how objectives are to be realized – only then activities can be planned, and one can speak about a project by which the (re)design will be implemented. Said implementation is also part of enterprise change, and therefore included in the scope of enterprise governance. Core competencies within the enterprise governance competence are discussed in [Hoogervorst 2009]. Clearly, the inquisitive process characterizes the very essence of a search process to discover an effective solution to a problem [Hevner et al. 2004]. Put another way, the inquisitive process characterizes the very essence of a design process. The inquisitive process is about reflecting, searching, learning, and discovering, whereby (design) results are emerging.

Noticeably, under the labels ‘appreciative inquiry’, ‘cooperative inquiry’, or ‘action research’ approaches have been suggested that basically fit within the competence-based enterprise governance view and the notion of an inquisitive process for investigating enterprise issues with the intent of enhancing enterprise performance, hence with the intent of perusing a new enterprise design [Barrett and Fry 2005, Burns 2007].

2.7 Phases of enterprise realization

For illustrating the scope of enterprise governance, four phases of enterprise realization are shown in figure 2.9. Core areas of attention in each phase are presented. We have identified the four phases as:

- Orienting/intending: conceptual exploration.
- Development/design: conceptual realization
- Building/Implementation: physical, ready-to-use, realization
- Delivery/Operation: physical, in-use, exploitation.

The inquisitive process discussed in the previous paragraph is concerned with the orienting/intending and development/design phase. Examples of techniques that might be used in these phases are indicated. Enterprise design is addressed in the development/design phase. Hence, this is the phase of enterprise engineering, which will be discussed in the next chapter. It must be stressed that through the inquisitive process, many strategic initiatives are developed in this phase, for example, strategic initiatives concerning customer interaction, HRM, security, or the use of certain types of technology. So, as indicated schematically by the dotted line, the phases orienting/intending and development/design have an interacting, iterative relationship. As stressed before, the development process is iterative, concurrent and emergent. The transition to the building/implementation phase – hence the transition from the lower-right quadrant in figure 2.8 to the upper-right quadrant – must in our view be based on rather strict conditions. Indeed, it seems obvious that only then building and
implementation can commence — thus one or more projects are executed — if it is precisely defined what the project result must be. Put differently, the transition from the development/design phase to the build/implementation phase must, at least for the activities undertaken in the project, be based on a clear, specific enough design. Comparable considerations hold for the transition towards the deliver/operational phase. Note, that enterprise governance encompasses all phases, except the phase that concerns the daily operation, which we have associated with enterprise management in its operational meaning (cf. Paragraph 2.1). The fact that enterprise governance is concerned with the building/implementation phase is not to say that ‘operational’ management associated with building and implementation is brought into the realm of governance. But it does say that governance provides guidance pertinent to, for example, the content structure of project proposals, progress reporting, relationships between projects, and project evaluation arrangements.

2.8 Summary

Enterprise governance is concerned with enterprise change and the safeguarding of enterprise unity and integration. Although planning and control is relevant for certain aspects of governance, such as the execution of projects, their use in other governance areas have been shown to be seriously at odds with conditions for adequately addressing enterprise complexity, dynamics and uncertainty, while, moreover, adequate attention for safeguarding enterprise unity and integration — hence attention for enterprise design — is missing. For satisfying the Law of Requisite Variety, the competence-based approach to governance is advocated, which enables to address the emerging nature of strategic enterprise developments and their operationalization through the inquisitive process of analysis and synthesis. For the competence-based approach to work, the organismic perspective on enterprises must be adopted.


3 Enterprise Engineering: Basic Concepts

Chapter 1 argued the crucial importance of enterprise design for successfully operationalizing strategic initiatives and areas of concern, as well as for ensuring enterprise unity and integration and adequate enterprise performance. Enterprise engineering as a theory, concepts and methodology – firmly rooted in the theory base of the natural sciences – is presented in this chapter as the formal approach to enterprise design. Enterprise engineering is based on the crucial premise that enterprise unity and integration does not develop ‘incidentally’ but must be intentionally designed. The same holds for the realization of certain enterprise performances and capacities. Indeed, service and customer orientation, quality, flexibility, compliance, process excellence, lean production, motivated and involved employees, productivity, or lower operational costs, do not develop autonomously, or because someone at the top declared so, or because there is a ‘business case’ that has been ‘decided’. On the contrary, the design focus is essential for operationalizing all these aspects. Within the limited scope of this paper, the basic concepts of enterprise engineering will be discussed.

3.1 Introduction

Our previous discussion indicated that an enterprise is: (1) a social entity, (2) goal directed, (3) an intentionally created system of human interaction, and (4) linked to the external environment. Enterprise Engineering is an emerging discipline that formally (theory-based) addresses the four essential characteristics, whereby enterprise creation is based on enterprise design. Hence, the central paradigm within enterprise engineering is the notion that enterprises are intentionally designed social systems. In view of the multitude of enterprise aspects, the enterprise design perspective is inherently broad. Enterprise Engineering aims to operationalize the previously argued design focus, while addressing and mastering the considerable complexity of enterprises. Arguably, unified and integrated enterprise design necessitates an approach (theory, concepts and methodology) which in and of itself is based on complete, unified and integrated concepts. As stated in Chapter 1, it is hardly conceivable that a conceptually incomplete and incoherent set of concepts for design would methodically lead to a unified and integrated design. Paragraph 1.3.2 argued that within enterprise design the system perspective must be a central notion. Further, in view of the ‘mechanistic’ and ‘organismic’ system and enterprise perspectives, we will discuss whether the enterprise engineering approach can effectively incorporate both perspectives. Finally, enterprise engineering has to do with change, either by designing a previously non-existing enterprise, or by (partially) redesigning an existing enterprise. As such, enterprise engineering constitutes an important facet of the enterprise governance competence discussed before. Design is the creative hinge point between what is being desired or intended on the one hand, and the realization thereof on the other hand. This creative hinge point is operationalized within the inquisitive process of the enterprise governance competence.

3.2 A framework for Enterprise Engineering

We will structure our discussion about the basic concepts of enterprise engineering based on the framework depicted in figure 3.1. On the left-side of figure 3.1 the strategic reference context for enterprise design is shown. These are well-known topics, some of which have been discussed before. On the right-side of the figure, the basic concepts of enterprise engineering are shown. The question might be raised whether the concepts shown in the five rows from above are necessary and sufficient for enterprise design. Before answering this question in a more specific sense, we recall
that enterprise design involves multiple disciplines that have specialist knowledge for the design of enterprises, like Work and Organizational Psychology, or Computer Science. In view of this, we will rephrase our question as: are the concepts shown in the five rows from above necessary and sufficient for effectively bringing the specialist knowledge of multiple enterprise-related disciplines within the enterprise design perspective? We feel, the concepts are definitely necessary, while based on practical application so far, these concepts seem also sufficient. Nonetheless, indications about the omission of basic concepts are welcomed. We will return to this issue in paragraph 3.2.9. The elements of figure 3.1 will be briefly discussed below.

**Figure 3.1. Framework for Enterprise Engineering**

### 3.2.1 Strategic reference context for design

Various aspects that serve as a reference for enterprise design are shown left in figure 3.1. One might think of:

- The enterprise mission, vision, products and services.
- Norms and values, as well as certain strategic areas of concern that enterprise design must address, such as customer orientation, flexibility or compliance with rules and regulations.
- Strategic choices, for example concerning consumer target groups, markets and distribution channels.

From the discussion in the previous chapter it can be appreciated that the definition of the enterprise reference context falls within enterprise governance activities.

### 3.2.2 Function and construction distinction

Enterprise Engineering is based on system thinking, applied to enterprises. Briefly speaking, the system perspective entails two fundamental perspectives: the functional (teleological) perspective and the constructional (ontological) perspective [Dietz 2006, Hoogervorst 2009]. The functional
perspective is concerned with purposes of the system and thus concerned with the relationships of
the system with its environment. Note, that speaking of the environment implies that – for a given
system perspective – an identifiable boundary exists that defines what is internal and external to the
system. Within the functional perspectives, the internals of the system are of no concern. Therefore,
this perspective is often identified as the ‘black-box’ perspective. For an enterprise, the functional
perspective is likewise valid, and concerns for example relationships with business partners and
suppliers, but more specifically, the relationships with customers and the products and services
delivered to them. Hence, the functional perspective is about with what the enterprise delivers to
the environment. Alternatively, the constructional perspective is concerned with the system
arrangement, that is, is concerned with the internal subsystems or components, and their
relationships, for bringing about the enterprise function. Or more narrowly, is concerned with how
the system’s (e.g. enterprise) products and services are produced. Since the system’s internals are of
key concern, the constructional perspective is often referred to as the ‘white-box’ perspective. Both
fundamental perspectives define the two columns of the framework.

3.2.3 Functional and constructional requirements
In view of the function notion introduced above, functional requirements have to do with the specific
nature of the relationships of the enterprise with its environment, more specifically, the nature of
the relationships with customers. Requirements could, for example, concern secure and user-friendly
access to the enterprise’s website, and the use of an ordering and payment service. Below we will
introduce an enterprise functional model that will aid in defining functional requirements.
Likewise, requirements can be formulated that have to do with the internal arrangement of the
enterprise: the constructional requirements. Notions like paperless office or flexible work spaces
obviously translate into constructional requirements. But also the ability to quickly reconfigure
processes or the ability to employ disabled staff are topics for defining constructional requirements.
Functional and constructional requirements address (but not exclusively) aspects of the enterprise
reference context mentioned before. During the design process, the functional and constructional
requirements are made concrete into functional and constructional specifications. All requirements
must be developed, published, and maintained formally through the enterprise governance
competence. This process plays an important role in linking strategic intentions and areas of concern
with enterprise design. Figure 3.2 gives an example of a requirements publication.

```
Requirement statement (functional)
Easy to use goods return and refund service

Rationale
Our firm focuses on quality-sensitive customers expecting high levels of service. The service for returning goods and refunds is expected to increase customer satisfaction, hence, increase customer retention, which is an important condition for our continuation and growth.

Implication
The service must be executed seamlessly. If not, communication about the service and its subsequent utilization will turn out to be a dissatisfier.

Key actions
Develop seamless goods return capabilities as part of Pottery’s web portal. Research the ability to use a packaging and transport service aiding customers Develop operational rules for returning goods and refunds.
```

Figure 3.2. Example of requirement publication.
3.2.4 The enterprise essence: implementation-independent design

It seems evident that phenomena that are not fully understood cannot be properly addressed and improved. Understanding is greatly enhanced when the essence of phenomena is grasped. These considerations similarly hold for the phenomenon ‘enterprise’. Enterprises, as we have seen, are very complex systems, so a first important step in mastering this complexity and understanding enterprises is focusing on the enterprise essence, completely abstracted from possible modes of implementation.

3.2.4.1 Enterprise teleology: Business model

Our first understanding concerns the functional essence of an enterprise. Thus, the essence of its relationships with the environment. We have to stress that the notion of ‘function’ does not refer to the use of that term in approaches that enumerate internal subsystems or components as a ‘functional composition’, or present a tree-like breakdown as a ‘functional decomposition’. These approaches seem to be pseudo-constructional (pseudo-white-box) approaches since they presume knowledge about the internals of the system. So, within the functional (black-box) perspective we restrict ourselves to aspects that define and constitute the system’s relationships with the environment. For an enterprise these aspects and relationships define and constitute the purpose for enterprise existence. Hence, we might call the aspects and relationships of the functional perspective the ‘enterprise teleology’. A possible graphical representation of the enterprise teleology is given in figure 3.3.

![Figure 3.3. Enterprise teleology: business model.](image)

We will reserve the label ‘business’ for the enterprise function, since this label expresses the enterprise purpose (the business it’s in). So, we might refer to the representation of figure 3.3, when specifically defined for a certain enterprise, as the enterprise business model. As can be appreciated, the model can be used for defining the functional requirements discussed before. Note, that nothing has been said yet about the actual implementation of enterprise functional aspects, nor about the
operationalization of functional requirements. Examples of items for the definition of functional requirements are given in table 3.1.

<table>
<thead>
<tr>
<th>Functional relationship</th>
<th>Items for requirements definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers-Channels</td>
<td>Manage own data</td>
</tr>
<tr>
<td>Customers-Products</td>
<td>Configuration and personalization</td>
</tr>
<tr>
<td>Suppliers-Channels</td>
<td>Automatic parts replenishment</td>
</tr>
<tr>
<td>Customers-Partners</td>
<td>Cross selling</td>
</tr>
<tr>
<td>Customers-Legislators</td>
<td>Presentation of customer legal rights</td>
</tr>
<tr>
<td>Customers-Channels</td>
<td>Goods return service</td>
</tr>
</tbody>
</table>

*Table 3.1. Examples for requirements definition.*

Note that the requirement publication given in figure 3.2 is the detailing of the goods return item mentioned in table 3.1, whereby key actions are defined to further operationalize the requirement.

3.2.4.2 Enterprise ontology: essential construction model

Next, the essence of the enterprise construction has to be explored. The definition of the constructional essence is based on the insight that prosessual activities within (or pertinent to) enterprises occur in universal patterns, called *transactions*. Figure 3.4 shows the basic pattern [Dietz 2006], whereby someone (the initiating actor) is requesting a specific result from somebody else (the executing actor). In some cases the initiator and executor are one and the same, for example when an actor is autonomously performing a periodic task, like checking a stock level. The requested result can be material (such as ordering a meal or a book) or immaterial (such as obtaining a permission). A process is thus a collection of causally related transactions. Enterprises have dozens of processes, such as for production, recruitment, purchasing, payment, accounting, logistics, and so on. Despite their different nature, they all share the same underlying transaction patterns [Winograd 1988].

![Figure 3.4. Basic transaction pattern.](image)

As figure 3.4 illustrates, the basic transaction pattern consists of four communication or coordination activities that define the collaboration (and commitments) between actors, and one production
activity. Variations on this basic patterns can occur, since communicative actions can be declined, cancelled, or revoked. For our brief discussion it suffices to say that all these variations can be precisely modeled, including the informational aspects associated with transactions [Dietz 2006, Mulder 2006].

As said, the essential view focuses on the implementation-independent transaction patterns. So, for example, the withdrawal of money through an ATM or by means of a bank employee is essentially the same transaction. The enormous advantage of essential enterprise design (and its associated enterprise models) obviously is the considerable reduction in dealing with enterprise complexity, as well as in modeling time. Moreover, attention to the enterprise essence makes clear that comparable enterprises have similar underlying essential designs. Understandably, this is the case for municipalities, police forces, banks, or airlines, to name but a few. Opportunities for re-use of functionalities or services already developed become manifest and applicable through knowledge about the implementation-independent enterprise essence. The collection of essential enterprise models is called enterprise ontology [Dietz 2006].

Although an elaborate discussion about the development of enterprise ontological models is beyond the intention of our brief discussion, we like to show the clarity and comprehensiveness of these models by providing a simple illustrative example of one model type. First, the transaction pattern of condensed into the transaction symbol of figure 3.5 [o.c.].

Figure 3.5. Transaction symbol.

The transaction symbol is relatively easy to understand. The circle represents the four communicative or coordination actions, while the diamond represents the production activities. The black square indicates the actor responsible for producing the requested result. In actual modeling relevant actor names are given. So, actor A01 might be ‘customer’ and A02 ‘order handler’. Using this type of modeling the essence of enterprise – its implementation-independent construction – can be clearly and comprehensively presented.

Figure 3.6. Example of an ontological construction model.

Figure 3.6 shows a pattern that is relevant in many cases, such as a restaurant. In that case the order handler can be the waiter and the producer the actor producing the meals. As can be appreciated, the actor roles and responsibilities are immediately clear. Even for far more complex situations, the
model type like the one shown above provides readily clear and comprehensive information about the enterprise essence. Just for illustrative purposes, figure 3.7 shows the model of a (fictitious) insurance company InSave.

Figure 3.7. Example of an ontological model for an insurance company.

In the model of figure 3.7 actor roles are depicted, whereby one person might perform more than one role, or vise versa (for example in case of working in shifts). Again, it not our intention to dive into the specifics of insuring, but merely to illustrate the elegance of this type of modeling. Briefly explained, the various actor roles are responsible for the following. A01 ensures starting of the insurance. Actually operationalizing the insurance involves additional activities such as making up the insurance conditions or underwriting, as is done by A03. Note that in case InSave terminates the current insurance in case of switching to InSave, A01 obtains an authorization to do so. Actor A04 manages the customer profile. The actors A07 and A08 are concerned with invoicing. Note that A08 is a self-activating actor who ensures periodic (say monthly) invoicing. Finally, A09 and A10 handle insurance ending, which can be initiated by the client, but also by another insurance company. Claims handling is not shown in the model of figure 3.7, but can be relatively easily incorporated with
a few extra transaction. Numerous practical cases using this type of modeling have been documented [Dietz 2006, Mulder 2006]. Case examples are presented in [Hoogervorst 2009, 2011].

3.2.5 Enterprise design domains

Earlier we reserved the label ‘business’ for the enterprise function, hence the enterprise functional design domain. Likewise, we could use the label ‘organization’ for the enterprise construction. In view of the importance of ‘information’ and ‘information technology’ (IT) we will identify them as separate enterprise constructional design domains. These main enterprise design domains are depicted along the horizontal axis of figure 3.8. Within these main design domains various sub design domains play a role [Hoogervorst 2009]. For example, ‘processes’ or ‘employee remuneration’ are important sub design domains within the design domain ‘organization’. Essential construction models like the ones introduced above represent the essentials of the organization domain. Note, that essential construction models generally relate to essential aspects within the organization and information design domains, but obviously cannot relate to the IT design domain, since technology already implies some non-essential design choices.

Figure 3.8. Enterprise design domains and phases of realization

Along the vertical axis of figure 3.8 the phases of enterprise realization are shown. We will discuss these phase in more detail below. For now it must be stressed that strategy development involves both functional and constructional considerations. Ultimately, enterprise engineering operationalizes the functional and constructional strategic intentions and areas of concern into enterprise design, which is subsequently implemented. Note, that a mere focus on information supply or IT governance is totally inadequate for holistically creating a unified and integrated enterprise. This concurs with the message conveyed in paragraph 1.5.

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2 See also www.demo.nl
3.2.6 Enterprise Architecture

Understandably, essential enterprise design must be followed by subsequent design within all enterprise design domains, such that designs are produced that can be implemented. The question then is: how should design proceed in order to: (1) ensure enterprise unity and integration, and (2) address strategic intentions and areas of concern adequately? The answer to these questions is normative, and comes in the form of enterprise architecture. Conceptually, enterprise architecture is thus the normative restriction of design freedom. Practically, enterprise architecture is defined as a coherent and consistent set of principles and standards that guides enterprise design [Dietz 2008, Hoogervorst 2009]. So, enterprise architecture stipulates how, for example, interaction with customers actually must take place (function), or how processes execution, information supply, or employee remuneration must be arranged (construction). Additionally, it must be determined how specific strategic intentions and areas of concern are addressed, such as pertinent to customer satisfaction, flexibility, motivated employees, or compliance with rules and regulations. Elsewhere we have discussed the crucial difference between architecture and requirements, and how architecture is defined [Hoogervorst 2009]. For now it is important to stress that enterprise architecture should address the enterprise in its totality. Put differently, enterprise architecture must provide design guidance for every aspect of the enterprise represented by enterprise design domains. This holistic perspective was emphasized in Paragraph 1.3. Yet, as one might observe, many ‘architecture approaches’ do not satisfy that condition [Dietz and Hoogervorst 2011].

In view of the four main enterprise design domains, enterprise architecture consists of four main architectures: business architecture (function architecture) and organization architecture, information architecture, and IT architecture (construction architecture). Design principles like “customer data must be customer manageable”, or “customer purchase and payment actions must always be confirmed” are examples of business architecture. All these architectures also have various sub-architectures. So, process architecture is an important sub-architecture of the organization architecture. An example is the principle “process control must be separated from process execution”. As can be appreciated, that principle addresses the concern for flexibility. Elsewhere we have illustrated that a concern might be addressed by multiple principles used in multiple enterprise design domains, while conversely, a principle might address more than one concern [Hoogervorst 2009]. Those conditions are conducive to ensuring enterprise unity and integration. As an illustration, an information architecture principle like “presentation logic may not contain brand-specific functionality” likewise as the process architecture principle mentioned before, enhances enterprise flexibility. As a final example, the IT architecture principle “network access must be based on authentication and role-based authorization” addresses (among other things) the concern for security. Various other principles are presented in [Hoogervorst 2009].

Our brief discussion shows that enterprise architecture is comprised of a hierarchy of architectures: the four main architectures with various sub-architectures within them. Safeguarding coherence and consistency within and between the various (sub) architectures is crucial. Defining enterprise architecture is a heuristic, participative process (guided by the enterprise architect) involving many stakeholders with their specific concerns. The process of development, approval, publication, and maintenance of architecture must be a formal aspect of enterprise governance, and is crucial for safeguarding architecture coherence and consistency – hence ensuring unified and integrated enterprises design – and the embodiment of strategic intentions and areas of concern in design [Hoogervorst 2009, 2011]. Figure 3.9 gives an example of an architecture principle publication.
3.2.7 Operational rules

Next to enterprise arrangements, the specifics of enterprise operation are evidently important. The notion ‘operation’ particularly refers to the manner by which enterprise transactions (defined during implementation-independent design) are carried out, that is, the manner by which processes are executed. That manner is defined by operational rules. Two categories of operational rules play a role: coordination rules and production rules (cf. figure 3.4). The first category concerns the manner by which activities between actors within an enterprise, or between enterprise actors and external actors (such as customers) are controlled. These latter ‘customer interaction rules’ are often identified as ‘business rules’. Examples are: “goods may be returned up to 30 days after purchase”, or “car rental only to persons with a valid driving license”. The second category of operational rules concerns the actual production. These rules are often identified as ‘work instructions’, such as for making a hamburger, whereby a coordination rule could require payment prior to producing the hamburger. So, with reference to the model shown in figure 3.6, transaction T02 must be completed before executing transaction T03. All such conditional aspects can be precisely modeled.

Comparably as with enterprise architecture, also the set operational rules must be coherent and consistent. Moreover, the set operational rules must also be coherent and consistent with enterprise architecture, hence, must not be in conflict with enterprise architecture. Clearly, enterprise architecture directed to realizing customer satisfaction or enterprise flexibility must not be jeopardized by operational rules creating the opposite. The relationship between operational rules and enterprise architecture is further based on the fact that enterprise design obviously must enable the execution of operational rules. For example, an operational rule that requires purchase confirmation through certain security measures must have its counterpart in enterprise architecture guiding the security design accordingly.
3.2.8 Enterprise design

Enterprises are multi-facetted entities. Hence, the ultimate unified and integrated design of an enterprise involves multiple disciplines: organization sciences, work and organizational psychology, information sciences, IT system design sciences, etc. These are all aspects of enterprise engineering. Within the limited space of this paper, all these aspects cannot be addressed. Some have been discussed in [Hoogervorst 2009]. As emphasized earlier, design must encompass the enterprise in all its facets. The traditional areas of attention – processes, information used in these processes, applications providing information, and the infrastructure for the applications – are evidently largely inadequate, as argued in Paragraph 1.3. Ensuring motivated employees and satisfied customers cannot be addressed within these traditional areas of attention. The design of adequate employee remuneration and assessment systems, or a system for effective customer relationship management, are thus as important as designing a workflow system. Moreover, a knowledgeable enterprise engineer will understand that all these functionalities are mutually related in the quest for motivated employees and satisfied customers.

Finally, enterprise design, or design in general, is not an algorithmic process. One cannot proceed algorithmically from desires and intentions to their ultimate realization. Enterprise design is a creative, emerging process, and is part of the inquisitive process within enterprise governance (cf. Paragraph 2.6). Only under appropriate conditions for enterprise governance, this creative, emerging process can occur [o.c.].

3.2.9 Is the level-eight complexity adequately addressed?

In paragraph 1.3.1 we raised the question whether the level-eight complexity of enterprises can be adequately brought within the enterprise design perspective, such that strategic intentions and areas of concern are successfully addressed and enterprise unity and integration is ensured. Moreover, a further question was raised whether the notion of emergence can be adequately brought within the enterprise design perspective such that enterprise renewal, adaptation, and innovation is enabled. As a preliminary to answering these questions, we recall the general systems theory introduced in Paragraph 1.3.2, indicating that higher-level complexities contain aspects of lower-level complexities. Enterprises thus manifest both ‘mechanistic’ and ‘organismic’ system characteristics. We might observe that the essential models like the one shown in figure 3.7 represent the mechanistic system perspective, or otherwise said, represent the structural-functionalistic perspective on enterprises. So, the mechanistic system aspects of enterprises seem to be covered.

In addition, the organismic perspective on enterprises plays a crucial, important role [Hoogervorst 1998, 2009]. Only this perspective can be associated with emergence (learning, renewal, adaptation, innovation), and is based on employee involvement as argued in Chapter 2. Hence, in our view, effectively bringing the notion of emergence within the enterprise design perspective boils down to effectively designing conditions for the crucial enabling role of employees on whose competencies enterprise learning, renewal, adaptation, and innovation – hence emergence – depend. It is precisely here that insights from the traditional organizational sciences must be utilized. That is, these insights must be translated into enterprise design principles (enterprise architecture). For example, the traditional organizational sciences teach that enterprise formalization is inversely related to the manifestations of creativity, innovation, and adaptation, hence inversely related to emergence. Capturing these insights in enterprise architecture enables to complement the essential structural-functionalistic models with designs concerning, for example, job content and execution, employee autonomy, employee self-efficacy, employee motivation, communication, the nature of supporting
information systems, norms and values, management practices, and so on. We cannot elaborate on these design principles within the limited scope of this paper. An example is given in figure 3.10.

**Principle statement** (Organization Architecture)
Assessment and reward systems must evoke and support desired customer and service oriented behavior and adherence to espoused norms and values.

**Rationale**
As a strategic focus, our organization places high value on customers and the service to them, and treasures the norms and values by which we conduct our business. Hence, we must ensure that our assessment and monetary reward systems induce coherent behavior that is consistent with these views.

**Implications**
Current departmentally focused assessment and reward systems will be discontinued.
Behavior not consistent with customer and quality oriented focus will be actively discouraged.

**Key actions**
Investigate and reengineer pertinent assessment and reward systems.
Define necessary employee and management training.
Define the necessary information supply and associated systems for supporting desired employee behavior.

*Figure 3.10. An example of a design principle addressing organismic aspects.*

We contend that enterprise architecture is an effective vehicle for bringing the organismic system perspective within the realm of enterprise design. Paragraph 1.4 argued that design science should have an adequate theory base, hence, must be firmly rooted in the naturals sciences. Enterprise architecture is thus an important concept for linking design sciences with natural sciences. In and of itself this insight provides an additional strong argument for the normative, prescriptive, principle-based notion about enterprise architecture. Finally, returning to the question whether the concepts of enterprise engineering are necessary and sufficient for effectively bringing the specialist knowledge of multiple enterprise-related disciplines within the enterprise design perspective, we feel that enterprise architecture likewise provides the necessary and sufficient vehicle. Although the concept might be also sufficient, the actual formulation of principles reflecting the insights from the traditional organizational sciences leaves much to be desired. This provides a fruitful perspective for future multidisciplinary research (cf. Par. 3.6).

### 3.3 Normalized IT system design

The design of IT systems is an important aspect of enterprise design. Earlier we identified enterprise flexibility (or agility) as a crucial area of concern: the ability to quickly change and adapt. All relevant enterprise ‘components’ must have this ability in order for the enterprise to be flexible and agile. Historically, IT systems have been known for their relative inability to change and adapt quickly, thereby seriously hampering enterprise flexibility and agility. Mainly, that inability is due to fact that a desired change in an IT system lead to an avalanche of necessary subsequent changes: the so-called combinatorial effects [Mannaert and Verelst 2009]. For example, the incorporation of a new legal requirement would necessitate changing all applications having that requirement as a ‘hard coded’ condition in their software, rather than updating the set requirements only once. For complex
systems these combinatorial effects have been shown to grow exponentially over time, thereby making it increasingly harder to carry out IT system changes expeditiously.

Under the label ‘normalized systems’ a new approach to IT system design had been developed that avoid combinatorial effects. Hence, enable expedient system change [o.c.]. Put differently, in a normalized system the impact of a change only depends on the nature of that change itself, without any further impact due to the absence of subsequent changes. The construction of normalized systems is based on necessary and sufficient fundamental (atomic) building blocks with proven adaptability. Actual building of a normalized IT system boils down to the repeated instantiation of the fundamental building blocks. Very short delivery and test times are thereby achieved.

Understandably, the relative easiness of changing normalized systems (high level of adaptability) significantly contributes to low IT system total cost of ownership, as well as significantly contributes to enterprise adaptability. Moreover, certain design principles underlying normalized system design can be applied at the enterprise level directly for enhancing enterprise flexibility and agility [Nuffel 2011, Huysmans 2011]. Appreciably, all these principles are aspects of enterprise architecture.

3.4 The phases of enterprise realization

The four phases of enterprise realization depicted along the vertical axis in figure 3.8 are redrawn in figure 3.11. This figure was introduced earlier in Chapter 2 (cf. figure 2.9). We recall the four phases identified as:

- Orienting/intending: conceptual exploration.
- Development/design: conceptual realization
- Building/implementation: physical, ready-to-use, realization
- Delivery/Operation: physical, in-use, exploitation.

Aspects of the enterprise reference context mentioned in figure 3.1 are positioned at the far-left. As mentioned, the definition of the specific nature of these aspects is part of enterprise governance, and characterized as an emerging and learning process, as discussed in Chapter 2. Aspects of the enterprise reference context must (also) be addressed in the development/design phase. This is the
phase of enterprise engineering. Like argued in Chapter 2, many strategic initiatives are developed in this phase. The dotted line indicates that the phases orienting/intending and development/design have an interacting, iterative relationship. As stressed before, the enterprise engineering process is iterative, concurrent and emergent. Note, that enterprise governance encompasses all phases, except the phase that concerns the daily operation, which we have associated with enterprise ‘management’ in its operational meaning.

We re-emphasize that only then building and implementation can take place – thus one or more projects are executed – if it is precisely defined through enterprise engineering what the project result must be. Put differently, the transition from the development/design phase to the build/implementation phase must, at least for the activities undertaken in the project, be based on a clear, specific enough design. Comparable considerations hold for the transition towards the deliver/operational phase. Figure 3.12 aims to provide a graphical summary of the design process discussed before.

![Figure 3.12. Summary overview of topics discussed](image)

Having elaborated on the essentials of enterprise governance and enterprise engineering, we like to emphasize a final point. From our previous discussion we conclude that the formal portfolio of activities concerning enterprise change is defined by: (1) key actions associated with the definition of requirements (cf. figure 3.2), (2) key actions associated with the definition of enterprise architecture (cf. figures 3.9 and 3.10), and (3) studies, pilots or projects that are defined by the enterprise design process. All these activities are developed within the inquisitive process of enterprise governance, as discussed in Paragraph 2.6 and schematically shown in figure 3.12. Note that it is the very nature of these mutually related governance activities that ensures that the formal portfolio of activities is coherent and consistent. Hence, ultimately ensures a unified and integrated enterprise. Unlike this perspective, some publication advance the idea of ‘portfolio management’ as a relatively
autonomous activity for defining or selecting projects to be executed. Presumably, such ‘management’ of a project portfolio would safeguard the coherence and consistency of the portfolio, and would ultimately lead to successfully operationalizing strategic intentions and areas of concern, as well as would lead to a unified and integrated enterprise. In view of our discussion so far, we fail to see how this notion of ‘portfolio management’ can be justified.

3.5 Multidisciplinary perspective and the unifying role of enterprise engineering

Figure 3.13. Unifying role of enterprise engineering

Our previous discussion indicated that enterprises are multifaceted entities. Indeed, a multitude of topics play a role, such as, service orientation, customer satisfaction, employee behavior and motivation, process excellence, quality, lean production, leadership and management, compliance with rules and legislation, effective internal and external communication, finance and administration, business intelligence and knowledge management, information supply, and the productive utilization of (information) technology. Despite their different nature, these topics must be treated in a coherent and consistent manner in order for the enterprise to operate as a unified and integrated whole. Enterprise engineering thus inherently has a multidisciplinary perspective, whereby all the topics must be coherently and consistently addressed within the various enterprise design domains, guided by enterprise architecture. So, as an illustration, legal topics about warranty and compliance with financial regulations have not merely a bearing within processes of a legal department, but rather have a bearing on operational processes in which these topics must be embodied and effectuated. For example, maintenance staff should know that faulty parts are still under vendor warranty. Likewise, legal topics also have financial/administrative implications, as well as implications for the design of information systems. Comparably, the International Financial Reporting Standards (IFRS) dictates that financial reporting must be based on the same data as is used for managing the enterprise operationally. Intricate relationships thus hold for operational process design and the design of financial reporting. As a final example of the multidisciplinary perspective: motivated employees are not achieved through financial incentives, but through employee development, recognition, involvement and autonomy. In line with earlier observations, addressing these aspects effectively, requires adequate attention to various enterprise design domains, like processes,
informational support, employee reward systems, employee assessment, norms and values, communication, reporting, etc. As the examples illustrate, a unified and integrated enterprise requires a concurrently exercised multidisciplinary perspective. Yet, such perspective is not always manifest. The reason for that does not primarily lie in the fact that the different topics, such as the ones mentioned in figure 3.13, are treated from within different disciplines. Surely, that is to be expected since the topics necessitate specialist knowledge. Hence, to a large extent, the different disciplines have also led to comparable different functional entities within enterprises, which all too often, treat the different topics in isolation. Fragmentation rather than unity and integration is the inevitable result. So, we submit as a prime reason for the apparent lack of a concurrent multidisciplinary approach the lack of a discipline that constitutes such an approach. As figure 3.13 aims to illustrate, enterprise engineering is positioned as the unifying and integrating discipline. In doing so, the challenge for both enterprise engineering theory and practice lies in acknowledging the individual theoretical, knowledge, and skill domains of the various disciplines, while at the same time providing a theory and methodology that enables effective communication with the respective disciplines, and utilize and integrate that part of their knowledge domain such that a unified and integrated approach for enterprise design is created. For such enterprise engineering discipline to work effectively within enterprises, an effective enterprise governance competence is crucial, as argued before [Hoogervorst 2009]. Obviously, the unifying and integrating discipline of enterprise engineering within enterprises can only be established if related academic research and education exists. We think that enterprise engineering and enterprise governance offer unique and fruitful unifying and integrating possibilities for those academic disciplines that have a bearing on enterprise operation and performance.

3.6 Criticisms: questioning the practical value of enterprise engineering

The McKinsey study quoted Paragraph 1.1.1 observed lack of attention for enterprise design. Partly this situation seems to be the result of the absence of a firmly established enterprise engineering discipline. Indeed, as the social-psychologist Kurt Lewin stated: nothing is as practical as a good theory. Nonetheless, the apparent lack of attention for enterprise design seems also due to the assumption that the complexity of enterprises cannot be fully grasped and mastered. Comments against enterprise engineering boil down to three objections. First, contrary to Lewin’s maxim, the approach is considered ‘academic’, complicated, and (thus) not suitable for practically oriented ‘business people’. One might observe that many ‘academic’ approaches are rather practical, also as the approach is complicated. Indeed, the design of an aircraft is complicated and based on academic knowledge and methodologies. Yet, passengers would presumably rather board an aircraft designed and built by a manufacturer who did not shrink from the inevitable complicatedness, instead of boarding an aircraft designed and built by quacks. This likewise holds for enterprises. Consequences of poorly designed enterprises are generally less lethal (unfortunately not always), but nevertheless considerable. Not shrinking from complicatedness seems also in the case of enterprises much to be preferred. The second criticism states that no enterprise can be completely designed: enterprises are too complex for assuming the possibility of that condition. Supporting that criticism would thus imply that one accepts that certain parts of the enterprise are left out of scope and are not intentionally designed. That is, in the words of Herbert Simon, are left out of the “courses of action aimed at changing existing situations into preferred ones” [1969, p.111]. For these parts, mere incidental developments would thus ultimately determine whether or not these parts adequately contribute to enterprise capacities and performance. We fail to see the advantage of taking this position over the one that attempts to bring the totality of an enterprise within the design perspective, while
mastering enterprise complexity. Finally, the third criticism is closely related to the previous one, and states that unity and integration for the whole enterprise is untenable. Actual observations about enterprise conditions indeed seem to confirm this criticism. Enterprises seem rife with fragmentation, incoherence and inconsistency, which grow (most likely) unintentionally over time as a result of enterprise complexity and lack of general oversight. However, this criticism seems to be based on the rejection of the very approach that could have avoided the criticism. Precisely the lack of a unifying and integrating discipline lies at the heart of fragmentation, incoherence, and inconsistency. As we have argued, that discipline is enterprise engineering embedded in the overall enterprise governance competence. Both are essential for realizing strategic success.

3.7 Conclusion

Successfully operationalizing strategic choices and areas of concern necessitates the realization of a unified and integrated enterprise. This is far from a trivial issue that can only be satisfactorily addressed through holistic enterprise design, under adequate enterprise governance. Basics about enterprise governance and enterprise engineering have been briefly discussed that aim to address enterprise complexity, dynamics and uncertainty, and aim to effectuate holistic enterprise design. In doing so, enterprise engineering provides the platform (theory and methodology) for unifying and integrating multidisciplinary enterprise aspects that would otherwise be treated incoherently and inconsistently in isolation, thereby jeopardizing enterprise success.
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