# ENTERPRISE ARCHITECTURES AND ORGANIZATIONS

## Analysing and designing their social and cultural interactions

Sander Meijer

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## Analysing and designing their social and cultural interactions

## ENTERPRISE ARCHITECTUREN
## EN ORGANISATIES

Analyseren en ontwerpen van hun sociale en culturele interacties

Thesis

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All architecture is shelter, all great architecture is the design of space that contains, cuddles, exalts, or stimulates the persons in that space.

Philip Johnson

To my dear wife, my daughter Eva and my son Tim
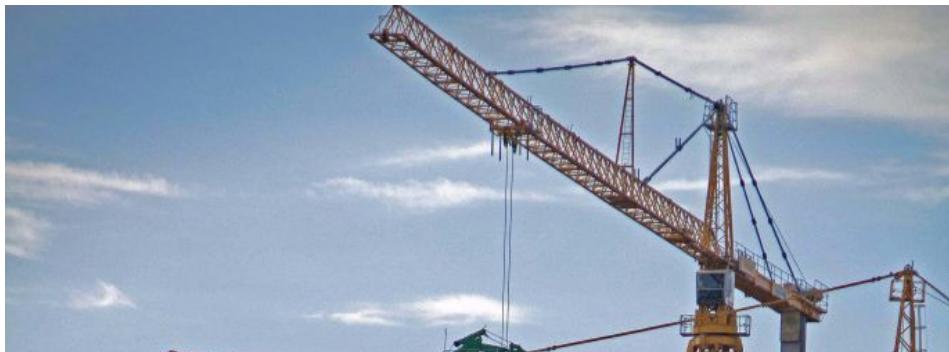
# PREFACE AND ACKNOWLEDGEMENTS

"Architecture can't fully represent the chaos and turmoil that are part of the human personality, but you need to put some of that turmoil into the architecture, or it isn't real."

Frank Stella

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# 1  INTRODUCTION

"The principle of the Gothic architecture is Infinity made imaginable."

Samuel Taylor

## 1.1 Introduction

This chapter introduces the research. This research is a design research, takes place in the context of e-government and focuses on the consideration and incorporation of social and cultural aspects of public organizations in enterprise architectures designs. The discipline of enterprise architecture is related to architecture, organization science, information science and software engineering. Therefore, these disciplines and their approaches to the consideration and incorporation of social and cultural aspects of organizations in their designs are briefly introduced in this chapter. The chapter closes with the research objective, the research questions, a summary of the research approach and the contributions that, it is hoped, the research will make.

## 1.2 Research background

### E-government implementation

E-government has been defined by Postma and Wallage as a government in which interaction between government and citizens takes place as much as possible through electronic means, with the aim of enhancing service delivery, law-enforcement, and citizen participation (Postma and Wallage 2007 p. 4). A major service delivery concept in e-government is 'OneStopShop government'. This concept has since 1980 triggered the need for new organization-wide designs of information systems, new organization and new business models, both within governmental organizations and in the relations between governmental organizations. Seventy-four large scale projects with a total budget of €5 billion have been initiated since 1999 in the Netherlands to design and implement e-government and OneStopShop government (Ter Horst 2007). One of those projects, SVBTien, was initiated in 2006 with a budget of €92 million. It is used as a case-study in this research. The OneStopShop government concept has been derived from the 'one stop shopping' concept in operations management (Bekkers and Zouridis 1999; Cook 2000; Meghan 2000; Efthimios 2008) and is an approach to integrating public service delivery from a citizen's, or public services customer's, point of view (Kubiceck and Hagen 2000).

A much commented-on issue in the design and implementation of e-government and OneStopShop government is overcoming the dominant focus on technology and traditional organization models in the design and implementation programmes and supporting organizations (Frissen 2007; Postma and Wallage 2007; Algemene Rekenkamer 2008; Docters van Leeuwen 2009). Frissen (2007) reports that developments in ICT like Web 2.0 are insufficiently deployed in the public sector, much of the ICT deployment in the public sector is based on a closed and hierarchical model instead of an open and decentralized network model and ICT innovations in the public domain have a strongly technological and instrumental perspective. She states that workers experience that their work is reduced to the execution of highly prescribed protocols by means of ICT, and is governed by ICT, and that close supervision by management continues. She concludes that professional workers experience ICT as a

burden and a straight-jacket. In 2008 the High Council of State in the Netherlands, a central government body that was established to ensure that the democratic system functions properly, concluded in a investigation on problems in governmental ICT projects that business and ICT are domains that are separated in those projects (Algemene Rekenkamer 2008). The investigators concluded that people in the business domain think too much in terms of ICT solutions and not in terms of business requirements. Furthermore, business management takes too little notice of the impact that changes in the organization have on ICT solutions. In the Council's view ICT is an asset which is not well understood in terms of contributions to business results. Postma and Wallage (2007) also reported these kind of issues. They stated that a large number of interviewees in their research experience the introduction of e-government as mainly a technical operation. In their view e-government projects remain too much in the technical domain whereas e-government is also about business processes, organization, and people. A gateway review, a peer review conducted by a small team of experts, was conducted in December 2009 on the design and implementation process of e-government. The reviewers said that the design and implementation of e-government focus almost solely on ICT and the technical side of government transformation (Docters van Leeuwen 2009). The reviewers report that ICT has become an end in itself, instead of a means to an end. These issues also occurred during the design of OneStopShop government in the governmental organization SVB, which is used as a case-study in this research. Management and business architects in that organization expressed concerns regarding the dominant focus on ICT and technology, the use of enterprise architectures and the role of employees in the new designs. The question they raised was how workforce preferences, such as professionalism and individualism, and concepts such as Enterprise 2.0 are considered by enterprise architects and incorporated by them in enterprise architecture designs.


### The enterprise architecture discipline

Enterprise architectures have been used since 1990 in the design and implementation of OneStopShop government and e-government (Janssen and Hjort-Madsen 2007; Wimmer, Scholl et al. 2008). It is a relative young discipline: some argue it is still in its infancy (Langenberg and Wegmann 2004; Op't Land, Proper et al. 2009). An enterprise architecture describes an enterprise in terms of organizational structure, business processes, information systems, software, and technical infrastructures. It describes both the actual and to-be organization and information systems and supports the transition by providing insights in the consistencies and dependencies of the different parts of the enterprise (Goutier and Van Lieshout 2010).

The enterprise architecture discipline originates from information systems development. Before 1980 information systems development focused on the development of stand-alone applications. General ledger and materials requirements planning (MRP) were the first functional areas to get standardized information systems (Klaus, Rosemann et al. 2000). MRP information systems increased in complexity and size due to the evolution of MRP systems into MRP-II packages that supported the complete production planning and control cycle, the long-term sales forecast and the

master production schedule. The complexity of information systems increased in the 1980s when software packages started to cover product development and production processes and led in the 1990s to enterprise resource planning systems (ERP) that include MRPII functionalities, integrated functionalities and data across suppliers, departments and customers. Because of the organization-wide scope of ERP systems from 1980 onwards, the organizational processes impact had to be taken into account in the design and application of information systems. The increase in the complexity and size of information systems, the management of interfaces between and integration of all information system components led in the 1980s to the development of architecture programmes. The focal point of architecture in those programmes was defining and controlling interfaces between and integration of all components of information systems. These programmes led to the enterprise Architecture discipline.

The term enterprise architecture originates from the Clinger-Cohen Act of 1996 (Langenberg and Wegmann 2004). That act intended to resolve the problems reported in the Computer Chaos Report by U.S. senator Cohen, who highlighted some long-standing systematic problems with acquiring, management and use IT systems in governmental agencies (Cohen 1994; Cohen 1996). The holistic integrated view of enterprises also defines the scope of the discipline, which works at the level of the complete enterprise. It includes the organization, its processes, its information, its information systems and its technical infrastructures. This definition of enterprise architecture is also used in other acts, for example in the e-government act (2002). A widely used definition of architecture amongst enterprise architects is based on the definition of ISO/IEC 42010:2007, the Standard for Architectural Description of Software-Intensive Systems: "*Architecture is the fundamental organization of a system embodied in its components, their relationships to each other and to the environment and the principles guiding its design and evolution*" (The Open Group 2009 p. 9).

Due to the origin, scope and design approach of the discipline, enterprise architecture applies knowledge from a number of disciplines such as software engineering, organization science, information systems research and traditional architecture (Figure 1). For this reason design science knowledge from those disciplines is applied and reported in this enquiry.
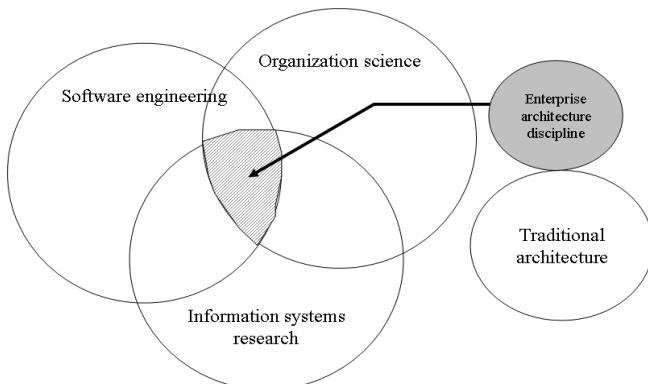


**Figure 1: The enterprise architecture discipline related to reference discipline**

Together with the introduction of the enterprise architecture discipline in the 1990s came the introduction of a new profession: the enterprise architect. This introduction triggered a debate about the role of enterprise architects in organizations. Originally, in the 1970s and 1980s, the enterprise architect was an information systems developer or an IT systems engineer. The increased complexity of information systems and the application of information technology in enterprises changed that role. Today the role of enterprise architect can include the definition, design and implementation of business processes as well as the application of technical capabilities and the implementation of measures to increase operational effectiveness and efficiency (Strano and Rehmani 2007). Sledgianowski, Luftman et al. (2006) concluded that the unique role of the enterprise architect is to align technology with the business goals and objectives.

## Design research

This thesis centres on design. Design can be regarded as a problem solving activity that contains both a process as well as a processed artefact (Hevner, March et al. 2004). The challenge of design is to create artefacts that fit into their context and deliver a solution to a stated problem. An artefact is an artificial construct made by humans (Simon 1996). It can be a physical construct such as a building, an electronic construct such as an information system, or an abstract construct such as a management intervention. The context of a problem and its solution is always part of the design and places demands on its form (Jutla 1993). In a purposeful design a fit exists between the design, the solution and the context in which it is positioned. For example, an IT artefact can be regarded as a combination of material and cultural properties in a socially recognizable form (Orlikowski and Iacono 2001). Therefore, a design process can be regarded as a mapping process from a 'functional' space into an 'attribute' space within a given context (Takeda, Veerkamp et al. 1990). The 'functional' space represents the problem and the 'attribute' space represents a solution to that problem. The design process of enterprise architectures is closely related to the design process of information systems. According to Takeda et al. a descriptive model, a cognitive model and a computable model are all needed in the design process of information systems. These models are also applied in enterprise architecture designs. The descriptive model describes the solution, and the cognitive model describes the reasoning in the solution. The computable model is the model in which the descriptive model and the cognitive model are combined and that is executable by computers. This design process is illustrated in Figure 2.
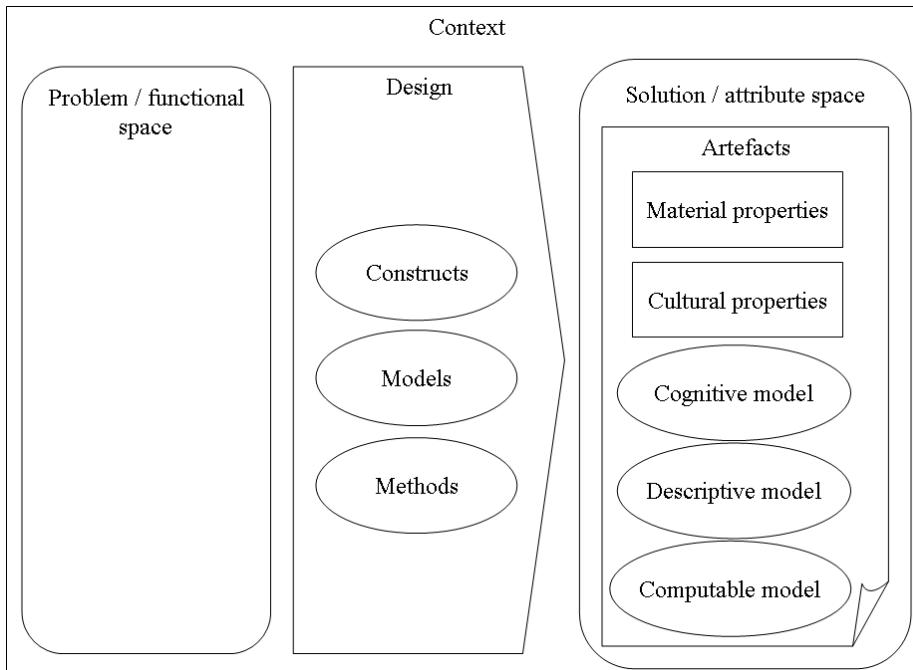
**Figure 2: Design process of information systems**

Design research seeks to enhance human and organizational possibilities in order to create new and innovative artefacts. It stimulates critical thinking and focuses on the development and justification of theories that explain or predict phenomena regarding the analysis, implementation and use of artefacts. It addresses important unresolved issues in the design of solutions to problems in certain contexts. It includes investigations into new ways to make designs more efficient or effective.

Design research is closely related to engineering. A distinction between engineering and design research is that design is about creating some artefact whilst design research creates scientific and practical knowledge. This distinction has been studied by Johnson (1994) in traditional architecture. He argues that design research rests heavily on persuasion of the audience. Persuasion can be regarded as a test of the research results. Successful persuasion can be considered as an indicator regarding the generalizability of research results.

Design research has a number of features that set it apart from other theories such as social science or natural science theories. A distinct feature is that it deals with artificial phenomena rather than natural phenomena (Simon 1996 p. xi). For example, in social sciences organizational goals can be the object of study. A purpose of a behavioural study can be to explain why goals exist in organizations or how they affect behaviour. Design theory deals with the creation of artefacts that support the achievement of goals, given the context in which the achievement takes place. Furthermore, design research focuses on utilization. For that reason Walls, Widmeyer and Sawy (1992) see design theory as a prescriptive and normative theory that states how a design process should be carried out to reach a predetermined goal. They state

that design is both a product, an artefact, and a process, a set of activities. Therefore, a design theory consists of product and process aspects. Each class of problems can be addressed through a specific design product and a design process and draws on kernel theories that are generally taken from natural sciences. A class can be used to test whether the product and the process satisfy those theories. Another distinct feature of design research is that in a design the set of variables contain context variables and other organizational variables. Traditionally context variables are not regarded by explanatory sciences because they complicate causal models and consequently reduce the possibility of studying phenomena.

Key products of design research are constructs, models, methods and instantiations. Constructs form the language within a specific domain. They are used to conceptualize problems and solutions. Models are representations of a specific domain and represent the design problem and the solution in a real world setting by using constructs and propositions that express relationships between and within constructs. Methods are algorithms and practices that use constructs and models to design and implement solutions. Instantiations are realizations of the models in the real world.

A design theory can consist of structural components such as a purpose and scope, constructs, principles, artefact mutability, propositions and knowledge. Gregor and Jones (2007) emphasize the importance to incorporate the design of methodologies and interventions into the design science field.

Key questions in design science are whether the constructs, models, and methods produces artefacts and instantiations that are viable, and whether a fit exists between the artefacts, the problem they intend to solve, and the context in which they are positioned. Therefore, creating and evaluating artefacts are basic activities of design science. Evaluation is a necessary aspect in design research because it is needed to evaluate whether the designed and implemented artefact has solved the problem it was designed for.

The focus of a design should be on the creation of artefacts that are encapsulated in rich contexts of organizations such as structures, routines, norms and values. According to Benbasat and Zmud (2003), core properties of information systems design science are capabilities and practices to design and maintain IT artefacts, human behaviours such as planning and designing concerning those artefacts, practices for artefact evolution and usage and impacts of artefacts on the context in which they are embedded. Therefore, information science research should not only focus on the artefact, but also on the transformational aspects of the technology at the macro level in order to create knowledge to improve the human condition (Agarwal and Lucas 2005). In these respects the enterprise architecture discipline closely resembles information science.

Design and design science are central themes in a number of disciplines that are closely related to enterprise architecture such as architecture, management science, software engineering and information systems research (Simon 1996; Van Aken 2004). In information systems research design science is one of two dominant research paradigms (March and Smith 1995; Hevner, March et al. 2004; Peffers, Tuunanen et al. 2007; Hevner 2010). March and Smith (1995) argue that both design and natural sciences are needed in a design to ensure that a design is relevant and effective. This combination of two distinct sciences is a characteristic of IT research and information

systems (Lee 2000). The combination of design science and explanatory science creates scientific knowledge regarding the design and instantiation of artefacts that can be applied in organizations to solve construction and improvement problems (Van Aken 2004; Van Aken 2005). In organization studies and management science, design science bridges the gap between theory and practice (Romme 2003; Van Aken 2004). Hevner et al. (2004) state in their guidelines that design science should not only produce viable artefacts, but also artefacts that address important organizational problems.

How to conduct design science research has been published by Hevner, March, Park and Ram (2004). Their conceptual framework is presented in Figure 3.
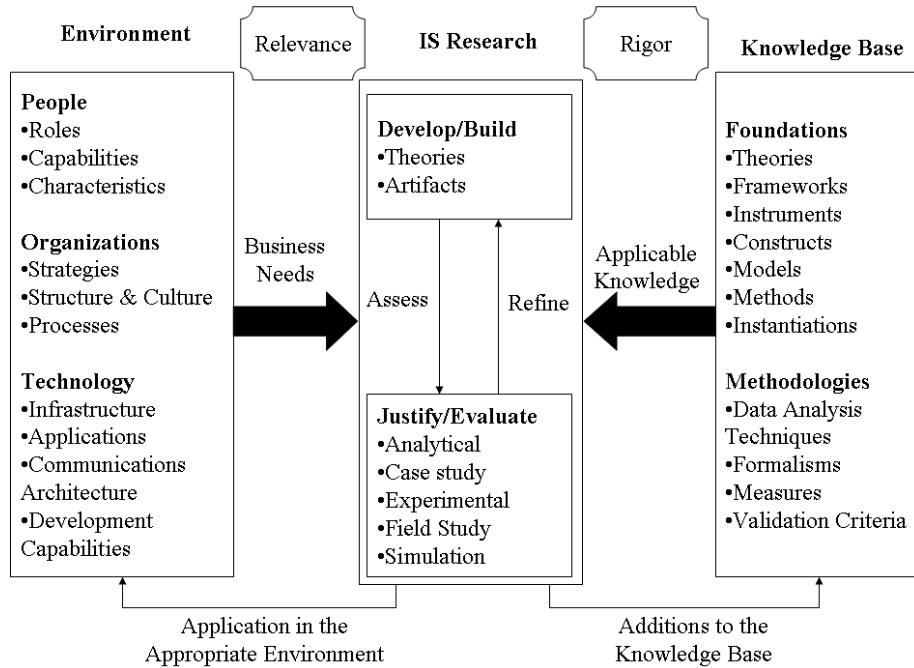


**Figure 3: Information systems research framework**

The epistemological stance of design science is pragmatism (Romme 2003). According to Romme, design science is the creation of knowledge in the service of creating what should be and does not yet exist. Design science is solution driven and the design scientist is an observer as well as an active participant. Consequently, design science and action research have strong parallels (Järvinen 2007; Purao 2010). An issue in design science is that it can not lead to law-like generalizations because a prescription only holds true for a certain mix of variables. The prescription is bound to a certain context.

## Design in enterprise architecture

Traditional architecture is used in the Clinger-Cohen-act as a metaphor. That reference was not the first reference to architecture. Zachman, who in 1987 was a systems engineer at IBM, used architecture as a metaphor in the discipline of systems engineering to symbolize the complexity and size of information systems (Zachman 1987; Zachman 1997). According to him, the architecture metaphor is needed to address the consistency and integration of all the different information system components and interfaces between them that are used in organizations. He promoted an architecture design approach to design complex objects. Nolan and Mulryan (1987) also used architecture as a metaphor in the discipline of systems engineering. They argued that a parallel exists between enterprise architecture designs and city planning because both disciplines deal with much uncertainty in the design processes and the designs should be flexible enough to accommodate future developments and shifts in user preferences. This parallel between architecture, city planning and enterprise architecture still holds today (Zachman 1987; Bernus and Nemes 2003; Schekkerman 2004). In 2000 the Computer Society approved IEEE Standard 1471 which documents a consensus on good architectural description practice (Maieer, Emery et al. 2001). The IEEE Standard 1471 is adopted by ISO/ICE 4201 and uses civil architecture as a metaphor for the design of software intensive systems. They emphasize the different perspective that are inherent in architecture descriptions (Maieer, Emery et al. 2001).

According to Zachman (Zachman 1997; 2007-2008), enterprise architecture is all about stakeholder perspectives. Each perspective, or viewpoint, has a corresponding stakeholder with its own definition, meaning, need and application. Views can be those of the owner, the architect, the designer and the user. In his online article 'Architecture Is Architecture Is Architecture' Zachman states that an architecture contains descriptive representations of an object and the intersections between abstractions of that object and stakeholder perspectives. An abstraction is a model of a component of the object that is designed. A perspective is a specific view of the component of the object. His design theory include constructs, abstract models, viewpoints and principles that can be used to represent all kind of complex objects, such as organizations and information systems, and accommodate their change and maintenance. He argues that the object itself is not architecture, but the result of it.

## Design in architecture

There are many parallels between traditional architecture and enterprise architecture. For example, both disciplines are about the production of space. Architecture produces physical space and enterprise architecture produces abstract space. Humans are almost always influenced by the experience they get from that that space (Hall 1982). Consequently, the design and built environment for enterprise architectures and the building environment for architecture have similarities. In architectural practice the building environment is a social, political and cultural construction in which the design professional plays a central role (Cuff 2000). Rationalist design approaches are used widely in traditional architecture. Traditional architecture can be defined as an art and

technique of designing and building (Ackerman, Collins et al. 2009). The interpretation of architecture as an art can be dated back to Marcus Vitruvius Pollio (± 85-20 B.C.), the first known architect to include 'venustas' (beauty) amongst the defining characteristics of architecture in his *De architectura libri X* (Ten books on Architecture). According to Vitruvius, architecture has three qualities: (1) *firmitas*; (2) *utilitas*; (3) *venustas*. It means that a physical building must be durable, useful and beautiful (Vitruvius, English translation 2005). Henry Wotton (1624) translated these properties as 'firmness', 'commodity' and 'delight'. In about 1450 the Italian architect Leon Batista Alberti wrote a treatise on architecture: *De re aedificatoria* (On Building). He described architectural beauty as being when all parts are in harmony with each other, and harmony is disturbed by even the smallest change in those parts or their ordering (Alberti, English translation 1988). In this sense architecture is more than just a building. In architecture the building expresses some feeling. According to Scruton (1980 p. 160), meaningfulness of a building will reflect and depend upon the way and order in which its parts are combined and put together. The architect Le Corbusier wrote in *Vers une architecture* in 1923 that engineering becomes architecture when ingenuity is at work and the heart is touched (Corbusier p. 215, English translation 2008). According to Panofsky, architecture aspires to totality, articulation and coherence (Panofsky 1976 p. 31). Totality means that the building should fit within the physical location and the surrounding structures or nature surrounding it. In the creation of Gothic cathedrals articulation and coherence has been interpreted as involving the integration of theology, morality, nature and history in the plan, elevation and furnishings of the great cathedral churches (Haldane 1998). There is continuing debate among architects about whether architecture is an art and whether it is correct to separate architecture from engineering and construction. For example, according to Esherick, an American architect, architecture is problem solving and beauty is a by-product, not the goal of architecture (Esherick 1966 p. 111). On the other side Roth argues that architecture is a form of expressive art that cannot be separated from practical requirements (Roth 2007 p. 3-7). In support Roth cites Emerson, who defined architecture as 'a shelter in the form of art, a blossoming in stone and flowering of geometry', and Rohe, a German-American architect, who defined architecture as 'the will of an epoch translated into space', and Huxtable, an American architecture critic and writer, who defined architecture as 'a balance of structural science and aesthetic expression for the satisfaction of needs that go far beyond the utilitarian'. Roth states that the purpose of architecture is to fulfil both practical and expressive requirements. He defines architecture as 'the crystallization of ideas' and 'a form of dialogue with the past and future'. The reference to dialogue is present in the translation of the Latin term ratiocination that was used by Vitruvius and refers to methodically and logically reasoning. In this regard a physical building is a rhetorical device, which is reasoning with oneself by making a statement, then questioning that statement, then answering that question. Architecture can be regarded as the enclosure of space or space enclosed (Scruton 1980). According to Zevi (1957 p. 160-161), architecture is the meaningful enclosure of space. Architectural design processes can be regarded as problem solving activities and the search for meaning because the enclosure of space is not only related to the builder, but also to the man who occupies it and his fellow men who are influenced by it (Scruton 1980 p. 32).

# Design in organization science

A parallel between enterprise architecture and organization science is the application of systems thinking in design approaches. Due to the industrialization of society, functional designs from the macro to the micro functional level were used in early systems thinking as a means of solving industrialization problems concerning government, administration and planning. In order to accommodate industrialization complexity large-scale systems evolved incorporating many interacting variables that had to be coordinated and controlled in order to achieve specific goals. Rational action, performance goals and technological development were needed to accomplish that. Rice (1963 p. 16) argued that an organization is an open system because of its relations with its environment. An open system can be defined as a complex set of elements standing in interrelation among themselves and with the environment (Bertalanffy 1972 p. 417). According to Miller (Miller and Rice 1967 p. 135-142), an organization can be designed as an open system using elements from the internal and the external environments, and the organization and management of transactions across internal boundaries and boundaries with external systems. An organization can be designed in rational terms of activities through which the import, conversion and export processes are carried out. Furthermore, concepts from general systems theory such as homoeostasis, cybernetic control, and dynamic equilibrium can be applied in the design to support organizational phenomena such as stability and adaptation (Morel and Ramanujam 1999).

Another design approach, such as socio-technical design, defines organizations by their sets of social activities, social groupings, social relations and their deliberately established purpose or goal (Parsons 1960; Blau 1962; Etzioni 1964; Stinchcombe 1965; Likert 1967; Van Aken 2000; Lammers, Mijs et al. 2001). In the socio-technical design approach that has been developed at the Tavistock Institute in England an organization is regarded as the combination of a social system and a technical system that need to be jointly optimized (Trist 1981; Cherns 1987; Mumford 2006). The socio-technical design approach that originated in the Netherlands is The Integral Organization Renewal theory of De Sitter (De Sitter, Den Hartog et al. 1997). In those socio-technical design approaches culture plays an important role. The set of social activities, social groupings, social relations and the deliberately established purpose or goal defines an enterprise and creates meaning for its members and is reflected in the culture of an organization. Hofstede et al. define culture as 'that which distinguishes one group of people from another' (Hofstede, Pedersen et al. 2002 p. 34). They relates it to the way in which a group of people resolves issues such as identity, hierarchy, gender, truth and virtue. Johnson (1992 p. 29) refers to culture as the core set of beliefs and assumptions of the organization's view of itself and the environment that is used to interpret events and formulate actions. Schein suggests a relationship between visible artefacts such as processes and structures and underlying assumptions such as perceptions, thoughts and feelings (Schein 1988; Schein 2009).

Another design approach regards organizations as processes that have lives of their own and are independent of human control (Cooper and Burrell 1988). In this design approach organizations do not have meanings or purposes: they have no fixed location and act independently of human control (Burrell 1988; Cooper and Burrell 1988; Burrell 1994; Lammers, Mijs et al. 2001). In this design approach the

organization is regarded as a process within society that is loosely coupled, fluid, organic and adhocratic (Hardy 1999 p. 389). This perspective on organizations arose from developments in science and technology such as the internet, network organizations, mass communication and transportation (Aylesworth 2010). In this perspective, the organization's structure is difficult to pin down and activities are distributed among a network of units. Consequently, the organization's identity, shared values and common meaning are ambiguous and fractured, the individual is a fiction, language is shaky and the grand narrative is out of fashion and not appropriate (Alvesson 1995).

Another design approach is to regard organizations as chaotic systems. This design approach questions the notion of homoeostasis (Mumford 2006). Thiétart and Forgues claim that organizational systems always contain seeds of both order and chaos as a result of the counteracting forces and continuous change to which organizations are subject (Thiétart and Forgues 1995). In this design approach organizations are considered to be potentially chaotic. They move from one dynamic state to the other. Unpredictability is a fact of life and forecasting is impossible, especially on a global scale and in the long term. Dooley builds on the idea of chaos in organizations and proposes a complex adaptive systems model in order to understand and analyse change in complex systems in a holistic manner (Dooley 1997). He describes complex adaptive systems as self-organizing, and order in them as emergent and not predetermined: complex adaptive systems are learning and are typified by non-linear flows of information and resources. The state of such systems is considered to be irreversible and often unpredictable. When they are pushed too far beyond their equilibrium conditions, paradoxical changes occur with variations between randomness and order, freedom and control, learning and unlearning, adaptation to the environment and construction of the environment. According to Manson (2001), a complex system is defined more by relationships than by its constituent parts. He claims that it is impossible for the whole system to have a unified purpose because of the complexity of relationships between these components, the locality of interactions between linked components and the lack of a continuously updated common body of information in the whole system. In these systems social norms emerge from interaction between system components and relationships.

## Design in information systems research

A parallel between design research in enterprise architecture and in information systems research is the dominance of rationalist thinking in design approaches. Design research in information systems research is closely related to design research in organization science. In fact, Markus and Robey (1988) suggested as long ago as 1988 that information systems research should be integrated into organizational theory because of the many links between the disciplines. Even a relation with between the metaphors of Morgan and information systems design has been proposed (Walsham 1991).

Around 1977 the socio-technical systems design approach for information systems was developed in order to design information systems that are both able to perform according to requirements and satisfy their users. Just like the socio-technical

theory in organization science that was developed by scholars such as Trist and Emery, the purpose of the socio-technical information systems design approach is to optimize both the technical and the social systems of the organization. In the socio-technical design method the technical system concerns processes, tasks and technologies to transform inputs to outputs and the social system is concerned with attitudes, skills, beliefs and values (Bostrom and Heinen 1977). Another design approach that is based on the socio-technical approach is called social informatics. It emerged in 1970s and focuses on technologies as social products that emerge from complex interactions (Davenport 2008).

In the design approaches in information systems research rationality is paramount (Hirschheim and Newman 1991). However, organizations process information to manage uncertainty and equivocality and in 1986 Daft and Lengel claimed that information processing in organizations need to deal with variety and uncertainty because organizations are open social systems in which information is needed to accomplish internal tasks, coordination and interpretation and many issues in organizations are fuzzy and ill-defined due to the social characteristics of organizations (Daft and Lengel 1986).

In 1991 Hirschheim and Newman (1991) found that only a minority of information systems developers was conscious of the fact that systems development is not a highly rationalist exercise. They linked failures in information systems development to rationalism in the design. Furthermore, they found that there is little agreement in the profession on how to reduce rationalism in design methods. According to Orlikowski and Robey (1991), social phenomena of organizations need to be understood in an information systems design effort. In their view, the social phenomena include both subjective and objective elements, and it is this duality that characterizes the relationship between organizations and information systems. They refer to Weber who posits a social system as a subjective reality, because a social system is the result of human behaviour, and they refer to Durkheim who posits a social system as an objective reality because he focuses on the institutional aspects of social systems that are independent of human action.

For Orlikowski and Robey information system design approaches needs to include both an objectivist and subjectivist approach, because a social system consists of objective structures and conditions together with subjective human action. This is contrary to the view of Hirschheim and Klein (1989), according to whom objective and subjective perspectives cannot be integrated in an information systems design. They said that there are four distinct paradigms in information systems design[1]: (1) a functionalist design paradigm that is based on the assumption of an ordered social world that can be objectively designed by using methods from natural sciences; (2) a social relativist design paradigm that assumes an ordered social world that can not be objectively designed by using methods from natural sciences; (3) a radical structuralist design paradigm that is based on the assumptions of an unordered social world that can be objectively designed by using methods from natural sciences; (4) a neo-humanist paradigm that is based on the assumptions of an unordered social world that can not be objectively designed by using methods from natural sciences. Their illustration of the

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[1] This is borrowed verbatim from: Burrell, G. and G. Morgan (1979). Sociological paradigms and organisational analysis. Burlington, Ashgate Publishing Company.

paradigms, which is borrowed from Burrell and Morgan (1979 p. 22), is presented in Figure 4.



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                              ORDER
                                ↑
                                │
                                │    Social
                  Functionalism │    Relativism
                                │
OBJECTIVISM ←───────────────────┼───────────────────→ SUBJECTIVISM
                                │
                  Radical       │    Neohumanism
                  Structuralism │
                                │
                                ↓
                             CONFLICT
```
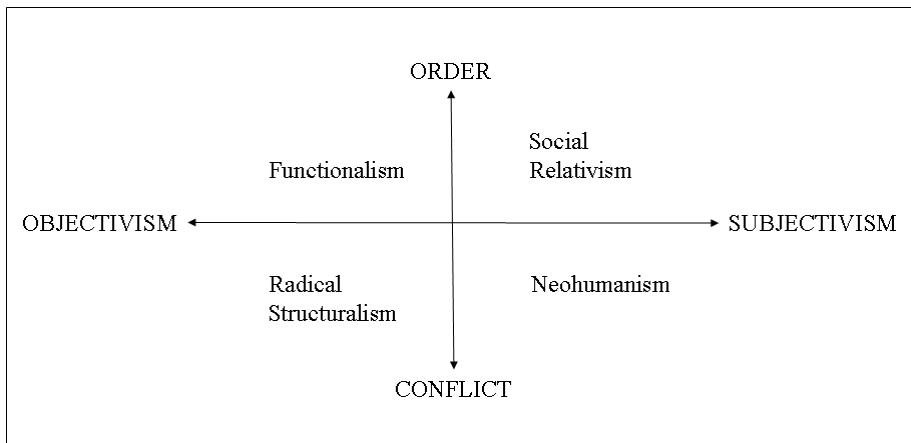
**Figure 4: Information systems design paradigms by Hirschheim and Klein**

Unlike Hirschheim and Klein, Orlikowski and Robey claim that the objective and subjective paradigms can be integrated in a design by using a structurational perspective. They adopt Giddens' theory of structuration, in which structure is an abstract property of social systems that exists together with social actors who enact and interpret it. Structures evolve during social action and become institutionalized, which means that they become the structural properties of organizations. After that, the structural properties determine social action. As a result meaning, power and norms are created and re-created. According to DeSanctis and Poole (1994), this structurational perspective, or the Social Technology School, is one of three major perspectives on information systems and organizational change. In the Social Technology School positivist (objective) and interpretive (subjective) perspectives on behaviour are integrated. Design approaches in this school are the socio-technical systems design theory and structural symbolic interaction design theory. The second perspective on information systems and organizational change is the Decision-making School which uses a positivist approach and is focused on technology engineering. The Institutional School is the third perspective and uses an interpretive approach which is focused on the social structure of the organization. DeSanctis and Poole modified the Giddens' structuration theory to address the mutual influence of technology and social processes because Giddens did not include technical artefacts in his theory. Structuration theory has been adopted by the information systems research community (Jones and Karsten 2008). Jones and Karsten found in their review that information systems research pays insufficient attention to the interconnection between individuals and social institutions that is manifested in relationships, norms and meanings, perceptions and identity.

A socio-technical design approach can be used to evaluate how an information system influences the social and technical systems of the organization (Shani and Sena 1994). Such an design approach can provide a framework that can be used to analyse

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the quality of information systems and analyse why information systems are sometimes accepted only reluctantly.

### Design in software engineering

Enterprise architecture includes the applications and the software that an organization uses in the designs. Therefore, software-engineering is closely related to the enterprise architecture discipline. The design approach in the 1970s to engineer software was a highly rational approach that used a top-down functional decomposition of organizational activities (Elfatatry 2007). Since the 1990s the software engineering discipline has been searching for other ways to design software than the practice until then, which had been based on purely rationalist assumptions (Robinson, Hall et al. 1998). The rationalist software design methods since the 1980s has led to software legacies such as relational database systems that are highly structured and are based on the idea that a formal conceptual database scheme can capture and represent the essence of some real world design problem. The rationalist software design approaches were based on the belief that the world is composed of rationalist design problems that can be solved in terms of requirements, software constructs, models, principles and software implementations. Robinson, Hall, et al. claim that a less rationalist software design method is needed to solve real world design problems and they say that such a design approach starts with the recognition that design requirements are implicit in the world and not explicit. Therefore, requirement analysis should be done in such a manner that the requirements appear during the design process and the implementation of software prototypes. This approach leads to an incremental software design and implementation process. This design approach requires the democratization of the development process, full participation of members of the organization, and intensive involvement and contributions of main stakeholders in the design. Remenyi, White et al. (1997) also discuss the need for different software development approaches rather than a pure rationalist one. Software engineering could be random, opportunistic and driven by accident rather than managed and controlled (Truex, Baskerville et al. 2000). Software design, just like architecture should be a negotiation between many small stories into a particular context or contexts (Noble and Biddle 2006). Noble and Biddle refer to Wiki and Google as successful designs that are not based on pure rationalist assumptions. However, less rationalism in software design is regarded as difficult by software designers since they are regarded as logical positivists that dislike ambiguous languages in design processes (Coyne 1997).

## 1.3    Research objectives and research questions

Clegg (2000) argues that enterprise architects put too much emphasis on the technical system of organizations and do not incorporate the human system into their design methods. According to him, the result is that the technical system becomes the focal point of an organization and the social system is then designed around it. Bieberstein et at. argue that most change efforts that are triggered by the introduction of IT fail or are stalled because the change efforts do not address social aspects such as individual

behaviour, and cultural aspects such as the collective culture of the organization (Bieberstein, Bose et al. 2005). Appleton (2005) remarks that the criticisms most often voiced against enterprise architecture is that enterprise architectures are too deterministic, neglect the autonomy of humans, and lower organizational flexibility. These criticisms of enterprise architecture are consistent with much commented-on issues that have been related to the dominant focus on technology in the implementation of e-government (Postma and Wallage 2007; Algemene Rekenkamer 2008). This dominant focus on technology has also been the reason why management in the governmental implementation organization SVB questioned how social and cultural aspects of the organization are considered and incorporated in enterprise architecture designs.

Recommendations in official reports to accelerate the e-government transformation process and reduce the dominance of technology are focused on programme management, governance, roles and responsibilities, consistency between implementation projects, the use of enterprise architectures and general acceptance of e-government (Postma and Wallage 2007; Docters van Leeuwen 2009). A matter that is not dealt with in such reports is the design process itself and the designed artefacts. Therefore, a question that remains unanswered is what the constructs, models and methods that the enterprise architecture discipline uses in the implementation of e-government possibly contribute to the dominant technical focus in the transformation process. Furthermore, the use of enterprise architectures is advocated as enhancing integration and cohesion between e-government components. This advice appears to assume that the enterprise architecture constructs, models and methods that are applied in the design and implementation of e-government are well equipped to consider and incorporate also the social, and the cultural aspects of organizations that implement e-government. However, it is uncertain whether this assumption is correct.

Therefore, the objective of this research is to explore, in the context of e-government, how certain social and cultural aspects of public organizations, from the perspective of a civil servant, should be considered in the design methods and incorporated in the design constructs, models, and principles of the enterprise architecture discipline. The aim of this research is to develop knowledge that can be applied to evaluate how certain social and cultural aspects of organizations are considered and incorporated in enterprise architecture designs and to enhance the consideration and incorporation of these aspects in the enterprise architecture designs of e-government when the problem statement, or the context, of a design tasks requires it.

The research questions in this investigation are:

1. How are social and cultural aspects of organizations considered and incorporated in architecture, organization science, information systems research and software engineering?
2. How are social and cultural aspects of organizations considered and incorporated in enterprise architecture designs?
3. How can the consideration and incorporation of social and cultural aspects of organizations in enterprise architecture designs in the context of e-government be evaluated?

4. What factors influence the way in which social and culture aspects of organizations are considered and incorporated in enterprise architecture designs?

Of the various design approaches presented above, it is the socio-technical design tradition that is most relevant to the research conducted here because its focus is the social and cultural aspects of organizations in designs. Of the various definitions of organizations presented above, it is the definition that defines organizations by their sets of social activities, social groupings, social relations and their deliberately established purpose or goal that is most relevant to the research conducted here. Furthermore, the investigation is focused on enterprise architecture designs and does not include complete enterprise architecture implementations. Of all possible social and cultural aspects of organizations, only those aspects are chosen in this research that are related to quality of working life (Herzberg 1968; Trist 1981; Mumford 1983).

## 1.4   Research approach at a glance

The presented research in this thesis can be classified as descriptive (Dul and Hak 2008) or exploratory (Robson 2002). Examples of exploratory research in the field of enterprise architecture are the investigations of Bucher et al., and Yu et al. (Bucher, Fisher et al. 2006; Yu, Strohmaier et al. 2006). The investigation is basically a case study supplemented by an expert panel and a survey. Case studies supplemented by surveys are applied in enterprise architecture research and information systems design research. The integration of case-study and survey research methods has for example been utilized by Gable (1994). The research presented in this thesis can be labelled as a 'sequential mixed method study' and a 'qualitative dominant mixed methods research' (Johnson and Onwuegbuzie 2004; Johnson, Onwuegbuzie et al. 2007). The object of study is enterprise architecture design. Pragmatism is the philosophical stance in this research because it is the epistemological stance of design science (Romme 2003). Four research instruments are employed: (1) a literature review; (2) a case-study; (3) a focus-group and (4) a survey. The literature review is used to explore which social and cultural aspects of organizations are considered and how they are incorporated in architecture, organization science, information systems research and software engineering. Two case studies are used to explore how social and cultural aspects of public organizations are considered and incorporated in enterprise architecture designs in the context of e-government and to explore what factors influence this consideration and incorporation. The expert panel and survey are included in the investigation to assess the level of transferability of the case study findings.

## 1.5   Expected contributions

Despite the relatively long tradition of socio-technical design methods, giving consideration to social and cultural aspects of organizations and incorporating them in design solutions has proved cumbersome because of the fluid and nuanced nature of social activity and conflicting goals of organization members (Ackerman 2000). Furthermore, design science traditionally focuses primarily on design methodology and

not on the designed artefact. Kroes (2002) argues that the evaluation of the design process should include the specific nature of the designed artefacts. This implies that the dual nature of artefacts should be taken into account in the evaluation and the design process. He refers to the gap in the design process that emerges when specifications and functional descriptions are transformed into structural representations. Furthermore, he states that because of this inherent gap and the diversity of the human context in organizations it is difficult to define quality criteria for designs (artefacts) and design processes. Apart from the traditional criteria such as usability, reliability and correctness, some refer to elegance and desirability as quality aspects and use a socio-cognitive engineering approach (Sharples, Jeffery et al. 2002). Others, again, focus on general human values, ethics and a design approach that is called value sensitive design (Friedman and Kahn 2002; Friedman, Kahn et al. 2006; Van den Hoven 2007).

Despite the developments in socio-technical design, computer supported cooperative work and other user-participative design approaches in the last decades aimed at user centred design, how the work domain can be conceptualized still remains a design question (Iivari and Iivari 2011). A relative new framework, socio-technical systems engineering (Baxter and Sommerville 2011), is a reaction to the finding that socio-technical design methods are not widely used and when they are applied, the technical systems still get the most attention (Eason 2001; Mumford 2006). Baxter and Sommerville question whether common design constructs and models in information systems design and software engineering are rich enough to capture and reflect the elements and characteristics of the social system. Enterprise architecture design models can capture the objective reality of organizations, for instance through object-oriented modelling or by the application of formal, mathematical, modelling languages (Wegmann 2003). According to Wegmann, the challenge of the enterprise architecture discipline is to analyse and design the co-existence and interaction of complex, pure functional, and complicated, social, systems (Wegmann 2003).

In the Netherlands enterprise architecture research focuses on determining the business value of enterprise and solution architecture (Slot 2010), effective application of enterprise architecture (Raadt 2011) and the effectiveness of enterprise architecture practice (Van Steenbergen 2011). A possible contribution of the research that is presented in this thesis is a stimulation of critical thinking regarding the consideration and incorporation of social and cultural aspects of public organizations in enterprise architecture designs. The expected knowledge can hopefully support enterprise architects in their effort to evaluate created enterprise architecture designs and can hopefully support business management in their effort to align enterprise architecture designs and design processes with the social and cultural aspects of their organizations.

The research focuses on enterprise architecture designs (the artefacts) and the applied design method. The research is intended to create knowledge concerning the evaluation of enterprise architecture designs, and the design methods regarding the consideration and incorporation of social and cultural aspects of organizations. For example, the research findings hopefully demonstrate how a socio-technical evaluation process can be executed on enterprise architecture designs (artefacts) and design processes. Furthermore, knowledge can be created regarding factors that influence how the social and cultural aspects of organizations are considered and incorporated in designs. A potential application of the research findings can be the formulation of

additional quality criteria for designs and design methods. An expected contribution is also the evaluation of the ability of enterprise architectural constructs and models to capture and reflect the social and cultural aspects of organizations. A possible contribution to practice is the evaluation process and evaluation tools that are expected to be created in this research that be applied in the context of e-government to evaluate how social and cultural aspects of public organizations are considered and incorporated in enterprise architecture designs and can be used to take measures to enhance the consideration and incorporation of them when the problem statement or context of a design task requires it.

## 1.6   The structure of the thesis

In Greek tragedy, just as in enterprise architecture and traditional architecture, there is the author and his/her ever changing audience with ever changing expectations and preoccupations (Taplin 2003). As in traditional Greek architecture, in Greek tragedy there is a relation between the tragedy, universals, the human condition and the voice and action of the body. Greek architects relied heavily on the application of design principles for their buildings (Hoogervorst 2004). In that respect, a strong parallel exists between enterprise architecture and Greek architecture. In respect to Greek tradition, Greek structuring principles are applied in the set-up of this dissertation, especially the structuring principles of Greek tragedy. Therefore, the structure of this thesis is as follows:

- **Chapter one**, the *prologue*, has described the research and provides a context and background for the understanding of the research questions and expected contributions.
- **Chapter two**, continuation of the prologue, answers the research question how social and cultural aspects are considered and incorporated in architecture, organization science, information systems research and software engineering. This chapter also explores the basic characteristics of the enterprise architecture discipline and how enterprise architects generally consider social and cultural aspects in their designs. The chapter concludes with the social and cultural aspects that can be considered and incorporated in designs in the socio-technical design tradition. Furthermore, an initial set of propositions is presented that has been derived from the enterprise architecture literature so far presented.
- **Chapter three**, describes the research methodology that is applied in this research. After this there are three episodes.
- **Chapter four**, the first *episode*, describes the first case study. This case study explores the consideration and incorporation of social and cultural aspects the Dutch reference architectures that have been created to support the implementation of e-government. In this chapter the social and cultural aspects discussed in chapter two are used to demonstrate how they are considered and incorporated in the reference architectures. Furthermore, the chapter tests which propositions set out in chapter two can be supported, or rejected, or must remain undecided. Some new propositions may be arrived at in this episode.

- **Chapter five**, the second *episode*, contains a case study that explores an actual enterprise architecture design. The social and cultural aspects that have been explicated in chapter two are used to evaluate how they are given consideration in the design. Furthermore, the chapter tests which propositions set out in chapter two and four can be supported, or rejected, or must remain undecided. Some new propositions may be arrived at in this episode.
- **Chapter six**, the third *episode*, depicts the perspective of the enterprise architecture design professional. The first part of the chapter sets out the results of an expert panel session. The second part of the chapter contains a survey. Again in this chapter the research propositions are tested and new propositions can be found.
- **Chapter seven** contains the analysis on the research findings. Based on the research findings and the tested propositions it is concluded how social and cultural aspects of public organizations, in the socio-technical tradition, are considered and incorporated in enterprise architecture designs in the context of e-government.
- **Chapter eight**, the *exodus*, reflects on the research findings and suggests further research.

# 2  LITERATURE REVIEW ON SOCIAL AND CULTURAL ASPECTS IN DESIGNS
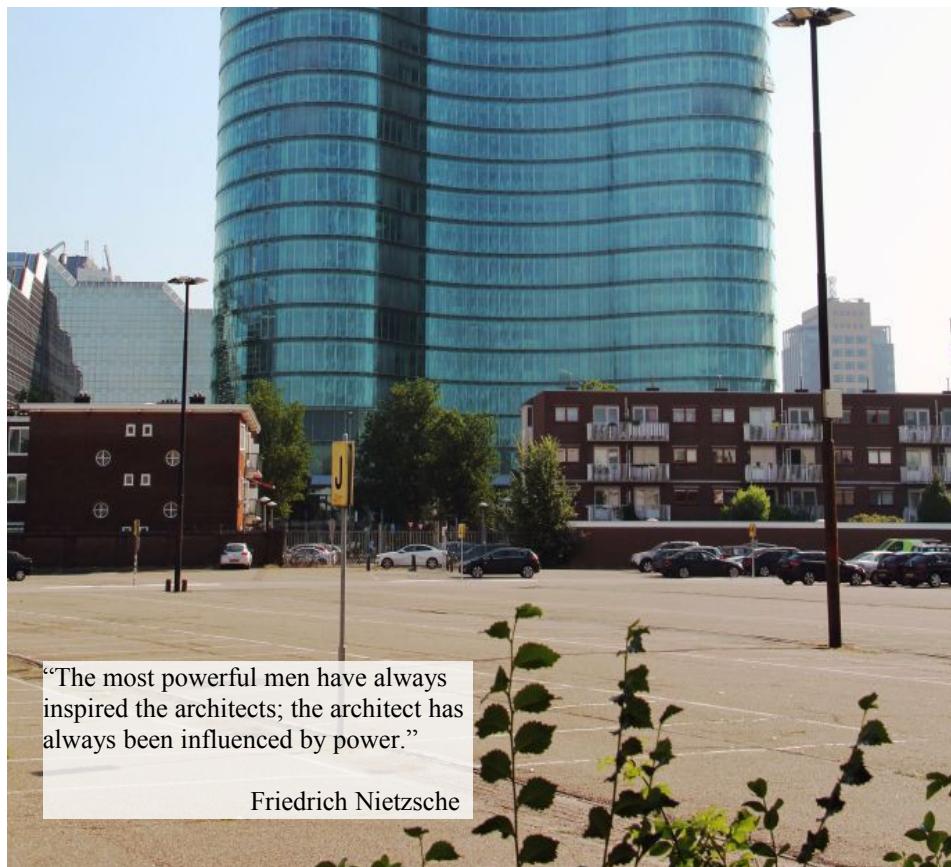
"The most powerful men have always inspired the architects; the architect has always been influenced by power."

Friedrich Nietzsche

## 2.1 Introduction

One purpose of this chapter is to provide an answer to the research question how social and cultural aspects of organizations are reflected on and incorporated in the design approaches of disciplines related to enterprise architecture: traditional architecture, organization science, information systems research and software engineering. Another purpose is to explore how the enterprise architecture discipline considers and incorporates social and cultural aspects of organizations in designs. The chapter closes with a set of propositions that are tested in the enquiry and a framework that consists of set of social and cultural aspects of organizations which are expected to be considered in designs in relation to the quality of working life. The propositions are tested in the case studies, the expert panel and the survey and the framework is used to evaluate enterprise architecture designs.

## 2.2 Social and cultural aspects in designs of reference disciplines

### Architecture

Vitruvius is the first known architect who published in *the Ten books on architecture* ($\pm$ 20 BC) a design approach on architecture (Vitruvius, English translation 2005). According to Hearn (2003 p. 179), Durand published in 1802 in his *Précis de leçons* a design method to achieve rational designs based on the formulation of requirements of a functional program. Hearn says that this rational role in the design of architecture was emphasized by Viollet-le-Duc (1814-1879). Viollet-le-Duc, is considered to be the first architect to describe a complete rationalist design method free of regulations and conventions from the past (Hearn 2003 p. 189). Hearn claims that this design method was the beginning of the movement in which architects create highly structured and ordered buildings in which the function of the building the primary focus is. It led to the functionalistic architectural style of which Louis Sullivan is often regarded to be the creator in 1924. Sullivan used the phrase 'form ever follows function'. In his view the design of a building should always be driven solely by the function of the building.

According to Vitruvius (Vitruvius, English translation p.10-12), the realization of both practical and symbolic requirements in a building are basic characteristics of architecture. Therefore, architecture is not only about the practical requirements of supporting some kind of human activity. It can be a powerful instrument to enforce cultural and societal values. With its prominent presence in a particular place architecture influences the public, either consciously by its function and structure, or unconsciously in the feelings, norms and values that architecture symbolizes. For example, in Egyptian society the geometric form was an expression of continuity and order. Egyptians saw not the stone, but the symbol (Smith 1938 p. 249). Other powerful examples of symbolism in architecture are the temples of Greece whose order and regularity symbolized the Greek belief in universal geometrical laws (Rieser 1956). Because of the symbolic power of buildings and their presence in society, architecture is

about societal values as well as environmental, political and economical values. Scruton (1980 p. 263) states that through its aesthetic dimension architecture transcends beyond the functional aspects. Architecture can stimulate and influence social life. It can be so powerful that civilizations have become known for their architectural achievements; take for example Egyptian civilization through the pyramids in Gizeh and the temples of Karnak. Architecture can also influence public life through its distinctive power to express intangible values. For example, in Gothic churches function and geometry are integrated in such a way that the architecture becomes an attempt to create a literal image of heaven and an instrument to express Catholic values (Simson 1956 p. 13). More recent eminent examples of symbolic power of architectural expression are the Petronas towers in Kwala Lumpur, Malaysia and the Freedom towers in New York. The Petronas towers have become symbols of corporate power and a signature of Malaysia that announces its participation in the global economy (Ford 1998).

Enforcing social and cultural values can be regarded as a function of architecture, besides building and construction. The way in which social values and architecture influence each other and how architecture can add value to social values is demonstrated by Henri Lefebvre. According to him, architecture is the production of space (Lefebvre 1991 p. 155). He argues that changing society and the production of space go hand in hand. There is always a relation between places and their time. According to Lefebvre, each time frame has its own characteristics that are reflected in architecture and urban design. The relational networks and centres of communication change with each time frame. Each moment in time has specific principles, or dominating factors that organize and shape relational networks and centres of communication in spaces. For example, in the middle ages the dominating powers where those of aristocracy and the church. This can still be witnessed today in the structure of towns that are build around cathedrals and palaces. In the industrial age power was formed by capital and politics. Cities were designed around the owners of those production factors. In recent years dominant factors have been financial power and efficiency. He contends that the Soviet constructivists of 1920-30 should have created a new space to support their new vision on society (Lefebvre 1991 p. 59). That space should have represented the new symbols and representations of their movement; without those new symbols and representations people in cities were constantly reminded and influenced by the culture of the past.

The inherent relation between architecture and symbolic expression of social and cultural values was the reason for severe resistance to the pure functionalist approach of architects such as Le Corbusier and Frank Lloyd Wright, and the rationalist design method of Viollet-le-Duc (Hearn 2003 p. 305). The argument was that their 'rational' architecture neglected the cultural meaning in and symbolic expression power of architecture. The critique was that 'rational architecture' focused so much on function and purpose that their structures felt and looked like machines. Because of their dominant focus on functionality these architects disregarded the social and cultural aspects of the building. In a famous open letter *Dear architects, I am sick of your shit* Anne Choi describes her disgust with this kind of architects and their architecture (Choi 2007). Other important critics are Jane Jacobs (1993) and Christopher Alexander (1965). Jane Jacobs describes that a building is not a set of walls and a city is not a set of buildings that can be designed purely by function alone. She defines a city as a

ecosystem, in which physical, economic, and ethical processes are active and in which diversity is essential for survival (Jacobs 1993 p. xvi). Her main point is that city planning activities were so driven by functionalities that they alienated people from their neighbourhoods. According to her, this kind of planning practice can only lead to decay. To illustrate her contention, she refers to housing projects that failed because of a unilateral emphasis on functionality and rationality. Roth too provides substantiation for this argument by citing critics who claimed that the pure logical determinism in modern architecture died at 3:32 P.M. on July 15 in 1972 when the demolition started of the Pruitt-Igoe Housing complex in St Louis Missouri (Roth 2007 p. 560). Roth explains that the demolition was unavoidable since the residents of the complex had vandalized the complex. The complex expressed the highest ideal of functionalist architecture. However, the design facilitated crime and the impoverished residents intended for it refused to live in it. According to Roth, it proved to some that social engineering is not possible. Christopher Alexander summarized his critique in an article called *A city is not a tree* (Alexander 1965). In this article he argues that designers, incapable of grasping the complex essence of a living city in a single design effort, create artificial structures by dividing the complex city entity into non overlapping units and subunits that relate to each other in a treelike structure. Alexander argues that with this approach architects create rational structures with unnatural divisions and lifeless subdivisions because they do not consider the natural way of living. In his later work he emphasizes the importance of using a holistic approach, in order to capture all relevant aspects in a design. He stresses the importance of the interaction between people and the natural and physical environment. Hall had already referred in 1966 to the architectural practice in which architects overlook the influence of the form of a building on people (Hall 1982). He proposed that team research is necessary to gain understanding of the relationship between people and buildings. The influence between people and buildings can be extrapolated to people and cities. Major debates are going on amongst architects, city planners, politicians and citizens about whether the 'function follows function' principle leads to enduring live-able spaces or not. For example, an international group of architects, Team 10 (also referred to as 'Angry young men'), between 1953 until 1983 committed themselves to the return to the human dimension in architecture. Silber criticizes architecture that ignores needs, values and beliefs of hundreds of thousands of people in the enactment of a plan that the architect believe is more real than his fellow man (Silber 2007 p. 44). He refers to this kind of architecture as 'architecture of the absurd'. In the Netherlands there are examples of this in so called Vinex-wijken. These suburbs were created after 1993 as a solution to the housing problem for a growing population and are situated alongside major cities. A major newspaper in The Netherlands, published an article on 21 February 2011 about issues in these suburbs (Algemeen Dagblad 2011). Its main message was that in the design of those areas not enough attention had been paid to the integration of work, living and leisure. The areas could become ghettos because of that lack of integration and the insufficient attention to the needs and wants of elderly and young people. The article contended that young people seem to get bored, and that this had already led to vandalism, burglary and threats.

In the book *The Fourth Dimension In Architecture* Hall and Hall describe their study of the design of the Eero Saarinen's building for Deere & Company (Hall and Hall

1975). They regard this building as a classic example of a design for people. In their study they interpreted design for people as meaning integrating three interrelated factors that are presented in Figure 5. In this design approach the humans are the physiological and psychological context of the structure and the organization stands for the purpose at the macro level. In a purposeful design the structure, its purpose at the macro level and the human context should all be in alignment. It means that the environment the building provides is suitable for employees and teams, and at the same time inspires high quality, durability and strength in a manner that suits the organization mission and reflects the industry the organization belongs to. Hearn says that in order to properly address cultural aspects in architecture, architects need to incorporate the urban context in their designs and need to consider physical structures and cities as vitally important to organizations and society.

Hearn suggests a design approach in which all sorts of cultural elements and meaning and symbolic purposes of the building are considered in the preliminary stage of an architecture program, even before the start of the functional programme to focus attention on cultural and symbolic meaning in architecture (Hearn 2003 p. 323-325). At this preliminary stage, the cultural context of the project must be clearly established together in agreement with the patron. At this stage all social, political and cultural implications should be considered. It must be clear what values the building should communicate. This must be done with reference to an already existing context.
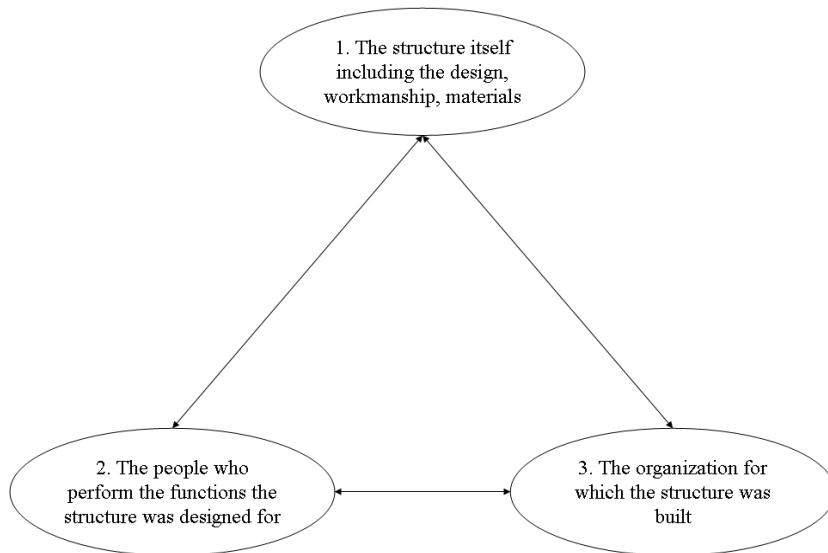


**Figure 5: Interrelating factors in a design for people**

In the design approach of Lefebvre three concepts are used that characterize the relation between physical, social and mental space in order to understand and create the relationship between architecture, urbanisation, culture and society (Lefebvre 1991 p. 33): (1) spatial practice embraces production and reproduction, and the particular locations and spatial sets characteristic of each social formation; (2) representation of

space such as maps and plans, transport and communication systems are tied to the relations of production. It is the space for scientists, planners, urbanists; (3) representational space embodies complex symbolisms linked to the clandestine or underground side of social life and art. It overlays physical space, making symbolic use of its objects. According to Lefebvre, time, or history, should also be accounted for in architecture designs. After all time creates physical, social and mental objects that influence relationships and objects.

In the design approach of Vitruvius order, eurhythmy, symmetry, propriety and economy should always be the guiding principles of a design (Vitruvius, English translation 2005 p. 10-12). In a proper design all parts fit together, create an elegant effect and correspond with the overall character of the work. The design is pleasing and reflect good taste which means that the elements of the design should be in due proportions according to the principles of symmetry, and authoritatively constructed and approved principles have been used properly. In the design approach economy is the proper management of materials and the site. Cost and common sense should always be considered. The proper level of economy depends on the type of building and the class it is built for.

Vitruvius' principles inspired the architectural design education of École des Beaux-Arts. This famous institution was founded in 1671 in France. The basic principles of architectural design the École des Beaux-Arts taught were (Roth 2007 p. 501):

1. Understand the function of the structure and accommodate it.
2. Understand the nature of the building site, the prevailing climate and design the building in relation to that context.
3. Do not rely on complicated and costly designs. A good design is easily buildable.
4. Maintain truth in architectural expression.
5. A building must be structurally sound and look strong.
6. A building has easy and inevitable patterns of circulation, for admitting light and carrying off rainwater.
7. The buildings composition is good, beautiful, useful and has character.

Architecture cannot take place without architects. In Latin or in Greek 'architect' can be translated as chief builder or carpenter (Liddell and Scott 1940; Harper 2001). The first architect whose name is recorded was Imhotep, 2635-2595 B.C., who worked for Pharaoh Zoser and designed the step pyramid complex of Djoser at Sakkarah (Roth 2007 p. 195). Imhotep met the classical ideal image of an architect. He was not only an architect but also a physician, carpenter, sculptor, astronomer and scribe (Badaway 1982). According to Vitruvius, the architect's role is to focus on the function of a building and the correct application of principles. He argues that an architect should have thorough theoretical and practical knowledge of drawing, geometry, optics, economics, history, physics, philosophy, music, medicine and astronomy (Vitruvius, English translation 2005 p. 4-10). Modern writers, such as John Ruskin (1819-1900) placed emphasis on the architect's social responsibility. According to him, architects are agents of social improvement through good design. He propagated

the idea of architecture as an instrument to reinforce social virtues. Others, like Viollet-le-Duc, emphasized the rational role of the architect in the creation of physical structures. The architect is also the client's trusted agent in coordinating all aspects of a building project, including the integration of structural, business, legal, and aesthetic concerns (Maieer, Emery et al. 2001). The architect is, moreover, a problem solver. At an abstract level the architect's problem is to mould and organize space in such a way that an optimum is found for executing a building's function in such a way as to encompass the space without losing sight of aesthetic values (Scruton 1980 p. 223). The consequence of this is that the architect should understand the effect the physical structure has on its users and others that are directly and indirectly affected by it. According to Scruton, the consideration and incorporation of different aspects, including aesthetics, is what distinguishes an architect from an engineer. The engineer is responsible for building and construction. An engineer assumes architecture and assures that a building does not fall down. It is the role of the architect to decide what makes a church a church.

## Organization science

Traditionally design approaches for organizations and organizational processes have considered them as rational and focused on the technical system of the organization. They are based on the belief that rationalist, scientific approaches can be applied to design organizational life and organizations in such a manner that they are effective and efficient machines for the delivery of services (Burrell 1988). An organization can be regarded as a rational coordination of activities for the achievement of some common explicit purpose, mission, vision or goal (Schein 1970 p. 104). The complete organization is a system of means-ends chains (Schein 1971). An organization can also be regarded as an extension of human rationality (Cooper and Burrell 1988). The organizational design approach based on rationality leads to a design in which technology is designed first and the organization is designed around it (Gephart 2002). In such an approach work is highly standardized, divided into clearly defined jobs, and tightly controlled. Gephart notes that in the rationale of rational organizations control, participation and structure are bureaucratically organized into hierarchical, and centralized work systems. This scientific-engineering-based design approach can be used to maximize worker's productivity through systematic analyses of work in minute detail (Ritson 2005). In that design approach, the emphasis in decision making is based on technical choices and excludes irrational, and intuitive elements (Alvesson and Willmot 1992). The organization is considered to be a machine that is designed to fulfil a purpose and employees are parts of it. Employees are supervised and their actions are evaluated to check that their actions are consistent with the goals and objectives of the organization.

Another design approach defines organizations by their set of social activities, social groupings, social relations and its deliberately established purpose or goal. It is one of the approaches that emerged as reaction to the criticism of the pure scientific and rational design approach. In 1935 Whitehead argued that in each major enterprise both the social and economic activities should be guided simultaneously by its leaders in

order to be successful (Whitehead 1935). Another criticism is that the dominant focus on rationality represses the critically rational individual in the interest of a machine-like system of social functionality (Cooper 1989). This can lead to passive, reactive and negative phenomena such as utility, adaptation and regulation that become major motifs in organizations and society. It tents to the mechanization of the social world (Cooper and Burrell 1988). Others also referred to issues with rational organization designs (James and Jones 1976; Dalton, Todor et al. 1980), citing dysfunctions in the bureaucratic model of organizations such as the failure to allow for the growth and development of mature personalities and reliance upon depersonalized relations and strict enforcement of rules. Trist directed his criticism to the dominant focus on the technical system of the organization. According to him, the result of that technical focus is a bureaucratic organization design with characteristics such as the technological imperative man as an extension of the machine and man as an expendable spare part (Trist 1981).

In rationalist organization designs people are regarded essential, but their presence hinders rational efficient functioning of the organization (Pugh, Hickson et al. 1963). Pugh states that organization design should consider social and economic factors and the technical system. The historical, socially constructed nature of existing work processes and human needs should be appreciated and seen apart from the imposed order and structure of the organization (Alvesson and Willmot 1992). Human and technical problems should never be completely separated, and that an employee should be dealt with as a whole person with interests, abilities, and persuasions (Parker 1984). Norms should not be imposed on individuals by outsiders. Instead, the group should have a continuous exchange of ideas and views that provides the group with self-created ideals and norms. These ideas appear also in the work of Herzberg, Trist, Emery, Cherns and Mumford. Trist was strongly against the one-sided technological focus in organizational design approaches (Trist 1981). He argued that an organization is made up of both technical and social systems that are independent of each other, in that the technical system follows the law of the natural sciences and the social system follows the law of the human sciences. Trist argued that the relationships between the technical and social systems can only be optimized when they are treated jointly. Therefore, technology, such as machines and work organization, should not be the controlling factor when work systems are designed and implemented. Equal attention should be given to high quality and a satisfying work environment. Furthermore, macro systems should be considered in the design since they contain socio-technical phenomena that influence organizational life. Trist predicted that attempts to optimize either the technical or social system alone would result in the sub-optimization of the socio-technical whole. Cherns also said that the technical and the human factors should be given equal weight in the design process (Cherns 1987). Trist formulated ten characteristics of socio-technical design characteristics (Trist 1981). Emery and Trist identified six intrinsic characteristics of job satisfaction (Emery 1978; Trist 1981). Herzberg formulated five characteristics of meaning of work life (Herzberg 1968). These characteristics are presented in Table 1.

| Socio-technical design characteristics (Trist) | Characteristics of job satisfaction (Emery & Trist) | Meaning of work life (Hertzberg) |
|---|---|---|
| 1. Joint optimization | 1. Reasonably demanding job content in terms other than sheer endurance and provision of some variety | 1. Feelings of achievement |
| 2. Man as complementary to the machine | 2. The ability to learn on the job and go on learning | 2. Recognition |
| 3. Man as a resource to be developed | 3. The existence of an area of decision-making that the individual can call his/her own | 3. Having satisfying tasks to perform |
| 4. Optimum task grouping and multiple broad skills | 4. A certain degree of social support, and recognition in the work place for the value of what a worker does | 4. Feelings of responsibility |
| 5. Internal controls and self-regulating subsystems | 5. The ability to relate what a worker does and what he/she produces to his/her social life, for it to have meaning and to afford dignity | 5. The potential for advancement and growth |
| 6. Flat organization chart with a participative management style | 6. To feel that the job leads to some sort of desirable future | |
| 7. Collaboration and collegiality | | |
| 8. The incorporation of members' and society's purposes | | |
| 9. Commitment | | |
| 10. Innovation | | |

**Table 1: Socio-technical design and job satisfaction characteristics**

A socio-technical design approach in the Netherlands came from de Sitter et al. and was called the Integral Organization Renewal (IOR) theory (De Sitter, Den Hartog et al. 1997). Its main objective was to develop a systematic design approach which supports improvement in both the quality of work and the ability of the organization to deal with a complex and continuously changing environment (De Sitter, Den Hartog et al. 1997). IOR regards functional requirements with respect to the physical environment, customers, the labour market, suppliers of capital and workers as equivalent to each other. Furthermore, IOR also includes the relation between social attributes such as attitudes, norms and values, and technical artefacts such as machines, computers, buildings and so on. To design a working system one should, according to Sitter, design integral parts starting from a vision of the whole, instead of designing both the social and technical systems separately, and then trying to fit them together afterwards.

According to Mumford (2006), the values that the socio-technical design approach contributes to work life are:

1. In socio-technical design rights and needs of employees get the same amount of attention as the technical part of the system.
2. There is a democracy, which means that employees should be able to participate in and influence decisions that concern them.
3. The importance of creating and developing knowledge and working in teams.

The evaluation of organizational designs can be done using four organizational principles: controllability, liveability, governability and manageability (Lammers, Mijs et al. 2001 p. 25). Controllability is the extent to which people can find out if or when a decision is made, or will be made, in combination which the possibility of testing that decision on norms concerning content and the decision process followed. Liveability is the extend to which people, according to certain standards, can have a satisfactory existence in given situations. Governability is the extent to which one is able to make social groups function or to change them in order to achieve pre determined objectives. Manageability is the extent to which one can set and enforce guidelines and conditions for the creation, functioning and development of certain social groups.

Mumford is not optimistic about the future of socio-technical design (Mumford 2006). She observes that information technology subordinates workers even more to the machine than the assembly line did. Workers now have fewer possibilities of, what she called 'chit-chat', and communication technology increases the management's ability to control employees because all their actions can be electronically monitored. She argued that the design of networks and organization democracy run counter to the prevailing ideology of capitalism, where the objective is profit for the stakeholders. This causes the design of organizations to be pulled in conflicting directions. She contended that flexibility and diversity are needed to manage complexity and efficiency and control are needed for profit generation. According to Mumford, socio-technical design was popular in the 1970s due to problems in obtaining and keeping staff. She related the decline of interest in socio-technical design in the 1980s to the pressure on industry to cut costs, increasing unemployment and the expensive and risky image of socio-technical approaches. The decline in interest continued in the 1990s when, according to Mumford, other methods were used such as 'business process re-engineering' and 'lean production' that took little account of individual needs and did not produce good human results. According to her, apart from initiatives in the Netherlands and Scandinavia, few companies have been interested in using socio-technical design as a general design principle. Trist (1981) addressed other issues in socio-technical design: (1) it demands that conventional establishments had to become innovative work establishments and that transformation was problematic in reality; (2) there is not one best solution for job design given the wide range of individual differences in work force motivation, which also changes over time.

The social system and the cultural system work together to form a whole. Therefore, the consideration and understanding of culture is considered to be important in socio-technical designs (Johns 2001; Johns 2006). What is culture? At least eight different schools of thought can be distinguished in cultural research. These can be divided into four schools of thought in which the social system and the cultural system are regarded as integrated, and four schools in which the cultural system and social system are seen as distinct, but interrelated (Smircich 1983; Allaire and Firsirotu 1984). Stated somewhat differently, culture can be seen as an independent variable that is injected into organizations by their members, or as is an internal variable that is present in the organization (Smircich 1983). The framework that Smircich uses to position culture with respect to other elements of the organization is illustrated in Figure 6.

Goals

Administrative
System

CULTURAL
CONTEXT

Technology
and
Structure

Sociocultural
System

Production
System
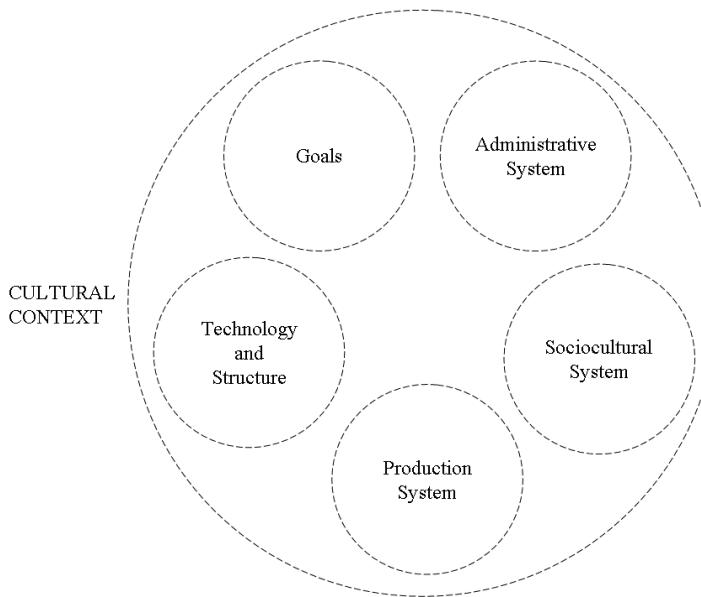
**Figure 6: Smircich's framework of culture**

| SOCIETY | HISTORY | CONTINGENCY |
|---|---|---|
| The ambient society's cultural, social, political and judicial system | The organization's genesis, history and transformations, including the founder's vision and the values of past leaders | The technology, economics, competition and regulations that characterize the organization and its industry |

**THE CULTURAL SYSTEM**

MYTHS — VALUES

IDEOLOGY

legimating?

supportive??

**THE SOCIOSTRUCTURAL SYSTEM**

STRUCTURES — STRATEGIES

POLICIES — PROCESSES

| Rites, Rituals, customs | Metaphors, slogans, lexicon, glossaries, acronyms | Sagas, stories, legends, lore | Symbolic artifacts, logos, architecture design |
|---|---|---|---|

| Formal goals, objectives and strategies | Recruitment, selection, training and education | Authority and power structure and control mechanisms | Reward and motivation | Managerial processes and style |
|---|---|---|---|---|

NORMS, STATUS
AND ROLES

THE INDIVIDUAL ACTOR:
PERSONALITY AND COGNITIONS

Knowledge          Needs
Cultural competence      Motives
Values          Leadershiprole
Assumptions and expectations

Idiosyncratic
endowments
and experience

ORGANIZATIONAL OUTPUT

Ongoing streams of individually
'purposeful' actions and
collectively 'meaningful' acts

**Figure 7: The framework according to Allaire and Firsirotu**

Allaire and Firsirotu introduced a conceptual framework for organizational culture based on the interrelated school that regards the cultural system and social system as distinct, but interrelated and applied the symbolic concept of culture. Here the culture is expressed in symbolism such as stories, myths, ritualized events, concrete visual signs and specialized language (Dandridge, Mitroff et al. 1980). In the framework of Allaire and Firsirotu society, the history of the organization and contingency factors such as technology shapes the cultural and socio-structural systems of the organization. Their framework is presented in Figure 7. In this framework society, the history of the organization and contingency factors such as technology shape the cultural and socio-structural systems of the organization.

Schein suggests that a relationship exists between artefacts such as processes and structures and underlying perceptions, thoughts and feelings (Schein 1988; Schein 2009). Culture can be regarded as the residue of success and is dynamic: it changes over time. Culture can be analysed into levels such as observable artefacts, values and basic underlying assumptions (Schein 1990). According to Schein, the elements of culture are norms, beliefs and assumptions. Johnson refers to culture as the core set of beliefs and assumptions that constitute the organization's view of itself and the environment. These are used to interpret events and formulate actions (Johnson 1992). Johnson distinguishes seven components of culture. At its heart is the cognitive structure and mechanisms together with the core set of beliefs and assumptions. Surrounding this heart are cultural artefacts such as stories and myths, symbols, power structure, organizational structure, control systems, rewards, rituals and routines. Culture can also be defined as the way in which a group of people resolves organizational issues such as identity (Hofstede, Pedersen et al. 2002 p. 39). Hofstede, Pedersen et al. regard each culture as filled with symbols, heroes and rituals that together embody and re-create that culture.

Cultural elements are learned and preserved by a process that Schein (1990) calls socialization. It means that cultural change takes place through natural evolution that is thought to occur when organizations interact with their environment or it can be initiated by leaders of the organization. According to Schein, cultural change can be forced through the introduction of new norms, beliefs and assumptions. Such an introduction can be facilitated by the introduction of new artefacts, symbols and rituals. The building, physical plant, equipment and resources can all be regarded as culture-bearing artefacts that communicate aspects of the organization's culture. They enforce the relation between features of the artefact and appropriate behaviour. Socialization, sense-making and symbolism are all processes that are related to culture. They can use the artefacts as inputs and result in the reinforcement of, or change in, the way in which organization's members think and behave. The values, artefacts, symbols and assumptions can be related to the processes of realization, symbolization, interpretation and manifestation (Hatch 1993; Schultz and Hatch 1996). The cultural dynamics model that Hatch proposes is shown in Figure 8.

According to Hatch, the processes between symbols, assumptions and values have a subjectivist theoretical orientation and the processes between symbols, artefacts and values can rely on the objectivist theoretical orientation.

Cooke and Rousseau asserted in 1988 that the application of qualitative and quantitative assessment instruments makes it possible to analyse and design interventions in the organization's culture that are specific, practical, and accepted by a

large number of members of an organization (Cooke and Rousseau 1988). Today, there is a wide range of qualitative and quantitative instruments for analysing culture (Jung, Scott et al. 2009). Cooke and Rousseau contended that such a broad assessment of culture within organizations is needed because organizations can contain a dominant culture and several subcultures, such as sales and production cultures. Schein (1996) distinguished three such sub-cultures: (1) the operators', (2) the engineers' and (3) the executives'. Each has its own sets of norms, behaviours and assumptions that can be in alignment or in conflict with each other. For example, according to Schein, the operator culture focuses on the improvement of organizational effectiveness. The executive and engineering cultures attempt to minimize the human factor. For Cooke and Rousseau a broad analysis of culture is needed to explore the direction and intensity of the culture. They regard direction and intensity as the two key attributes of culture, with direction as the content of culture and intensity as the strength of that content.
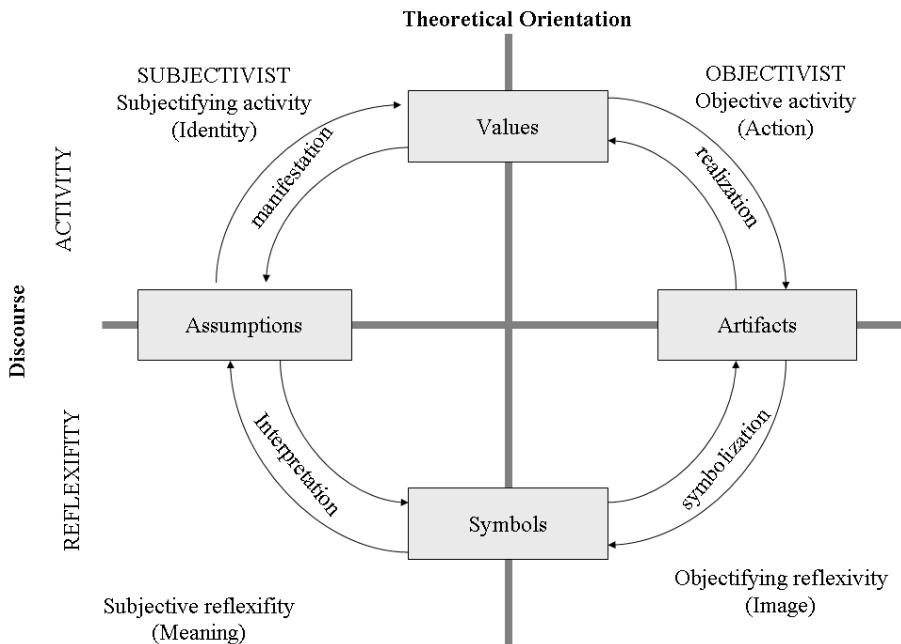


**Figure 8: The cultural dynamics model according to Hatch**

According to Schein, observation is needed as a research method to truly understand and appreciate how cultures affect different groups of members of an organization. In the 'interrelated' school of thought culture can be analysed into stimuli and phenomena that are external to the social system, and can be classified into physical and social attributes, informational attributes such as ambiguity, and task attributes such as autonomy (Johns 2006). Cultural elements influence the constraints and opportunities for behaviour and attitudes in organizations. Johns asserts that considering these cultural

elements is essential for developing an appreciation of person to situation interactions. For example, a particular technology can shape the design of jobs that use that technology and job design moderates the connection between worker personality and performance. Johns proposes two levels of analysis to assess the cultural context: (1) context broadly considered, which describes the who, what, when, where and why and (2) the discrete context that describes specific situational variables. The discrete context includes: (1) task context, composed of features such as autonomy, uncertainty, accountability and resources; (2) the social context including social density, in other words the location of others in space; (3) social structure which refers to the differentiation of those others by tenure, gender, status and social influence and (4) the physical context which means such things as temperature, light, the build environment and décor. Johns regards this cultural context as a shaper of meanings, underlying organizational behaviour and attitudes. He regards the degree of autonomy of workers as the most important contextual factor.

The constellation of the social system and the cultural system changes over time, because of, for example, the effect the environment has on the organization and changing preferences of people within the organization. Orlikowski and Yates (2002) argue that the experience of time occurs in the process of temporal structuring in organizational life. Therefore, the consideration of temporal aspects regarding social and cultural dynamics should be part of organizational design. Bluedorn and Denhardt (1988) report that temporal aspects in the field of management and organization science did not get much attention before 1988 and that for a long time only sociologists have interest in temporal aspects that specific events have on the creation of socio-cultural reality. They argue that different cultures can have different time perceptions. For that reason they argue that time is a fundamental organizational attribute and design variable. Time should also be treated as a separate concern in organizational design since it can explain organizational behaviour that would otherwise be missed (Ancona, Goodman et al. 2001). Furthermore, they contend that design approaches should lead to highly structured and controlled designs if the purpose is to support exploitation, and less structured and controlled designs to support exploration. They argue that both types of designs do not have to be integrated, because architectural inconsistencies that can result from the differences in temporal aspects. In Hardjono's four phase model time is explicitly modelled (Hardjono 1995; Hardjono 2000). According to him, management principles, models, and hypes have social and cultural value in certain contexts depending on market circumstances, and the organization's strategy, history and culture. All these aspects change over time and have their own dynamics and rhythm. He positions time as a separate factor in organizational change separate from the driving forces of individuals and organizations, organizational orientation and strategic premises. Hardjono links time to the phase, or state, an organization is in. He argues that an organization should change its primary focus on a specific phase at a certain rhythm, without totally neglecting elements of the other phases. This should be done in order to find the most appropriate organization design for a given period of time and to avoid the danger of being trapped in a phase. The four phases Hardjono distinguishes are: (1) effectiveness; (2) efficiency; (3) flexibility; (4) creativity. For the effectiveness and efficiency phases he suggests a rationalist organization design orientation with an emphasis on control. As for the flexibility phase the organization design emphasis is on

participating. The design emphasis is on change and innovation for the creativity phase. According to Hardjono, there is a chronological order to the phases. The effectiveness phase should be followed by an efficiency phase, then a flexibility phase and finally a creativity phase.


## Information systems research

In two articles in 1977 Bostrom and Heinen argued that failed initiatives to implement management information systems can be attributed to inadequate designs and organizational behavioural problems (Bostrom and Heinen 1977; Bostrom and Heinen 1977). They argued that a socio-technical design approach could help designers to see organizational perspectives other than their own. They found seven conditions that are conducive to inadequate information systems designs. Their rationale is presented in Figure 9. According to them, information systems have direct relations to the technological system of an organization and indirect relations to the social system. They proposed a three stage approach: (1) a strategic design process; (2) a socio-technical system design process and (3) an ongoing management process. Their method is to explicitly analyse the social system's requirements and to describe its design parameters. Therefore, they analyse the problems in the social system, the communication network, roles, work groups and the external environment. An approach for analysing these problems is through the participation of users in design processes.

User participation in information system design methodologies got much attention in information systems design research since the 1960s. User participation can take the form of consultation, representation or consensus (Mumford 1983). The principles of participation are to focus early in the design process on users and tasks, to have empirical judgement of the design quality and to design iteratively. An example of user participation in information systems design is the design methodology PORGI, which stands for Planning Tools for the Organizational Implementation of Computer-based Information Systems, developed by Kolf, Opelland, Seibt and Szyperski (Oppelland 1984). Another example is the design methodology ETHICS, which has been developed in 1975 by Mumford based on the socio-technical organization design approach developed by the Tavistock institute. ETHICS intended to design user friendly and technologically efficient information systems (Mumford 1983) and stands for Effective Technical and Human Implementation of Computer-based Systems. The basic elements of the method are requirements and constraints of technology, values and needs of people, motivation and competence for tasks, and the objectives of the company. The method integrates these basic elements by diagnosing the needs of the business and the social system, developing planning strategies and choosing one, designing socio-technical systems, implementing the system and post-implementation evaluation.
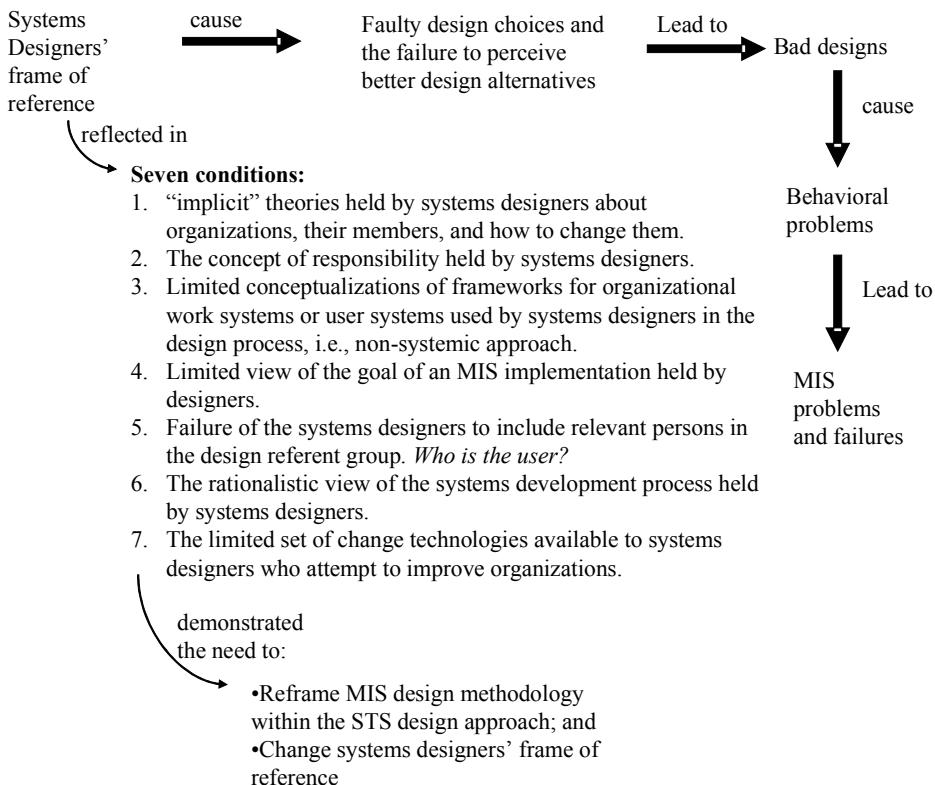
**Figure 9: The rationale for a socio-technical design methodology, adapted from Bostrom and Heinen**

In ETHICS users actively participate in the design process. This means that direct and indirect users and designers influence each other in making plans, policies and decisions. Data in the design process are gathered using interviews and questionnaires. No formal modelling techniques are used. Quality of the design in ETHICS is measured using five aspects:

1. The knowledge fit of workers, in terms of the skills of employees.
2. The psychological fit, in terms of the personal interests of employees.
3. The efficiency fit, in terms of financial rewards, control systems and support services.
4. The task-structure fit, in terms of task differentiation.
5. The ethical fit, in terms of personal values.

User participation methods are considered to be particularly suitable in complex problem situations characterized by a combination of well-structured problems, unclear user requirements, uncertain objectives and high user-computer interaction (Avison and Wood-Harper 1990; Avison and Taylor 1997). In such situations technical specifications, human-computer interface concerns, working life

aspects, information processing and the aims of the organization all need to be considered in combination with each other. The methodology MULTIVIEW has been developed to design information systems for these situations (Avison, Wood-Harper et al. 1998).

According to Markus and Mao (2004), participatory approaches aim at a high degree of user control in the design process. Participation mainly focuses on requirements analysis and testing or prototyping. Kujala distinguishes four types of user involvement approaches that are presented in Table 2.

|  | User-centred design | Participatory design | Ethnography | Contextual design |
|---|---|---|---|---|
| Emphasis | Usability | Democratic participation | Social aspects of work | Context of work |
| Typical methods | Task analysis Prototyping Usability evaluations | Workshops Prototyping | Observation Video-analysis | Contextual inquiry Prototyping |

Table 2: User involvement approaches according to Kijala

Since the 1970s questions have been raised about the relation between systems success, user acceptance and user participation. In their review Ives and Olson (1984) claim that it is generally proposed, but not proven, that user participation has a positive influence on information systems success. In their definition of systems success they include systems quality, user information satisfaction, user acceptance and system use. There is empirical evidence to support their claim (Franz and Robey 1986; Kujala 2003; Markus and Mao 2004).

Markus and Mao (2004) present a number of issues regarding participation: (1) user participation becomes a challenge when the scope of an information systems design is the complete organization, because then it is difficult to determine who are the 'representatives' of the organization; (2) the transformation of user requirements into technical and system requirements; (3) the quality of the relation between designers and participating users. According to them, there are many unknowns about these issues and their relation to the quality of the design. Also the skill set of the core design team is considered to be an influencing factor in systems success (White and Leifer 1986). So White and Leifer contended in 1986 that the core design team should posses business knowledge, good communication skills, analytical and organization skills and technical expertise. Despite user participation in design processes, they found that a gap exists between information systems professionals and the rest of the organization. The design team members acknowledged the technical, behavioural and group processes that lead to system success, but this awareness did not extend to those organization members that were not part of the design team. These issues can be the result of the dominant functionalist assumptions in most participative approaches (Hirschheim and Klein 1994). According to Hirscheim and Klein, functionalist approaches do not focus on social sense-making, the creation of shared understandings and ethical imperatives of work arrangements. For them neo-humanist ideals and principles need to be included in design approaches because those ideals include psychological and organizational dimensions. Therefore, a neo-humanist design approach should support self-determination and self-reflection, should encompass social justice, due process and

human freedom and should include principles for evaluation of decisions in the design process. They mentioned PORGI (Oppelland and Kolf 1980) as an emancipatory design approach and said that the ETHICS methodology of Mumford (Mumford 1983) is also an emancipatory methodology that encompasses neo-humanist principles.

Participative design receive special attention in Computer Supported Cooperative Work (CSCW) (Schmidt and Bannon 1992), in which both social and technical aspects are considered to accommodate cooperative work arrangements. The objective of CSCW research and development is to design computer based technologies that fit on the interdependence of work and cooperation requirements in cooperative work settings. The objective of CSCW is that both objective and subjective elements are considered. Such a combination has also been proposed by the structurational model of technology (Orlikowski 1992). In this approach information systems are seen as the result of social action, and at the same time technology is absorbed in the organization and becomes a structural property of the organization. An important element in this approach is the reflective use of artefacts. It means frequently assessing the effectiveness or ineffectiveness of the absorbed artefacts by the organization's members. The premise of the approach is that the artefacts are not fixed but modifiable during their existence. The structurational model of Orlikowski consists of three interacting elements: (1) human agents such as designers, users and decision makers; (2) artefacts; and (3) institutional properties which include social properties.

Considering social aspects of an organization and implementing them in technical solutions proves to be cumbersome despite the developments in user-participatory design methods. Ackerman (2000) gives a number of reasons for this such as the fluid and nuanced nature of social activity and conflicting goals of organization members. Therefore, Ackerman contends that social requirements should be central in a science of artefacts. He refers to the Scandinavian approach, in which trade union participation is mandated, as a design approach in which users have the ability to reject troublesome impacts. Other approaches rely on frequent alignment with users such as rapid prototyping and rapid ethnography (Millen 2000) These approaches try to deal with the issue that design science traditionally focuses primarily on method and not on the designed artefact. Kroes (2002) argues that the evaluation of the design process should include the specific nature of the designed artefacts. This implies that the dual nature of artefacts should be taken into account in the evaluation and the design process. As Simon (1996) has stated, artefacts have both physical characteristics and intentional ones. According to him, three elements are important in the construction of artefacts: (1) the substance and organization of the artefact; (2) the intended purposes of the artefact and (3) the environment in which the artefact operates. Kroes proposed that the human context is part of the environment because humans use the artefact to realize their intentions. Therefore, explicit attention is needed on how to communicate the intended functions of the artefact to the human users. He refers to the gap in the design process that emerges when specifications and functional descriptions are transformed into structural representations. Furthermore, he states that because of this inherent gap and the diversity of the human context it is difficult to define quality criteria for artefacts and design processes. Apart from the traditional criteria such as usability, reliability and correctness, other authors cite usability, elegance and desirability as quality aspects and use a socio-cognitive engineering approach (Sharples, Jeffery et al. 2002). Others,

again, focus on general human values, ethics and a design approach that is called value sensitive design (Friedman and Kahn 2002; Friedman, Kahn et al. 2006; Van den Hoven 2007).

Despite the developments in socio-technical design, CSCW and other approaches in the last decades regarding user-centred design, a question still remains about how the work domain can be conceptualized. According to Iivari and Iivari (2011) the issue of work domain conceptualization is that it involves representation which is an abstraction of the domain. Such abstractions are not easily understandable for users. Furthermore, each user group may need a specific representation of the work domain. Iivari and Iivari found four different perspectives in user-centred design approaches: (1) the perspective of the user; (2) the perspective of work; (3) the perspective of involvement and (4) the perspective of system personalization.

A relatively new design framework is socio-technical systems engineering. It has been suggested by Baxter and Sommerville (2011) as a reaction to the finding that socio-technical design methods are not widely used and if they are applied, the technical systems still get the most attention (Eason 2001; Mumford 2006). Possible reasons for this that Baxter and Sommerville report are inconsistent use of terminology, the abstraction, conflicting value systems, lack of positive evaluations, the multidisciplinary nature of the method, perceived anachronism and field work issues. In the socio-technical engineering framework Baxter and Sommerville integrate socio-technical analysis with all aspects of systems engineering including organizational change. They advice using both existing tools, and also new tools such as Web 2.0 collaboration tools, social networks, Google, and Wiki to support the socio-technical engineering approach. Those tools support collaboration, the design process and communication. However, they question whether common constructs and models in information systems design and software engineering, such as Unified Modelling Language (UML) and Business Process Modelling Notation (BPMN), are rich enough to capture and reflect the components and characteristics of the social system of an organization. Among the issues raised by constructs and models is that they cannot represent the social system completely, and the meaning and context of a model cannot be made explicit completely (Clancey 1993). Therefore, a special modelling notation such as SeeMee has been suggested to model socio-technical systems (Herrmann and Loser 1999; Herrmann, Hoffmann et al. 2004).

Constructs and models are not the only factors that contribute to the success or failure of information systems design and implementation. There are also cognitive influences regarding information processing and decision behaviour and the influences of users during or after the development process. Already in 1979 Zmud (1979) identified three classes of variables that influence information systems success: (1) cognitive style; (2) personality; (3) situational variables. He found that individual differences between designers and users to a large extent determine the success of information systems development and implementation. Other factors include the alignment of the system and its purpose to the power structure of, and politics in, the organization (Markus 1983).

The fit with the organizations culture, the values and beliefs of members in the organization is regarded as another determinant of the success of the development and implementation of information systems (Romm, Pliskin et al. 1991; Pliskin, Romm et

al. 1993; Robey and Azevedo 1994; Claver, Llopis et al. 2001). Robey and Azevedo contended that technical artefacts such as information systems possess symbolic power and can be used to sustain cultural and social values. Efficiency, customer service and rationality are examples of values that can be communicated through technical artefacts. This implies that technology has material and social properties and technical artefacts are connected to cultural persistence as well as cultural transformation. Pliskin, Romm, Lee and Weber (1993) argued that the success of an information system can be predicted on the bases of technical characteristics of the system and their alignment with organizational characteristics. Organizational characteristics are at the micro level, such as user-interaction, and at the macro level, such as organization structure, distribution of power and the environment. The alignment with the organizational culture of the different user groups, such as managers and operators, that are effected by the system is a characteristic at the macro level. In the design of information systems it is regarded as important to analyse how individuals in organizations create and re-create meaning through the use of information technology, how information systems influence the social, cultural, political and economic relations and how cultural systems and information systems influence each other (Avison and Myers 1995).

Although the existence of a relationship between organization culture and information technology is generally acknowledged, there seems to be little agreement in the research community regarding the influence of information technology on culture and vice versa. Gallivana and Sriteb (2005) identified four different stances in the literature regarding this relationship:

1. The technological determinist stance, which assumes that information systems cause unguided, but determinable effects in the organizations culture.
2. The organizational imperative stance, which assumes that information systems can be applied as a tool to deliberately change selected aspects of an organizations culture.
3. The interactionist stance, which accepts that information systems and culture interact, but regards culture as unchangeable. This interaction may lead to acceptance of the system, changes in the system or rejection of the system.
4. The emergent perspective, which accepts that an interaction exits between information systems and culture and regards culture as changeable.

Only the interactionist stance assumes that culture is a fixed property of the organization. Leidner and Kayworth (2006) argued that the consideration of culture is still difficult due to the number of different definitions of culture, national, organizational and individual cultural differences, and the way in which culture is valued in information systems design and the different measures of culture. They noticed that information systems literature and cultural information systems research are separate research streams. In cultural information systems research the notion of cultural fit is an important theme. They found that culture is generally treated as being homogeneous and the cultural information systems research does not address the potential for competing values among organizational subgroups, conflict and

contradictory information system outcomes. They contended that three types of cultural conflicts can occur in the application of information systems:

1. When the values implicit in a specific information system contradict the values held by the group members that are using or influenced by that system.
2. The contradiction between the perception of the added value of the information system on the level of business functions that different groups may have.
3. The contradiction between the overall vision of the organization and the vision that seems to be implemented in the information system.

They suggest that these conflicts are likely to occur when standard information system packages are implemented and in situations when there are cultural differences between groups that are expected to use an information system and groups that are responsible for the design and development of the information system.

Integration, differentiation and fragmentation perspectives regarding cultural elements can be used to analyse the relation between organization culture and information systems design and use (Kappas and Rivard 2008): in the integration perspective there is an overall consensus on interpretation and manifestation of cultural elements; in the differentiation perspective there is consensus between groups; and in the fragmentation perspective no consensus exists. Based on their literature review and their framework Kappas and Rivard concluded that there are relationships between culture and the design process, culture and the characteristics of the design, culture and the level of acceptance of the design, culture and use processes, and culture and the implemented information system. However, they also say that knowledge regarding these relationships remains uncertain and fragmented in the information systems research community, partly because the concept of culture is not uniformly defined amongst researchers and partly because it remains uncertain how culture, organizations, organization members and the environment are related to each other.

## Software engineering

Social and cultural aspects of organizations are seldom taken account of in software engineering research. Ramesh, Glass and Vessey (2004) reviewed 628 papers in leading computer science research journals in the in the period from 1995 until 1999. They reported minimal attention to management and organizational concepts in the journal articles and no attention to social concepts. These findings are consistent with the dominant rationalist design tradition within software engineering which uses a top-down functional decomposition method since the 1970s (Elfatatry 2007). In such an approach the design process starts with a top-level functional description and decomposition of a system into interacting modules, followed by a detailed description of those lower-level smaller modules. In the 1990s an object-oriented method emerged in order to make software more adaptable to change. For that reason functions and data were encapsulated in re-usable software objects. In the 1990s component based and

service based software development also emerged as a reaction to the instability problems of software objects. Software components consist of predetermined functionality that is present in design time. Software services deliver functionalities on runtime. Software components are less suitable for accommodating business change than application services, but have better implementation efficiency. Application service based development is better at accommodate changing business requirements.

Since the 1990s the software engineering discipline has been searching for other approaches to design software than the purely rationalistic assumptions the software design practice was based on until then (Robinson, Hall et al. 1998; Noble and Biddle 2006). According to Robinson, Hall et al., these rationalistic assumptions are apparent in structured development methods, the emphasis on progress and improvement in the software industry and software legacies since the 1980s. Rationalist software engineering methods presume that the world is composed of ordered and rational problems that can be described using requirements and can be solved with rationalistic solutions. Another approach is the socio-technical software development approach (Remenyi, White et al. 1997; Robinson, Hall et al. 1998). Robinson et al. argue that a socio-technical software engineering approach, by contrast, starts with the recognition that software requirements are implicit and not explicit in the world. Requirements appear during the design and implementation of prototypes by means of democratization of the development process through full participation of organization members in the design. A socio-technical approach addresses the communication and collaboration issues that a rationalist software development approach raises. The systems engineer should be able to identify, consider and discuss all the important features of a socio-technical setting. Furthermore, the software engineer should be open to the possibility of chaos, fluidity, and the fact that all rules, values and perspectives of organization members are variable and negotiable. The software engineering discipline also should use figurative language in the design process and should find ways to overcome ambiguity problems and logical errors that are inherent in figurative language (Coyne 1997). According to the socio-technical design approaches, software engineering should be more random, opportunistic and driven by accident, rather than managed and controlled. Truex, Baskerville et al. (2000) argued that software engineering processes should be simultaneous and overlapping. Uncertainties should be allowed in the design. Furthermore, they suggest that socio-technical software development processes should be unique instead of replicable and universal, and that software development should be open to negotiation and compromises and capricious instead of rational, determined and goal-driven. Dervin (2003) argued that software engineering should highlight the communication aspect of information because information is an artefact designed for humans to make sense of reality that is both orderly and chaotic. She calls this the 'sense-making design approach' because it focuses on how humans make and unmake, develop, maintain, resist, destroy, and change order, structure, culture, organization, relationships, and the self. It is the individual or the collective that is moving from a time-space situation across a gap by making a bridge, and then moving onto the other side of the bridge where the outcome is. The sense-making approach focuses on the communication aspect of information and on the individual and social context of it. To regard individuals as themselves information designers acknowledges that humans create meaning individually and collectively as

they move from order to disorder and vice versa. Therefore, software engineers should create information systems that human beings can use to create their own meaning and that enable them to share with others the ways in which they have struggled individually and collectively to create order out of chaos or chaos out of order when order restricted or constrained them. Traditionally the software engineering discipline supposes that software describes an ordered rational reality that is based on data which is regarded as the natural description of natural reality. Furthermore, data and data processing algorithms can only be found by those with the right observational skills and technologies. She stated that users of the software should rather be regarded as information designers rather than information seekers and finders.

New software development approaches imply that efficiency, correctness are no longer an effective or useful guide to practice. Noble and Biddle (2006) contended that software design should be a negotiation between many small stories from a particular context or contexts. They refer to Wiki and Google as successful designs that are based on socio-technical assumptions. They described a number of design approaches that consider social aspects in the design. One approach is called 'agile'. Here users and software engineers collaborate and bring their own knowledge about their spheres of expertise and continually negotiate changes in the design from software iteration to software iteration. Another approach is focused on patterns and divides the total design into many small patterns that are combined into a functioning program. The patterns that are combined to form the total design can be re-used. The patterns can be based on different techniques, programming languages, hardware and software platforms and technologies. Another approach focuses on using just enough software. The software that results from this approach is neither correct nor efficient: it is adequate for the context of its use. A last approach they cite is one in which a designer assembles radically heterogeneous systems using a mix of different programming languages, hardware and software platforms and technologies. In this approach the different systems are used and combined in such a manner that user requirement are met.

## 2.3   Social and cultural aspects in Enterprise Architecture

Systems thinking (Bertalanffy 1972) is the core of the enterprise architecture discipline and is eminent in the widely used definitions of enterprise architecture of IEEE 1471 and ISO/IEC 242010:2007 that relate architecture to the fundamental organization of a system, its components and the relationships between components and the environment. In these definitions an architecture is a concept of a system, and not the system itself (Maieer, Emery et al. 2001). Furthermore, the focus on consistency of, and integration between, information system components within organizations has dominated the enterprise architecture discipline since the 1980s (Patankar and Adiga 1995; Kosanke, Vernadat et al. 1999; Delen and Benjamin 2003). In PERA, the Purdue Enterprise Reference Architecture, an organization is regarded as a combination of the information architecture, the manufacturing architecture, the human and the organizational architecture (Williams 1994). The Framework for Information System Concepts (FRISCO) that was published by the International Federation for Information Processing (IFIP) in 1998 was intended to provide simple, clear and unambiguous

definitions of the most fundamental concepts in the information systems field, including the notions of information and communication, and of information and organization. In FRISCO organizations are regarded as systems and information systems are sub-systems within them. In this framework an organization constitutes a social system in which action is performed within the frame of more or less well established goals, conforming to a certain culture that consists of norms and rules of behaviour. The focus on consistency and integration of an organization's components was also the focus of the IFIP–IFAC task force on architectures for enterprise integration which developed GERAM, the Generalized Enterprise Reference Architecture and Methodology, in 1999 (IFIP-IFAC 1999). Originally the authors of GERAM used the term enterprise engineering and focused on integration of the enterprise operation and the organization of knowledge in order to identify the need for change and to accommodate that change in the organization. They argued that enterprise engineering focuses on the recognition and identification of feedback loops that are constantly evaluated and are related to products, mission and meaning of an organization. Wegmann's Systematic Enterprise Architecture Methodology (SEAM) has also been created to support the integration of the organization and it's information systems. The framework is grounded in General System Thinking and living system theory: these are held to explain and interpret organizations (Wegmann, Balabko et al. 2005). According to Wegmann, enterprise architects use design methods to explore options to the align enterprise processes and its structure with their supporting information systems in such a manner that the enterprise can flourish in its environment. Wegmann (2003) observed that in enterprise architecture literature it seems that enterprise architects view organizations as complex systems with interacting elements that can be engineered. The Institute for Enterprise Architecture Developments (IFEAD) included the complete expression of the enterprise in its definition of enterprise architecture (Schekkerman 2004; Schekkerman 2005). The need to integrate and engineer organizations is also described in The European Commission Enterprise IT Architecture Framework (CEAF), laid down by the Directorate General for Informatics of the European Commission. That framework positions information technology in a business requirements perspective (Meersman and Vandenborre 2006).

According to researchers at Gartner, a world wide IT research organization, enterprise architectures focus on key requirements, principles, and models that describe the organization, its mission and goals and its evolution in its definition of enterprise architecture (Lapkin, Allega et al. 2008). The focus on integration and engineering of the organization in the discipline of enterprise architecture is also visible today, for example in the definition of enterprise architecture of the Open Group, a vendor- and technology-neutral consortium in the enterprise architecture field which publishes the Open Group Architecture Framework (TOGAF). For the Open Group enterprise architecture is about understanding all the different elements that constitutes the enterprise and how those elements inter-relate (The Open Group 2009). The Open Group contends that an effective enterprise architecture is critical to business survival and success and is the indispensable means to achieve competitive advantage through information technology. Therefore, enterprise architectures consist of formal descriptions of a system, or a detailed plan of it, including a guide to implement it. To

construct their models enterprise architects can use constructs from ArchiMate, a modelling language (Lankhorst 2005).

Enterprise architecture frameworks contain modelling constructs, reference models, design methods, techniques, and template architecture deliverable descriptions that can be applied by enterprise architects to design enterprise architectures. Tang, Han et al. (2004) identified typical inputs and general outcomes for enterprise architecture design methods that are presented in Figure 10.

| General inputs | Enterprise architecture design activities | General outcomes |
|---|---|---|
| 1. Business drivers<br>2. Technology inputs<br>3. Business requirements<br>4. Information system environment<br>5. Current architecture<br>6. Non functional requirements | | 1. Business models<br>2. System models<br>3. Information models<br>4. Computation model<br>5. Software configuration model<br>6. Software processing model<br>7. Implementation model<br>8. Platforms<br>9. Non-functional requirements design<br>10. Transitional design<br>11. Design rationales that are needed to construct business wide information systems |

**Figure 10: Typical inputs and general outcomes of an EA design process according to Tang, Han et al.**

Generally enterprise architecture frameworks advocate the use of a hierarchical, top-down, design approach (IFIP-IFAC 1999; Wegmann 2003; Fischer, Aier et al. 2007; The Open Group 2009). Such an approach starts with a strategic positioning of the enterprise, followed by the derivation of appropriate business requirements, organizational processes and structures and finally specifies the interaction between human and technical system components that support the strategic positioning and business requirements. An example of such an approach is present in TOGAF, the framework of The Open Group. In that approach requirements are positioned at the centre of the design processes. The design approach starts with a preliminary organizing phase and continues to the formulation of the organization's vision, and continues to the design of the business architecture layer, the information systems architecture layer, and the technology architecture layer. The implementation of the different architecture layers is commenced after the completion of the design through solution definition, planning, implementation and change management. According to Winter and Fisher (2007), all other enterprise architecture design methods follow more or less the same approach.

Enterprise architecture frameworks generally contain also a number of change management processes besides an design approach such as strategic architecture

visioning, maintenance of enterprise architecture models, migration planning processes and implementation processes (Fischer, Aier et al. 2007). The reference architecture GERAM, which is illustrated in Figure 11, for example, contains elements and processes for the design and maintenance of organizations during their entire life cycle (Bernus and Nemes 2003). It contains reference architectures that contain life cycles in order to model growth phases of organizations. They are called 'Reference Architectures type II'. The life cycle steps closely resemble phases in software engineering processes. Each object in type II reference architectures can follow a life cycle pattern in organizations and more than one life cycle can exist in parallel. Such an life cycle design approach is also visible in the frame work of Zachman (2008) and in TOGAF (The Open Group 2009). For example, Zachman uses the following life cycle steps: identification, definition, representation, specification, configuration, and instantiation.
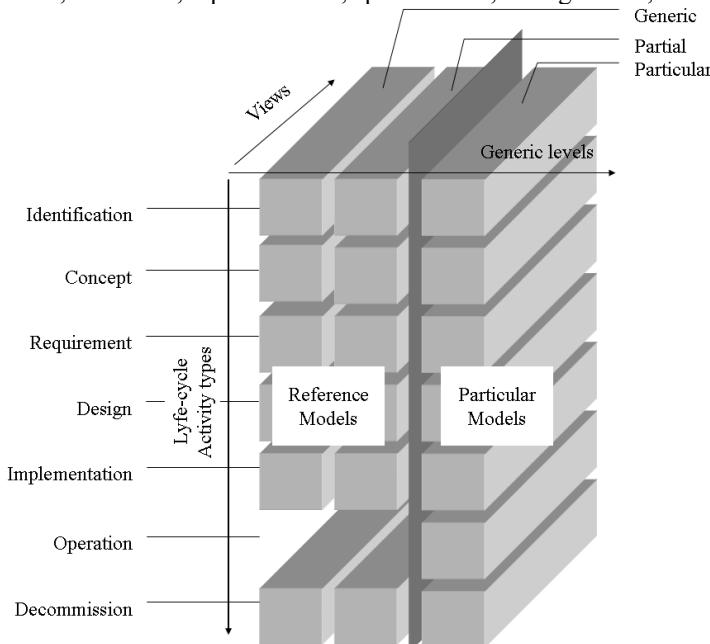


**Figure 11: GERAM modelling framework according to Bernus and Nemes**

Enterprise architecture designs consist of layers in which each layer restricts the design space for the subsequent layers. The fundamental organization of an enterprise is usually represented in the first layer and contains the business architecture from a strategic point of view. The second layer represents the fundamental organization of service delivery, which Winter and Fisher call process architecture. The third layer contains the integration architecture that represents the fundamental organization of information system components. The fourth layer contains the software architecture that represents the fundamental organization of software services and data structures. The last layer contains the technology architecture and represents the fundamental organization of hardware and networks. Each layer is linked by means of so-called

artefacts that describe the 'what' and 'how' of each layer. According to Winter and Fisher, the use of layers is derived from the multi-level systems theory approach that has been presented by Mesarovic, Macko et al. (1970). With this multi-level approach the enterprise architect is able to focus in each layer on a certain design perspective and can manage multiple perspectives during the design process. The models and sub-models in the different layers must be structurally, behaviourally and spatially consistent with each other. For Zachman (1997) this consistency is an important enterprise architecture design principle. The layered design approach also makes the enterprise architecture meaningful to multiple stakeholders because each layer focuses on a specific perspective a stakeholder has.

This layered structure is, for example, present in the framework of Zachman (1997) who uses perspectives to describe the different components of an enterprise. According to him, an enterprise is defined by a set of business functions and assets that are all integrated in support of a common mission or set of objectives. Zachman related the disciple also to quality management (Sowa and Zachman 1992). He noted that change is the biggest challenge modern enterprises face and it should start with an engineering description of the change. He contended that enterprise architectures are necessary for quality management and guidance in the change. The first perspective in the framework of Zachman is that of the strategist who defines the scope of an enterprise architecture. This perspective describes the boundaries of the enterprise architecture. The second one represents the perspective of the business leader. The first and second perspectives contain components such as business entities, business processes, business locations, organizations or agents for the allocation of work, organization charts, business events, master schedules, goals/strategy and business plans. The other perspectives are those of the architects, engineers, technicians, and workers. They comprise the information systems perspective, the technology perspective, the component perspective, and the operations perspective. Each perspective contains constructs, models, principles and descriptions that describe what each component in the perspective is made of, how it works, where the components are, who works on them, when they work on them, and why. This framework is presented in Figure 12. Zachman (2008) contended that the composition and integration of these perspectives makes it also possible to create comprehensive and composite descriptions of complex ideas.

Another example of the layered structure is present in CEAF, the enterprise architecture framework of the European Union which uses business, functional, application and technical perspectives to describe an organization. The purpose of the *business* perspective is to get a correct scoping of business needs that need to be translated into the information systems support. Business functions that do not need IT support are excluded from the framework. Therefore, the business perspective contains all the business processes that the information systems must support. It structures the *functional* perspective of the organization and describes the application services that information systems should deliver. The *application* perspective describes the applications that are needed to deliver the application services. The *technical* perspective describes the hardware, basic software and technologies used to deliver the application services.

|  | What | How | Where | Who | When | Why |
|---|---|---|---|---|---|---|
| **Strategist** Scope |  |  |  |  |  |  |
| **Executive leader** Business model |  |  |  |  |  |  |
| **Architect** System model |  |  |  |  |  |  |
| **Engineers** Technology model |  |  |  |  |  |  |
| **Technicians** Detailed representations |  |  |  |  |  |  |
| **Workers** Functioning enterprise |  |  |  |  |  |  |

Perspectives

Artifact parts, models and descriptions
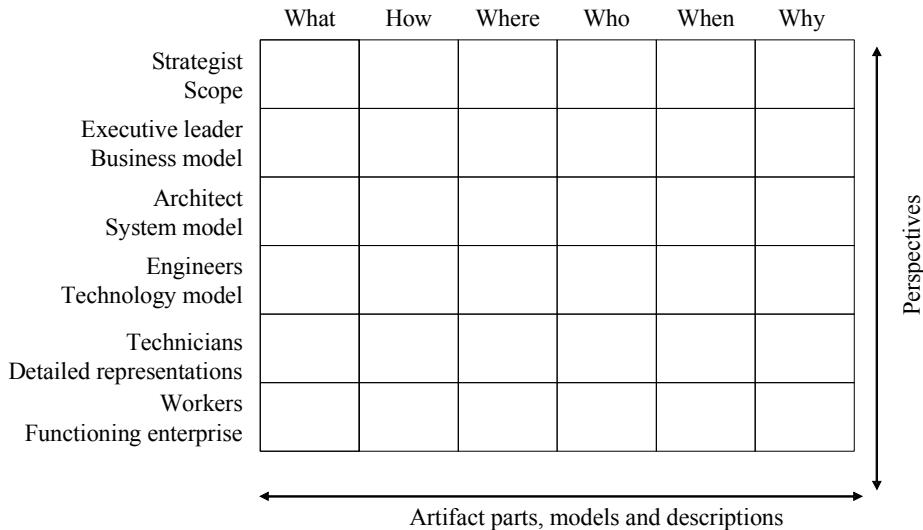
**Figure 12: The Zachman Framework for Enterprise Architecture**

Principles are regarded in enterprise architecture designs as the organization's basic philosophy that guides the development of the enterprise architecture (Richardson, Jackson et al. 1990). The Open Group (2009 p. 265-283) defined an architectural principle as a qualitative statement of intent that has a rationale and a measure of importance that should be met by the architecture. According to the Open Group, principles are general enduring rules and guidelines for the organization in the fulfilment of its mission. In FEAF (Thomas 2001 p. 7-8), the federal enterprise architecture of the US, principles serve as a set of organizational rules. They are applied to guide development, maintenance and use of the enterprise architecture and are derived from strategic plans, business needs and IT vision, requirements, and practices. The principles are used to determine IT policies and guidelines, system life cycles, capital planning and investment control. According to Dietz (2003), principles should be used as a means in the design process to constrain the design freedom of architects, which he considered to be undesirably large. He contended that the design principles can be regarded as a coordinated set of architectural constraints that restrict the roles and features of architectural elements and the permitted relationships between those elements within the enterprise architecture. Therefore, an enterprise architecture can also be regarded as a consistent set of design principles and standards that guide the design process (Dietz 2003; Hoogervorst 2004). Despite a consensus in the discipline about the added value of principles, the above presented applications of principles in enterprise architectures illustrate the continuing debate between enterprise architects on what principles exactly are and how they should be formulated (Op't Land, Proper et al. 2007).

Enterprise architects generally use an enterprise architecture framework to create a rationalist, consistent and systemic representation of different organization levels, such as the organization structure, business processes, information structure, information systems, and technical infrastructures. Some publicists argue that enterprise

architects should solely be involved in information systems engineering, whilst others argue that information systems today encompass the complete enterprise and the enterprise architect should therefore be involved in the strategic and management processes of enterprises. According to Strano and Rehmani (2007), the enterprise architect can also be regarded as a programme manager whose responsibility it is to design and implement an enterprise architecture. Zachman (1997) has published a number of challenges that enterprise architects face. The main issue he addressed is the time, for example the time it takes to produce and maintain an enterprise architecture because it frequently leads to a mismatch between the point at which an enterprise architecture is delivered and the point at which it is needed by an organization. According to him, this mismatch also results in a relatively short period of time in which an enterprise architecture really fits the needs of an enterprise. This was also reported in 2009 by Buckl, Ernst et al. (2009). They said that the planning of the evolution of business applications and the traceability of application changes are major challenges in the enterprise architecture discipline. Another challenge that enterprise architects face is the transformation process of an organization because there are no approaches in current practice that support the transformation process (Aier and Gleichauf 2010). Another issue that Aier and Gleichauf reported is that enterprise architecture methods lead to a complex and layered set of interrelated and time-bound models that are hard to maintain because of the number of relationships between layers, models and inside models. They argued that the design methods of enterprise architecture should support the discovery of an optimum between complexity and maintainability of its models. Aier and Gleichauf proposed a design method in which meta and micro models are modelled to represent the current state, transformation state and future state of an enterprise. Each model should have different time dimensions such as modelling time and valid time. However, such a time dimension leads to more complexity in the models and because of this complexity change has been regarded by designers as an evil to be evaded rather than an opportunity to be embraced (Elfatatry 2007). Different methods have been adopted from the software engineering discipline to cope with the complexity that time adds to the models such as object modelling, component based modelling and service oriented modelling. The design method that uses object-orientation encapsulates functions and data in re-usable business, application and technical objects. Both component-based and service-based methods include pre-determined functionality into the components or services. The difference between components and services is whether behaviour on runtime is already known in design time. Recent enterprise architecture design methods advocated the use of service-orientation (Lankhorst 2005; The Open Group 2009). However, this enterprise architecture method is still in the early stages of research and issues concerning organizational impact of service orientation are underserved (Elfatatry 2007; Viering, Legner et al. 2009).
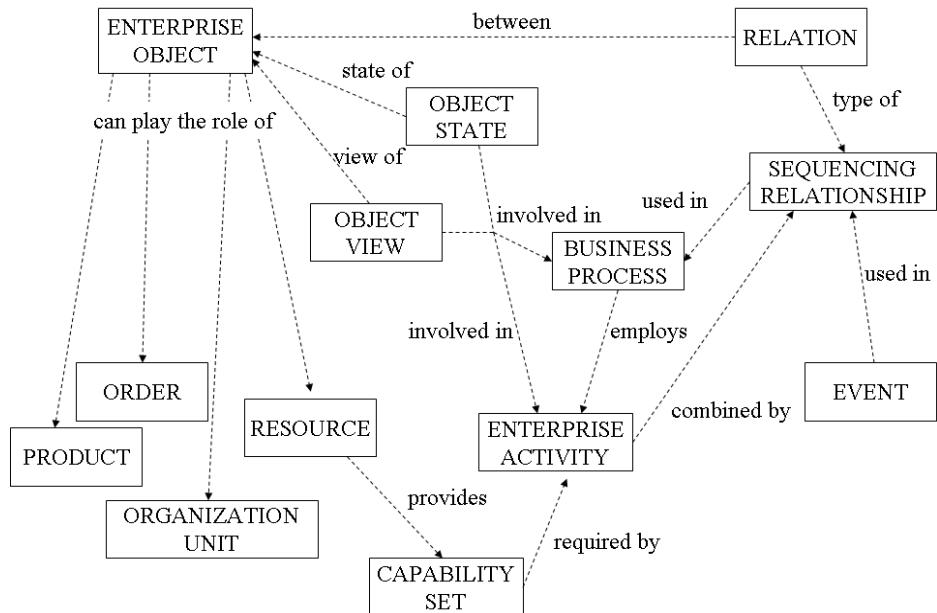
**Figure 13: CEN ENV 12204 constructs and relationships (Vernadat 2002)**

An enterprise architecture design process can be used as a problem solving activity to design an enterprise that best satisfies the goals of an organization given the risks, costs and benefits (Tang, Han et al. 2004). According to Bernus and Nemes (2003), a rationalist design approach is needed because the purpose of the enterprise architecture discipline is to integrate processes, strategies, organizational structures, resources, goals and constraints. Therefore design approaches generally lead to an objective and ordered representation of the different organizational levels. Rationalism can be regarded as the application of reason to expose and remove unreason, superstition and dogmatism (Alvesson and Willmot 1992). Important postulates of rationalism are that reason and logic are universally valid and that there is an objective natural reality that can be represented and referred to by language (Duignan 2010). Furthermore, knowledge about natural reality can be acquired by humans and can be justified on evidence or principles and general theories can be constructed that explain many aspects of the natural or social world (Cooper and Burrell 1988). Rationalist design approaches lead to formal models on each architecture layer that are used to describe the objective and structured reality that the enterprise architect perceives for that layer. The models are constructed by using a formal, preferably mathematical, and unambiguous language in such a way that the complete set of layers and models represent the objective and ordered reality of an enterprise. Examples of those models are presented in Figure 13 and Figure 14.
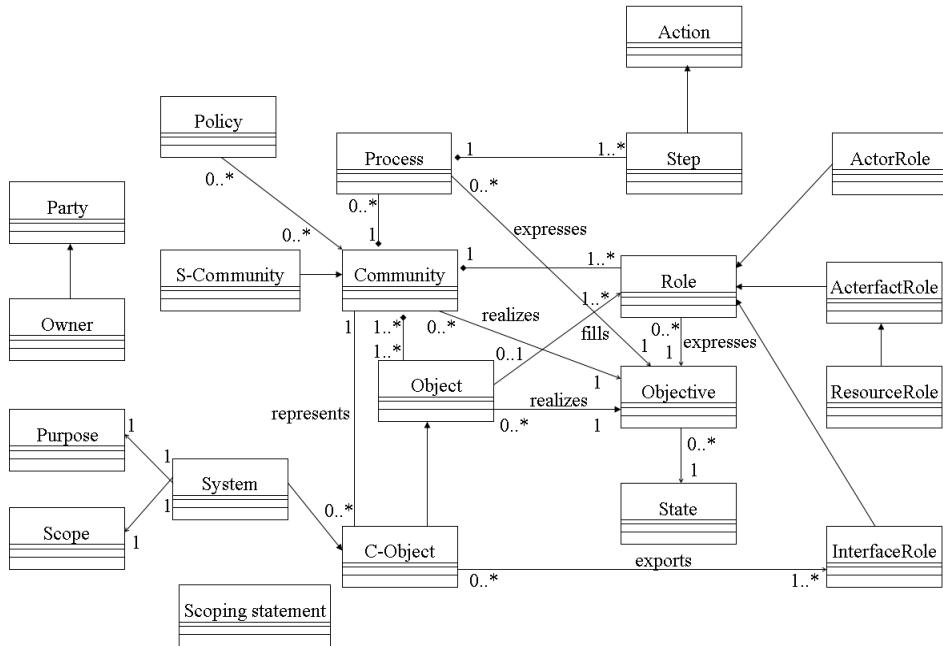
**Figure 14: ODP-RM Enterprise Language constructs (Vernadat 2002)**

Rationalism can also be observed in Zachmann's design approach. Zachman (1987) compared enterprises with complex objects such as aeroplanes that can be invented, defined, designed and built in a rationalist manner. He contended that enterprise-wide integration and business technology alignment do not happen by accident: they must be engineered. According to him, engineering is the same as architecture. The enterprise is an instantiation, an implementation, the end result of doing enterprise architecture (Zachman 2007-2008). He argued that enterprise implementation is synonymous with enterprise manufacturing and that the process of enterprise architecture is synonymous with enterprise engineering. Complex objects should be engineered first, and so, the first step is to create an architecture. Only after engineering one should manufacture (Zachman 2007).

As a result of the rationalist design approach enterprise architectures contain for instance object-oriented models or models that relate to formal symbolic modelling languages such as ArchiMate or formal relation partition algebra that is used in SEAM (Rychkova and Wegmann 2007). Wegmann (Wegmann 2003) contended that the dilemma that enterprise architects face is that they make decisions about the reality that they perceive, but that these choices cannot have any formal justification. The only justification is the specialist's believe that he or she is right. He classified systems into complicated and complex ones. Because of the deterministic nature of complicated systems such as computers, their behaviour can be predicted and analysed However, this does not apply for non-deterministic complex systems, such as organizations. Wegmann argued that the challenge of the enterprise architecture discipline is to analyse and design the co-existence and interaction of complex and complicated systems. analysing and designing this interaction implies that people, resources, organizational

policies, institutional rules should all be considered (Scacchi 2004). This leads to a dilemma because not taking these interactions into account leads to omissions in enterprise architecture designs, whereas taking them into account leads to ambiguities in the designs. It is these ambiguities that cause problems because it is hard to include ambiguities in constructs and models (Sowa and Zachman 1992; Patankar and Adiga 1995; Vernadat 2002; Delen and Benjamin 2003).

Concepts relating to working live such as capabilities, skills, know-how and competencies, as well as roles of employees in organizations and operations are considered in a number of enterprise architecture frameworks such as GERAM and FRISCO. In GERAM organizational aspects are the decision level, responsibilities and authorities of workers. Operational aspects are the capabilities and qualities of employees. Communication aspects are the interoperation between individuals and with technology. According to the framework, these aspects are only incorporated in a design if computer-executable models can be derived from such models. The modelling constructs in GERAM focus on human roles in organizations because roles are needed to understand when, how and by whom decisions are made and tasks are performed and those constructs are needed to model the aspects of human roles that are necessary for that integration. Without these models knowledge about the role of employees cannot be capitalized on, analysed by computer or re-used. In GERAM the use of informal models, such as cause and effect diagrams or images, is suggested as an alternative to formal modelling, even though they are hard to analyse by computer and can be impractical in design processes. The deployment of socio-technical design methods is also suggested in the framework.

Representations of social and cultural aspects of organizations are generally not considered to be enterprise architecture artefacts. Shorter (1999) observed that in conferences and workshops issues regarding the consideration and incorporation of social and cultural aspects of the organization in enterprise architectures are recognized, such as restricting formalisms to describe capabilities and qualities of humans and the absence of constructs to model those aspects. Although these issues were already observed in the enterprise architecture discipline in 1999, they still hold today. For example, TOGAF version 9 positions the enterprise architecture of an organization as the responsibility of the chief information officer. TOGAF refers to human computer interfaces and human interaction services that are defined as the means to consistently present data to end users in an appropriate format. ArchiMate, the formal modelling language of enterprise architects also contains constructs to model elements of the organization such as products, processes, business objects, and services. No concepts have been found in that language that can be used to model social aspects of enterprises.

In enterprise architecture literature there is little or no attention to the symbolic power of enterprise architecture designs and the possibility of communicating beliefs, values and assumptions to organization members, apart from the translation of goals, objectives and strategies into formal models. In frameworks references to culture in organizations are lacking (IFIP-IFAC 1999; Eriksson and Penker 2000; Lankhorst 2005; Zachman 2007-2008; The Open Group 2009). The use of requirements in traditional architecture design approaches, as suggested by Hearn (2003), is observed in enterprise architecture frameworks such as TOGAF. However, it is not explained there how cultural aspects of organizations such as beliefs, and values and assumptions can be

taken into consideration and incorporated in enterprise architecture designs. This does not mean that culture is completely ignored: the importance of cultural contexts in the design of enterprise architectures is acknowledged. According to Hoogervorst (2004), failed introductions of technology and related symptoms underscore the importance of considering and incorporating cultural aspects. He stressed that management practices and the organizational culture, structures and systems should all be part of an enterprise architecture design. However, in enterprise architecture literature the gap between the intention to consider and incorporate social and cultural aspects of organizations in enterprise architectures and how they actually should be considered and incorporated in designs, or be evaluated after the design is completed, is not bridged.

## 2.4   Conclusions

The literature presented in this chapter demonstrates that in the reference disciplines of the enterprise architecture discipline schools of thought exist that focus on the consideration and the incorporation of social and cultural contexts of organizations in their designs. Furthermore, it demonstrates that no school of thought was found in the enterprise architecture discipline that focus on social and cultural aspects of organizations in designs. The literature illustrates that the discipline is grounded in systems theory and regards enterprises as rational structures of programmable components, with interrelationships that are constructed for the attainment of some goal. The discipline includes principles and guidelines in enterprise architecture designs to govern a design and its evolution over time. To represent organizations enterprise architects use constructs en methods to construct formal models that represent organizations and that can ideally be understood and executed by computers. A dilemma was found in the discipline concerning the perceived objective reality that enterprise architects think they perceive as opposed to the socially constructed reality of organization members (Wegmann 2003). The presented literature suggests that enterprise architects tend to focus on those elements of the socio-technical system that can be modelled in an unambiguous and formal manner in languages such as UML, BPMN and ArchiMate. Consequently, they focus on the objective technical, programmable side of enterprises and social and cultural aspects of an organization are not considered. This leads to rationalistic designs, despite socio-technical design theory developments in reference disciplines dealing with socio-technical systems.

The basic assumption in the socio-technical tradition is that the designed, organized and built enterprise architecture should also have additional meanings within the sociological and cultural environment of the enterprise apart from the purely rational and functional meaning. Furthermore, the distinction between engineering and architecture in traditional architecture can also suggest that the design, organization and building of an enterprise architecture is not only a craft, but also an art. This is in accordance with a tradition in traditional architecture that emphasizes that architecture is more than engineering, because architecture also attends to aesthetical, symbolic and social values. In accordance with the socio-technical design tradition and the artistic element of traditional architecture, the enterprise architecture discipline can therefore also be regarded as the art and craft that designs, organizes and builds enterprise architectures that not only have to deliver pre-defined functionalities, but also have

meaning in the sociological and cultural environment of the enterprise. However, this view differs from the rationalist design tradition in enterprise architecture. No enterprise architecture publication has been found that addresses aesthetic aspects of an enterprise architecture. Furthermore, this alternative perspective on enterprise architecture emphasizes that enterprise architects should also focus attention to social and cultural aspects of the designs, besides the attention they give to integration and engineering of rational and programmable components. What is more, the discipline gets with this attention to those aspects parallels with the socio-technical design school in traditional architecture in which social and cultural meaning in architecture designs is valued as much as the functionalities of a physical structure. The alternative view corresponds to the socio-technical design schools in organization science and information systems research that were initiated by scholars such as Trist and Mumford.

The literature presented illustrates that social and cultural aspects of organizations are not constants. They change over time. Three cultural stances have been presented that posit influences between information systems and culture (Gallivana and Sriteb 2005) that demonstrate that consideration and incorporation of the dynamic between social and cultural aspects of an organization and enterprise architectures is relevant. The influence should be treated as a design variable by enterprise architects instead of a constant. The literature also demonstrates that social and cultural aspects of an organization are related to the phase and focus of an organization. Therefore, that relationship and the expected shifts in phase and focus should also be considered in order to keep the enterprise architecture design aligned with them.

A socio-technical perspective on enterprise architectures emphasizes the importance of social, cultural and their related temporal aspects of organizations in designs. The alternative perspective on enterprise architectures presented here pays attention to and incorporates these aspects in enterprise architecture designs, as is illustrated in Figure 15.
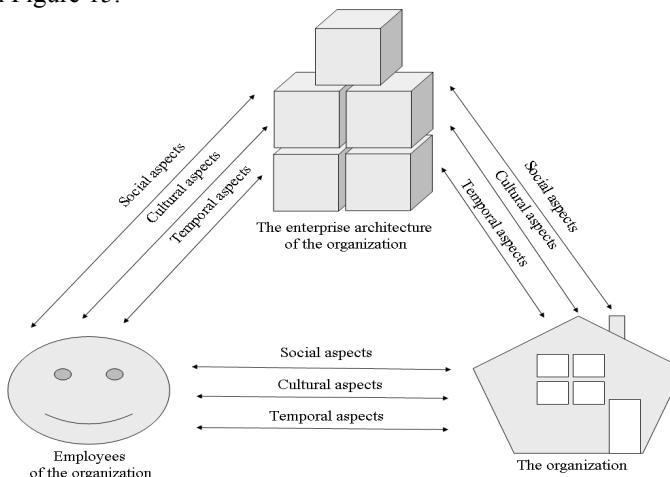


**Figure 15: Social, cultural and temporal interactions**

Each one of these three elements can be detailed further and are presented in Table 3. The social aspects are derived from the socio-technical design theory in the organization science literature presented here. The cultural aspects are regarded as the bearers of the culture of an organization that can be considered and incorporated in a design. These aspects are chosen because in the organization science literature presented here these cultural bearers are important in enterprises, the architecture literature demonstrates that these cultural bearers can be incorporated in an architecture and they are related to the socio-technical design tradition. The literature contends that a relationship exists between architecture and society, culture and society, social aspects and the culture of an organization, and information systems and organization culture. Social and cultural aspects influence designs and designs influences culture and society. Moreover, two other temporal aspect are discussed in this chapter that are related to social aspects and cultural aspects of an organization. They concern the phase and focus of an organization. Therefore, these aspects of time also are included in the framework and are investigated in this research.

The literature demonstrates that the elements in the framework are related to each other (temporal aspect 1). Temporal aspects 5 and 6 (the phase and focus of the organization) or temporal aspect 2 (the purpose, structure and processes of an organization) are for example related to the social and cultural aspects of the framework. Temporal aspect 3 (the enterprise architecture of an organization) influences for example also the social and cultural aspects and vice versa (temporal aspect 4).

| Social aspects | Cultural aspects | Temporal aspects |
|---|---|---|
| 1. The roles that employees have in the organization and in business processes | 1. Symbolism | 1. Organizational, social and cultural elements are not constants but change over time and influence one another |
| 2. The possibilities for employees to have variety in their work | 2. Norms and values | 2. The dynamic between purpose, structure, processes and culture in an organization. |
| 3. Possibilities employees have for self regulation and self determination | 3. The shared identity | 3. The influence an enterprise architecture design has on the social system and the culture of an organization |
| 4. Possibilities employees get to make decisions that they can call their own | 4. The core set of beliefs and assumptions | 4. The influence that a social system and the culture of an enterprise have on an enterprise architecture |
| 5. Feeling employees gain from self determination and recognition | | 5. The relation with the phase the organization |
| | | 6. The relation with the focus of the organization. |

**Table 3: The research framework**

The enterprise architecture discipline focuses on coherence and integration of organizational aspects. It is expected, therefore, that the aspects of the framework, and their interaction are also treated in a corresponding manner in enterprise architecture designs. To investigate this, five propositions are here formulated based on the literature presented in this chapter. These propositions are subsequently tested in this thesis. The propositions are:

1. The discipline of enterprise architecture regards organizations as rational, programmable systems that can be engineered to attain some goal or purpose through the technical, programmable, side of the enterprise;
2. The socio-technical design theory in organization science and social design theory in architecture urges enterprise architects to pay attention to social and cultural elements in their designs. In enterprise architecture practice it is acknowledged that social and cultural factors should get equal attention as the technical side of the organization in enterprise architecture designs;
3. The enterprise architecture discipline does not have instruments for giving consideration to social aspects of an organization, or incorporating them into a design;
4. The enterprise architecture discipline focuses on the objective reality of organizations and pays therefore no attention to the creation of cultural meaning, apart from the translation of goals, objectives and strategies into formal models;
5. Physical, social and mental objects change constantly and influences individuals, organizations and enterprise architectures. The consideration and incorporation of this in enterprise architecture designs is problematic. Time in enterprise architecture creates an unwilling and unwanted complexity to an already complex design.

# 3  RESEARCH METHODOLOGY

*"We shape our buildings: thereafter they shape us."*

Sir Winston Churchill

# 3.1   Introduction

The objective of this research is to arrive at an understanding of the way in which the social and cultural aspects of organizations are reflected upon and incorporated into enterprise architecture designs in the context of e-government. The purpose of this research is to create knowledge in a systematic fashion (Snyder 1984). There should be a clear research objective (Saunders, Lewis et al. 2009 p. 5), the ideas generated as well as the validity of observations and conclusions should be subject to critical discussions with others and an ethical code of conduct should be followed in the research (Robson 2002 p. 65-76). Van Engeldorp Gastelaars (2008 p. 27-29) argued that traditionally research is scientific when the following concepts are dealt with: (1) replicability; (2) objectivity; (3) publicity. He emphasized the neutral position of the researcher, and proclaims explorative and communicative carefulness in management research so that the research process and findings can be validated and pluralism of opinions is encouraged. Groat and Wang (2002 p. 176-180) contended that research data should also be checked with interviewees and there should be multiple sources of data collection. They emphasize reflexivity of the researcher and also maintain that: (1) there should be a 'thick' description of context to assess similarity; (2) expected instability of data should be traceable; (3) there should be triangulation of data; and (4) there should be reflexivity on the part of the researcher.

This chapter focuses on these aspects. The type of research, the research philosophy, research methods and techniques that have been used in the research are all explained, along with the measures that have been implemented to assure research quality.

# 3.2   Type of research

There are several research methodologies to study the connections between human experience and architecture (Groat and Wang 2002 p. x-xi). The research presented in this thesis can be categorized as interdisciplinary (Aram 2004), participatory (Schwartz and Green 1955) and dominantly qualitative (Johnson and Onwuegbuzie 2004). According to Groat and Wang, architectural research aims at understanding of the relationship between successful build environments, physical attributes of those environments and the consideration and incorporation of human aspects. They argued that architectural research is inherently interdisciplinary because it involves many aspects such as engineering, design and sociology. They emphasized this interdisciplinary nature of architecture and argued that case study and mixed methods are suited to topics concerning architecture and human life. Just like architecture, management science also has an interdisciplinary nature and should have a strong relationship with daily practice. According to Van Engeldorp Gastelaars (2008), the usability of knowledge and procedures to acquire knowledge are central themes in management science, rather than the question about the nature of truth. In this research a number of design theories from different disciplines is applied. Interdisciplinary research is the most commonly applied type of research in design research (Aram 2004) and is well known in information systems research (Markus and Robey 1988; Guarino 1998; Peffers and Ya 2003).

This research involved observing and participating in a particular instance of a design done by the SVB, a Dutch governmental implementation organization, because the researcher worked there as a senior enterprise architect in the period between January 2008 and March 2010 in the change programme of the SVB that serves as a case study in this research. In that period the researcher gathered case data and at the same time participated in the enterprise architecture design process. The researcher, together with other designers, explored possibilities to solve design issues regarding the consideration and incorporation of social and cultural aspects of the organization in the enterprise architecture. The case study thus has a number of the general characteristics of action research, such as action and change orientation, a problem focus, an organic process and collaboration between participants (Baskerville and Wood-Harper 1996; Baskerville 1999). According to Baskerville (1999), action research is applied in information systems research and can be linked to the Tavistock Institute. He contended that action research in information systems research is most appropriate in situations in which the social system interacts with information systems. Furthermore, action research done in co-operation with stakeholders creates knowledge that is pragmatically useful and is grounded in local knowledge. Action research has resulted in contributions to Multiview contingent systems development framework, the soft systems methodology, socio-technical design and the ETHICS methodology developed by Mumford (Avison, Lau et al. 1999). Processes in action research can be iterative, reflective or linear, the structure can be rigorous or fluid, the involvement of the researcher can be collaborative, facilitative or experimental and the goals can be organizational development, design, training or scientific knowledge (Baskerville and Wood-Harper 1998). According to Baskerville and Wood-Harper (1996), action research is not without problems. One problem with it is that the researcher is not an independent actor in the research and this can lead to a research approach that neglects scientific discipline. Neglecting research rigour can lead to limited transferability of the research results. McKay and Marshall (2001) argued that an action research project design in which a problem solving process is designed alongside a knowledge creation process can overcome this problem. Although the research presented in this thesis has a number of action research characteristics, it is not typical action research because of its exploratory character. For example, change experiments were not conducted. All the same, the researcher was a participant observer in the SVB case study, the process of registering, interpreting and recording can be regarded as participation which, according to Schwartz and Green (1955), can be active or passive. This distinction depends on the investigator's emotional involvement in the phenomenon under observation. In that regard the researcher has been an active participator in the SVB case study. Greater involvement relates to more active participation and more active participation leads to more understanding of the phenomenon under study. Schwartz and Green described two types of active participation: observation and investigation. Participation has a number of drawbacks such as too much emotional bond with research subjects, the time it takes to conduct the study, and that documentation is separated from observation (Miller 1952; Schwartz and Green 1955; Becker 1958). Miller argued that a participatory research can be vitiated by the intensive relation with the observed and bias, especially if the researcher identifies strongly with the observed. Because of the long research period of the SVB case study and the in-depth understanding of that situation, that case

study also has characteristics of ethnographic research (Myers 1999). A benefit of ethnographic research is the acquisition of in-depth understanding of a situation. Disadvantages are the time it takes to conduct such a research and its limited scope. In the SVB case study researcher bias was a potential risk. In order to guarantee the appropriate level of objectivity and to minimize potential bias in the analysis of the case data and the overall research a number of quality measures have been taken such as the application of multiple data collecting techniques and a review of the findings by persons not involved in the case data analysis.

In this research qualitative and quantitative techniques, methods and approaches are combined: thus for example a case study is combined with a survey. Such a mixed method research and pragmatism fit well together (Rocco, Blis et al. 2003; Johnson and Onwuegbuzie 2004). Mixed methods research builds on the strengths of qualitative and quantitative research and minimizes their weaknesses. It is used to integrate insights from quantitative and qualitative research. Mixing quantitative and qualitative methods adds value to analytical and statistical generalization (Yin 2003 p. 150-151). Qualitative research assumes a subjective role on the part of the researcher, especially in complex social-cultural settings. According to Groat and Wang (2002 p. 124-125), a mix of methods is often used by designers in architecture. Although information systems research has a tradition in quantitative research, qualitative, interpretive, and mixed methods are applied (Kaplan and Duchon 1988; Myers 1997; Avison, Lau et al. 1999). The integration of case study and survey research methods has for example been published by Gable. Gable (1994) argued that it is relevant for information systems research to combine a case study with a survey in order to verify case study findings. He suggested that a survey contributes to greater confidence in the generalizability of case study results.

Mixing methods in an inquiry can be referred to as 'between' or 'across' method triangulation. Johnson, Onwuegbuzie et al. (2007) describe four types of triangulation: (1) data triangulation, (2) investigator triangulation, (3) theory triangulation and (4) methodology triangulation. Between-method triangulation can be used as a means to cancel out bias and to reach a convergence upon the truth about some social phenomenon. Generalization can be obtained through methodology triangulation. Data triangulation and methodology triangulation have been applied in this research. Data triangulation is applied in the SVB design case by using multiple data sources. In the overall research multiple methods are used.

Another aspect of mixed method research is the validity of it. Guba and Lincoln (2005) summarized validity as the certainty one has that the inquiry has led to outcomes that one can act on with confidence. They referred to two forms of validation that are needed in a research, and are applied in this research. The first form is rigour in the application of each applied research method and the other is rigour in interpretation of the results. Onwuegbuzie and Johnson referred in 2006 and 2007 to issues in mixed method research (Onwuegbuzie and Johnson 2006; Johnson, Onwuegbuzie et al. 2007). An important concern of theirs about mixed methods research was the credibility, trustworthiness or validity of the research. They referred to problems with representation, integration and legitimation of findings in mixed methods research. The representation issue is the difficulty in using text and numbers simultaneously to represent data. The legitimation problem refers to research findings and inferences

between findings in different research methods that are credible, trustworthy, dependable, transferable, and/or confirmable. The integration issue is the problem of integrating qualitative and quantitative data. All the same, the advantages of the mixed design outweigh these concerns because the research findings in the mixed method research that is presented in this thesis fit the research objective very well. Such advantages include the convergence and corroboration of objective and subjective findings, the enhancement of those findings, knowledge development expansion for the enterprise architecture discipline, the discovery of paradoxes and contradictions between objective and subjective representations of entities in an universe of discourse, and the expansion of the breadth and range of inquiry regarding subjective elements in enterprise architecture designs.

## 3.3   Research philosophy

Researchers need to be aware of the underlying research philosophy in their research (Orlikowski and Baroudi 1991). Several philosophical stances can be applied in design research. Each stance has unwanted consequences regarding the creation of scientific knowledge. An interpretivist stance appears to be appropriate for this research because some social and cultural aspects of organizations such as feelings of recognition and assumptions are inherently socially constructed. An interpretivist stance is, however, in conflict with the dominant positivistic stance of enterprise architects (Langenberg and Wegmann 2004). The consequence of a positivistic stance is that social entities are only considered and incorporated in artefacts if they exist independently of social actors (Orlikowski and Baroudi 1991). Only that kind of social aspects, such as roles of employees, is generally considered by enterprise architects to be real and therefore included in their discourse. All other social aspects are excluded. Therefore, choosing a positivistic stance in this research can lead to the exclusion of socially constructed aspects in advance. Not exploring those aspects because of one's chosen philosophical stance is an unwanted consequence in this inquiry, because one aim of this study is to explore how social and cultural aspects of organizations regarded as being of a subjective nature are considered and included in an enterprise architecture design.

The issue concerning the existence or non-existence of entities in reality is also applicable to the research object 'enterprise architecture'. In the subjectivist paradigm each member of an organization has a personal mental image of the architecture of the organization. Consequently, the subjectivist stance is that an enterprise architecture does not exist as an object independent of social actors. The implication is that only the discourse of a group determines what the architecture of an enterprise is. Consequently, each person and group of persons has different mental architectural images of an enterprise. Therefore, in the subjectivist stance there is not one enterprise architecture of an organization, but many. To overcome this enterprise architects choose an objectivist stance in the design process in order to be able to design and implement an architecture that is capable of producing goods and services.

The differences between subjectivist and positivistic perspectives on reality also have consequences for the epistemology of the inquiry that is presented in this thesis. Enterprise architects and information system designers traditionally use a positivistic epistemology (Kaplan and Duchon 1988; Orlikowski and Baroudi 1991;

Wegmann 2003), with a view to producing law-like generalizations, whereas interpretive research focuses on subjective meanings (Orlikowski and Baroudi 1991). However, design research is situated in a specific context and consequently does not generally produce law-like generalizations. In this inquiry the researcher adopts an empathetic stance to reality in order to understand the social and cultural aspects of design contexts. Such a stance corresponds with interpretivism. Some social and cultural aspects are considered to have an existence independent of the human mind. Knowledge regarding those elements is obtainable, according to a philosophical position known as realism. Choosing exclusively a positivistic or a subjectivist epistemological philosophical stance in this research would imply that knowledge about certain social or cultural aspects are unobtainable. This is undesirable.

A pragmatic stance has been chosen here because of these fundamental differences between objective and subjective ontology and epistemology, and the unwanted consequences of choosing either one of those research philosophies. Besides, the epistemological stance of design science is pragmatism (Romme 2003). Charles Sanders Pierce, William James and John Dewey are considered the fathers of pragmatism, with Pierce as its founding father. He stated the pragmatic doctrine in 1878 in the essay *How to Make Our Ideas Clear* (Peirce 1998). The pragmatic position is that an abstract concept is only meaningful when it refers to some sense experience. According to Moore in the introduction of *The essential writings* (Peirce 1998 p. 2-42), Pierce, James and Dewey each had a different interpretation of pragmatism. Pierce focused on general relations between action and experience. James focused on particular experiences and Dewey on the dynamic nature of ideas and their roles as instruments for action. According to James, truth is not a inherent property of an idea. Assimilation, validation corroboration and verification are processes that are used to establish whether an idea is true or false (James 1978 p. xxii). According to Taekema (2010), the pragmatic philosophy according to Dewey means a holistic world view in which dichotomies are rejected; there is an emphasis on intelligent inquiry in which a mix of methods is used to find a solution to practical problems; ideas are dynamic and temporary; and the context of human action determines how people act in given practical circumstances. Pragmatism links theory to praxis (Baskerville and Myers 2004; Hevner, March et al. 2004; Denzin and Lincoln 2005 p. 53). The relation between science and practice fits well in the field of information systems research (Lee and Baskerville 2003). In pragmatism qualitative and quantitative methods can be mixed in one inquiry and combining quantitative and qualitative methods in a research is applied in information systems research (Kaplan and Duchon 1988; Gable 1994).

## 3.4   Research approach

As has been mentioned, the research approach adopted here follows a sequential mixed methods design (Onwuegbuzie and Johnson 2006; Johnson, Onwuegbuzie et al. 2007). It is sequential in that in the research process data are collected, represented and analysed in each phase of the inquiry and each phase has a distinct research philosophy as illustrated in Figure 16.
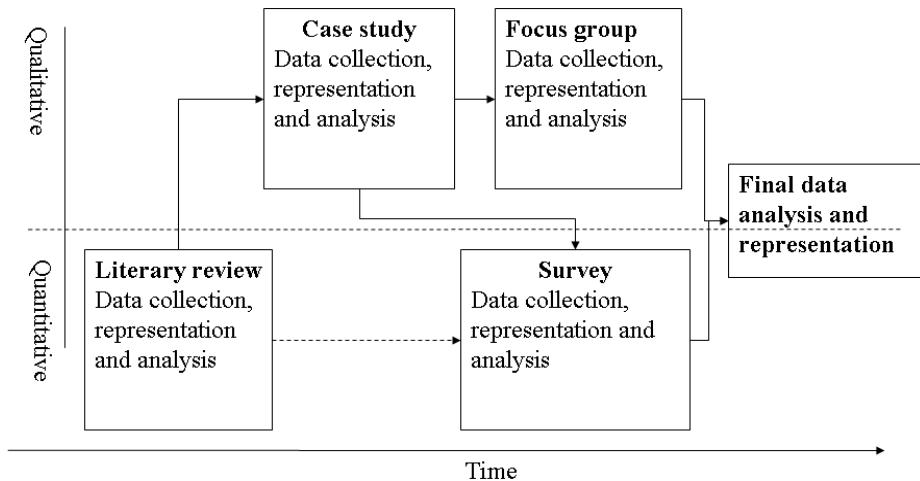
**Figure 16: The sequential mixed method research design for this inquiry**

Mixing methods and theories in information systems research has been suggested by Markus and Robey (1988). The sequential mixed design of this research makes it possible to design each research phase according to the norms, values, and assumptions of the relevant method's philosophy. Each subsequent phase builds on the data of the previous phase. The survey research is deliberately positioned just before the final phase of the research, the final data analysis and representation. The effect of that positioning is that the representation problem that is pushed forward to the final phase. Only in that phase do qualitative and quantitative results occur simultaneously. Integration is a minor concern because of the exploratory character of this mixed methods inquiry. The integration problem is reduced in the research design by the use of distinct research phases and a clearly defined research paradigm, qualitative or quantitative, in each phase. Comparable to the existence of the representation problem, the research design did not eliminate the integration problem completely, but postponed it to the final phase of the research. The legitimation problem is present in this study, but is mitigated by a number of design choices: (1) the research is exploratory; (2) the incorporation of an explicit qualitative route and an explicit quantitative route; (3) only in the final phase are both routes integrated in order to formulate overall conclusions; (4) the survey is deliberately placed after the case study in order to minimize potential meta-inference errors; (5) only enterprise architects contributed in the research in order to get a clear picture of their point of view; (6) the sample of enterprise architects that contributed in each phase differed per phase in order to avoid unwanted mutual interference between enterprise architects; and (7) the theoretical foundation is the same for all research elements. This design makes it possible to track what kind of result contributes to which part of the overall conclusion. This 'explicit route' design minimizes the unwanted occurrence of paradigmatic mixing in a research phase. Therefore, commensurability issues are pushed forward to the final phase. This design also minimizes the conversion from qualitative data into quantitative data. Conversion occurs only in the comparison of theoretical findings with empirical findings, in the

comparison of qualitative findings in the case study and expert panel with quantitative findings in the survey, and in the conversion of all findings into the overall conclusions. Another choice is the order in which quantitative and qualitative approaches are used.

All these choices have been made with a view to ensuring high quality meta-inferences. The proper measures have been taken to assure high quality results for each quantitative and qualitative element and the research has been designed to allow generalization, triangulation and validity. However, not all of these can be applied in each research component because of the specific characteristics of each. For instance, limited generalization is one of the characteristics of case research and generalization is a strength of survey research (Robson 2002; Yin 2003).

## 3.5    Research methods

This mixed methods research includes four research methods: literature review, case study, focus group and survey. Each method has specific characteristics and a specific application in this thesis and are described in this paragraph. The research method that has been used for each research question is presented in Table 4.

| Research question | Research method |
| --- | --- |
| 1.  How are social and cultural aspects of organizations considered and incorporated in architecture, organization science, information systems research and software engineering? | Literature review |
| 2.  How are social and cultural aspects of organizations considered and incorporated in enterprise architecture designs? | Case study, focus group, survey |
| 3.  How can the consideration and incorporation of social and cultural aspects of organizations in enterprise architecture designs in the context of e-government be evaluated? | Literature review, case study, focus group, survey |
| 4.  What factors influence the consideration and incorporation of social and culture aspects of organizations in enterprise architecture designs? | Case study, focus group, survey |

**Table 4: Research questions versus research methods**


**Literature review**


The research question regarding the consideration and incorporation of social and cultural aspects of organizations in designs of related disciplines to enterprise architecture is explored by means of the literature review that has already been provided in chapter 2. Literature in this research means the body of published material in scientific journals, books, and electronic formats. The outcomes of the review are used to guide the collection, analysis and interpretation of data in the case studies, the focus group and the survey. They provide a focus and a structure for the presentation of the research findings. Therefore, the outcomes of the literature review are thus used to develop a conceptual framework that contains a set of consistent and relevant propositions and a limited set of social and cultural aspects of organizations that are relevant in designs. This framework is applied in the case studies of this research because theory has to be present in order to analyse case data (Yin 2003). The initial, coherent set of propositions and the set of social and cultural aspects are also used to

structure and analyse the focus group session and the survey in this research. The literature review also serves to extract actual debates, issues and problems regarding the way social and cultural aspects of organizations are considered and incorporated in enterprise architecture designs.

The literature is selected according to the requirements of the scholarly process known as literature review. According to Kitchenham (2004), the literature review process consists of planning, conducting and reviewing phases. A review protocol is essential because it mitigates the risk of researchers bias. According to Kitchenham, a review protocol consists of the rationale for the review, the research question it intends to answer, the review strategy that contains search terms and resources to be searched, selection criteria and procedures, quality assessment, data extraction strategy, the syntheses strategy and a time table. Publication bias is a concern in literature review. This bias threatens internal validity of the review.

The review process in this research consisted of three phases. In the first phase architecture literature has been reviewed to explore how social and cultural aspects of society and organizations are given consideration and are incorporated in traditional architecture. In the second phase organizational literature has been reviewed to explore the same question in the context of the socio-technical tradition of organizational science, information systems science and software engineering. In the third phase enterprise architecture literature has been reviewed in order to explore the same matter with regard to enterprise architecture.

Both quantitative and qualitative research publications have been included in the review because of the mixed method research approach of this research. The review has been focused on principal publications in Dutch and English. The importance of a publication has been established by using the number of citations of the publication, the journal it was published in, whether or not it has been referred to in other prime publications, and the year of publication. In the review process several electronic indexing services have been used such as Google scholar, a specialized search engine of Erasmus University, CiteSeer library, ACM Digital library, IEEE computer society, JSTOR and Springerlink. There have been no restrictions in the publication selection process regarding industry, type of design or type of design process.

**A case study**

A case study is suitable in exploratory research in which contemporary events are studied and the researcher has little to no control over the events (Yin 2003 p. 3-6). According to Benbasat, Goldstein et al. (1987) key characteristics of case studies are:

1. A phenomenon is examined in a natural setting.
2. Data are collected by multiple means.
3. One or few entities (person, group, or organization) are examined.
4. The complexity of the unit is studied intensively.
5. Case studies are more suitable for the exploration, classification and hypothesis development stages of the knowledge building process; the investigator should have a receptive attitude towards exploration.

6.  No experimental controls or manipulation are involved.
7.  The investigator may not specify the set of independent and dependent variables in advance.
8.  The results derived depend heavily on the integrative powers of the investigator.
9.  Changes in site selection and data collection methods could take place as the investigator develops new hypotheses.
10. Case research is useful in the study of 'why' and 'how' questions because these deal with operational links to be traced over time rather than with frequency or incidence.
11. The focus is on contemporary events.

These characteristics apply for the case studies in this research. The case study method is applied in this research to empirically explore the consideration and incorporation of some social and cultural aspects of organizations in actual enterprise architecture designs. The case research can be classified as an 'instrumental' case study, because the cases are used to understand how the selected social and cultural aspects of organizations, that have been identified and presented in the literature review, are considered and incorporated in enterprise architecture designs. With that purpose the results of the case studies help to pursue an external interest (Denzin and Lincoln 2005 p. 443-444). According to Yin, a case study can cover a single case or multiple cases. Two cases have been selected for this research that are presented in Figure 17.
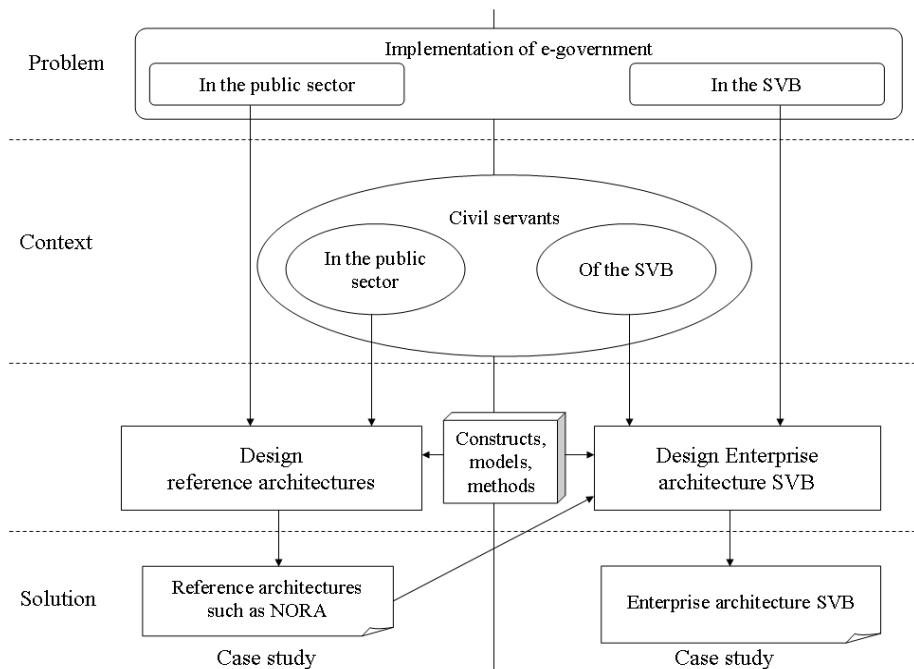


**Figure 17: Case study design**

The above mentioned characteristics of case study research apply to these studies. The first case contains an exploration of the Dutch reference architecture design. It contains a set of reference architectures and their design processes. This set has been chosen because one master reference architecture exists and the others are refinements of that master design. The second case is a study of an enterprise architecture design for a specific company, the SVB.

The Dutch reference architecture design has been selected because the problem, the social and cultural context of civil servants and the design processes are explicitly stated in a number of official documents. Furthermore, the reference architecture is used as a starting point for the enterprise architecture design that was commissioned by the SVB, a Dutch implementation organization. The second case, the design commissioned by the SVB, has been selected because the design included: (1) a project to develop a new social and cultural environment for employees, and (2) a project to design a new enterprise architecture. With the co-existence of these two projects it has been possible to analyse the results of the first project, which were the social and cultural aspects of the new environment, and how those aspects have been given consideration and have been incorporated in the enterprise architecture design, which was the result of the second project. Furthermore, both projects were part of a change programme that was organized separately from the going concern. Therefore, there was relatively little interference between the going concern and both design projects.

Using more than one case in a study introduces the problem of comparability. The cases that have been selected here are comparable for the following reasons: (1) the central element in both cases is a design task; (2) both design tasks are situated in the context of e-government; (3) in both cases enterprise architectures are designed using the comparable constructs, models and methods (which are propositions, algorithms and practices that use constructs and models to design solutions based on problems). (4) the design in the second case is based on the reference architecture that has been created in the first case; (5) in both cases enterprise architects guided the design; (6) in both cases the design of the enterprise architecture was separated from other design activities; (7) the created solution architectures are abstract representations (models) of e-government components. The first case models e-government components in a general way. That enterprise architecture is called 'reference architecture' The second case delivers a specific design that can be implemented; (8) both design cases involve civil servants. Consequently, the social and cultural aspects of both cases, such as individualization and professionalism, overlap; (9) the social and cultural aspects regarding civil servants are explicitly stated in documents. This makes is possible to analyse those aspects and explore how they are considered and incorporated in the enterprise architecture designs; (10) the problem area for the design task is e-government in both cases; (11) in both instances the design process as well as the processed artefact (the enterprise architecture) are observable and both cases are used to evaluate it. For these reasons it can be studied in both cases how the solution, which is the enterprise architecture design, fits the problem, which is the implementation of e-government, in a specific context, which is civil servants. These cases have also been selected because seven out of the eight structural components that Gregor and Jones (2007) specify for design research can be studied. The only component that is missing is the instantiation of the artefact.

Case study research is applied in the enterprise architecture discipline. For example, Yu, Strohmaier et al. (2006) and Coenen, Van Gils et al. (2010) use the case study method to investigate a phenomenon in the enterprise architecture discipline. Furthermore, the disciplines that are related to enterprise architecture, such as information systems research and organization science, also apply case study methods (Benbasat, Goldstein et al. 1987). Furthermore, the case study research method is well known in traditional architecture (Groat and Wang 2002 p. 124-125). Moreover, within business-IT alignment research, a discipline also related to this research, case study research is the most used method (Tapia 2009).

Each case study research has a number of characteristics. A characteristic in the second case study is that the researcher participated. Therefore, a number of quality assurance measures are included in the design of that study to minimize researcher bias namely data triangulation, the extensive use of formal external and internal reports and a review at the end of the case study. Furthermore, qualitative and interpretive data collection methods have been used such as observation, document review and interviews. Another quality measure is the presentation of the data. The data are presented as much as possible in historical order so that a chain of evidence can be established. Another characteristic of case study research is that it is inherently reflexive (Denzin and Lincoln 2005 p.449-450). Therefore, a review, observation and interviews are included in the case study design. Case study research also has an ethical side. Therefore, permission has been asked for by, and granted to, the researcher to collect and use case data. Furthermore, the enterprise architects involved and a number of other participants in the change programme were kept informed about the case study and have reviewed the case report. Their collaboration is preserved throughout the research. Iteration can also be a characteristic of case study research (Saunders, Lewis et al. 2009 p. 145-148). One iteration took place.

Reliability, statistical generalization and external validity are concerns in case study research (Yin 2003 p. 33-39). These concerns have been mitigated in the overall research approach by the incorporation of a focus group and a survey.

## A focus group

The purpose of the focus group in this research was to explore, in detail, whether the findings in the literature review and the case studies also hold, more generally, beyond the boundaries of these research instruments. A focus group is a group interview with a panel of a small number of professionals about a certain topic. The interview is facilitated by a moderator who focuses and stimulates the discussion between the experts (Saunders, Lewis et al. 2009 p. 347). A focus group research is a form of qualitative research and is usually combined with other research, most often with surveys. According to Morgan (1996), a reason for this is that a group can focus on a topic, whilst a survey has a broader reach. He argued that exploration and gaining detailed insight into complex behaviours and motivations are the most valuable strengths of focus groups. A focus group consists of four to eight participants that are 'information rich' (Saunders, Lewis et al. 2009 p. 344). According to Denzin and Lincoln (2005p. 898-899), they are also relatively inexpensive to conduct and they

produce rich data. Furthermore, they can be stimulating for respondents and the format is flexible. Weaknesses are that the focus group sample is usually small compared to the size of the entire group, and that a group interview cannot be replicated. There are also weaknesses regarding reliability and external validity of the results. According to Denzin and Lincoln, a disadvantage is also that the group process can interfere with individual contributions: results can be influenced by group think.

In the overall design of this research these weaknesses have been mitigated by means of: the inclusion of a survey at the end of the research and the set-up of the group session. The focus group sessions were organized as three semi-structured group interviews. Each session started with an open question that was related to the research questions. The following three questions were asked: (1) What is the relation between the social system and the enterprise architecture of the organization?; (2) What is the relation between the culture and the enterprise architecture of the organization?; and (3) What is the relation between aspects of time, like organizational dynamics, and the enterprise architecture of an organization?"

The sessions were chaired by an experienced consultant that was not involved in the research. The chairman was only briefed by the researcher about the research objective, the topics of each sessions and the timetable. He was not briefed about the preliminary case study results, nor was he informed about the results from the literature review. His instructions were to ask open questions and to let the discussions unfold without interfering too much. An experienced consultant was the scribe. The researcher was present at the sessions in order to observe and to make notes. That notes and the ones from the scribe were used afterwards to create a concept report of each session. The concepts were send to the experts in order to review if they were accurately describing the outcomes of each session. The reports were finalized after the comments were incorporated in the report.

A number of qualifications for the experts were formulated in advance in order to gain an outcome with some representativeness: (1) the person had to be an enterprise architecture practitioner; (2) the person had to have at least five years of experience in the enterprise architecture discipline; (3) the person had to have contributed actively to the development of the enterprise architecture discipline; (4) the person had to have no prior knowledge of the research and the preliminary findings; (5) the person had not been influenced by the researcher; and (6) the person had not been involved in the case studies. Two other criteria were formulated regarding the composition of the expert panel: (1) the public sector, semi-public and the private sector had to be all represented in the panel; and (2) eight to ten qualified experts had to join the panel.

Twenty-nine experts, who were qualified to join the expert panel were invited. In the invitation text the three topics of the meetings were briefly introduced. The first topic was the relation between the social system and the enterprise architecture of the organization. The second topic was the relation between the culture and the enterprise architecture of the organization. The third was the relation between aspects of time, such as organizational dynamics, and the enterprise architecture of an organization. Five experts did not respond. Sixteen experts responded positively to the invitation, but were unable to come. Instead of joining the meetings, they filled out the online questionnaire. Eight experts accepted the invitation. They were active in the enterprise architecture discipline and were working in the public, semi-public, or private sector. Thus all the

experts, and the expert panel as a whole met the required conditions. The results of the expert session are presented in paragraph 6.2.

**A survey**

Limited generalizability of research findings is a characteristics of case research (Robson 2002; Yin 2003) and generalization is a strength of survey research. A descriptive survey has been included in the research to assess the generalizability of the findings of the case studies and to test propositions by exploring opinions, attitudes and behaviours in the enterprise architecture community regarding the consideration and incorporation of social and cultural aspects of organizations in enterprise architecture designs. The survey provided a structured collection of data from a sample population by means of an online questionnaire. For analytical purposes the survey provided ordinal, or ranked data for the opinion and behavioural variables. According to Gable (1994), it is appropriate to combine a case study with a survey in order to objectively verify case findings. He argued that a survey contributes to greater confidence in the generalizability of case study results. According to Saunders, Lewis et al. (2009 p. 140), the use of a survey is appropriate in an inquiry that has an exploratory nature.

Internal validity, representativeness, external validity and reliability are all important quality aspects in survey research (Robson 2002; Saunders, Lewis et al. 2009). Internal validity is important because surveys are used to obtain valid information about respondents concerning the research questions. For that reason the framework and propositions from the conclusion of the literature review (paragraph 2.4) have been used to structure the survey and to formulate questions. It is difficult to test propositions by means of a survey because propositions, descriptions and the terminology used can be interpreted differently by different respondents. As a consequence of that it can be difficult to analyse responses. Therefore, it was a conscious choice to not incorporate the literal text of the propositions in the survey, but to design the questions in such a manner that the responses can be used to test the propositions.

The survey contained fifty-two questions. Thirty-six question were included about the enterprise architecture discipline and sixteen questions were included about the general characteristics of the respondent. The survey contained six question categories. The first category has been designed to discover which organizational elements are considered and incorporated in a design by enterprise architects. The second, third and fourth category contained questions about social and cultural aspects of an enterprise. In these categories the social, cultural and temporal aspects that were derived in the literature review have been used. The second question category has been designed to investigate which social aspects of an organization are considered in a design by enterprise architects. The third category of questions had been designed to explore how important it is for enterprise architects to consider and include a number of cultural aspects of the organization in a design. The structure of the survey is presented in Figure 18.
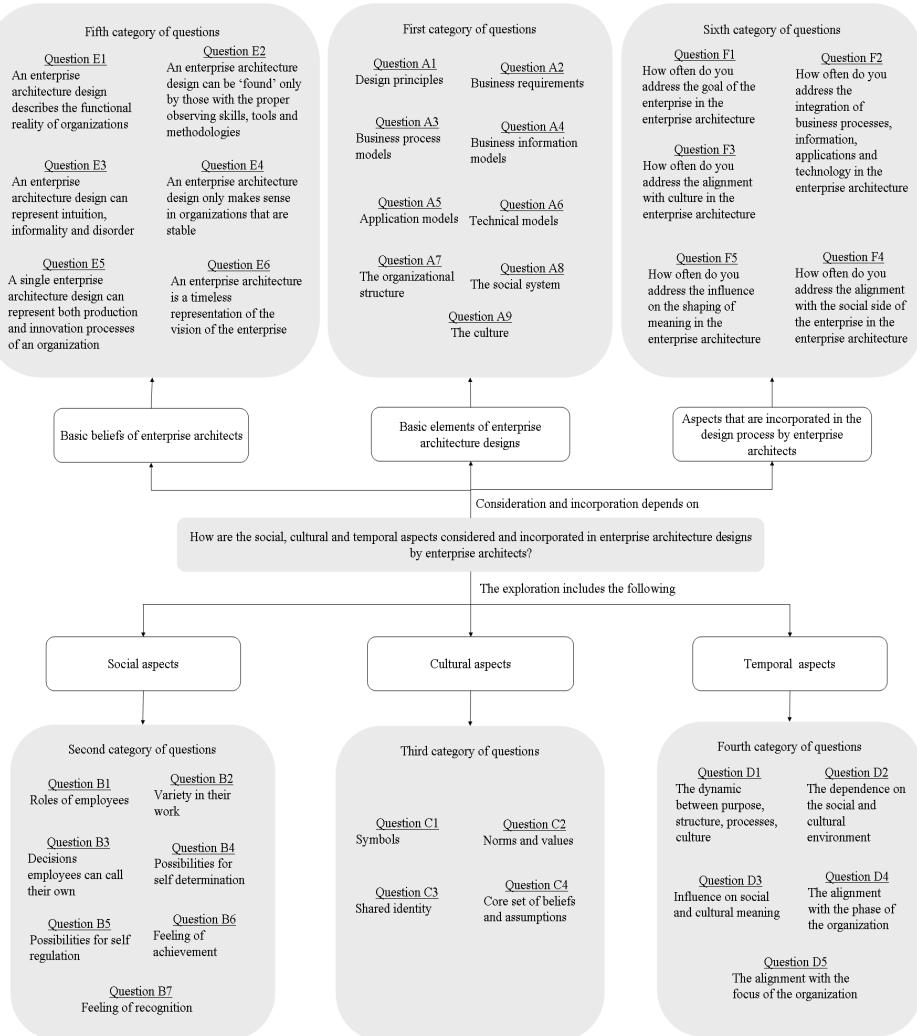
**Figure 18: The structure of the survey**

The questions from the second and third category are related to two questions from the first category. The expected relationships were: (1) when enterprise architects regard it as important to consider social aspects of an organization in a design, then they will incorporate these aspects in a design; and (2) when enterprise architects regard it as important to give consideration to cultural aspects of an organization in a design, then they will incorporate these aspects into a design. The fourth question category was about aspects of time in a design. This category has been designed to explore how important it is for enterprise architects to incorporate time aspects of an organization in a design. The fifth question category was designed to find assumptions that enterprise architects make regarding enterprise architectures. It is relevant to know these assumptions because they can play a role in the organization of design processes. The

sixth category was questions designed to investigate which elements of the enterprise are addressed by architects when they design an enterprise architecture. This category has been added to explore the design process. There was a relationship between this category and the first category. The first category was related to the design product, whilst the sixth category was related to the design process. The other questions have been added so that the characteristics of the respondents could be determined. A number of these questions, for example the education level of the respondent, contained drop lists with predefined answer possibilities. The values in these lists were international standards, which have been used because the survey was in English and was published on the internet and respondents could come from anywhere in the world. The categories were ordered in such a manner that they started with easy questions and ended with the more difficult ones. This has been done in order to encourage respondents to answer the questions, to complete the survey, and to prevent them giving socially desirable answers. Furthermore, the survey has been designed so that it took respondents about ten minutes to complete the survey. The survey contained no open questions. This too has been done to encourage respondents to fill out the survey. Another reason was that open questions lead to responses that are generally difficult to analyse. Instead, closed questions have been used with a Likert-scale that contained answering possibilities. Another measure to encourage respondents to fill out the complete survey was the use of an online survey tool that published the survey without distracting advertisements.

The survey design started by using the conclusions of the literature review. They provided the structure and categories for the survey. The survey was reviewed by three principal researchers, and the online version of the survey was tested by ten enterprise architects. The review comments and test results were used to correct the survey.

The survey was online between 14 March 2011 and 15 May 2011. In all 147 valid responses were received. Initially there were 153 respondents, but it emerged that six respondents had not answered any question, and were removed from the dataset.

As regards representativeness, the target group of respondents was defined as 'professionals in the enterprise architecture discipline that are actively involved in the design of enterprise architectures'. This group has been specified as the target group because the purpose of the inquiry is to explore how enterprise architects give consideration to and include social and cultural aspects of organizations in their designs. The target group is not registered somewhere, so the total size of this group is unknown. Consequently the necessary sample size and response rate could not be calculated in advance. A snowball sampling or availability sampling approach has therefore been carried out. The first step in the approach was to design the survey in such a way that respondents were encouraged to respond. The second step was to include questions regarding the characteristics of the respondents. These characteristics have been used to analyse the representativeness of the group of respondents. The third step was to reach a large number of potential respondents. For that reason a number of active online LinkedIn groups were used such as 'ArchiMate' and 'The Enterprise Architecture network'. These online discussion groups were chosen because the groups' members are active in enterprise architecture practice and active discussions take place between members of the group. In addition to the online groups, this survey has also been send to participants of the 2011 Dutch enterprise architecture conference (EAM2011) by the

organizer of that event. Furthermore, it was the secretary of the Dutch architecture forum (NAF) that sent the invitation to fill out the survey to the members of the forum. The researcher did not contact any enterprise architect directly in order to avoid influencing respondents beforehand.

The drawback of this 'availability' or 'snowball' sampling approach is that it is not possible to determine if the group of respondents is statistically representative of the complete population of enterprise architects. In these sampling techniques representativeness is limited to that portion of the population that has the same characteristics as the respondents. Tang, Barbar et al. (2005; 2006) used these techniques in their research. According to them, these non-probabilistic sampling techniques are reasonable for exploratory research. Foorthuis et al. (2010), used in their research several communities related to information systems and architecture and established representativeness by using economic characteristics. Roy, Roy et al. (1998) established representativeness in a small sample size based on general characteristics of organizations and projects.

The dataset has been analysed by using the SPSS statistical program, version 15.0. The dataset that contains the original responses and the data set that has been used for the analysis have been stored separately. That both data sets contain the same response data has been verified. The standard statistical calculations for categorical values have been applied, such as the calculation of the median and the Chi-Square test. Standard statistical tests for ordinal data have been applied to analyse the responses. The Wilcoxon signed ranked test has been used for hypothesis testing, the ordinal regression test has been used to test the presumed relationships that were incorporated in the survey and a Mann-Whitney test has been applied to examine if a significance difference exists in responses from respondents of the public sector and the private sector. The Wilcoxon signed-ranks test and the Mann-Whitney test are both non-parametrical tests. Non-parametrical tests must be used to analyse the responses in this survey because they contain ordinal data (Saunders, Lewis et al. 2009). A Mann-Whitney test can be applied in the analysis because the survey data are ordinal. The Mann-Whitney test assumes that the data are not distributed normally. However, the test can also be applied if the data are distributed normally. A regression test is needed because both variables have been measured using an ordinal scale (Vocht 2005; Saunders, Lewis et al. 2009; Foorthuis, Van Steenbergen et al. 2010; Norusis 2010). The Wilcoxon test has been applied to compare the distribution of two (related) interval variables (Vocht 2005). According to Norusis (2010), the Ordinal Regression procedure in SPSS is an extension of the linear model to ordinal categorical data and can be applied to test if a dependence exists between a dependent variable and an independent variable.

# 4 CASE STUDY I:
# DUTCH E-GOVERNMENT
# REFERENCE ARCHITECTURES

"Any architectural project we do takes at least four or five years,
so increasingly there is a discrepancy between the acceleration of
culture and the continuing slowness of architecture"

Rem Koolhaas
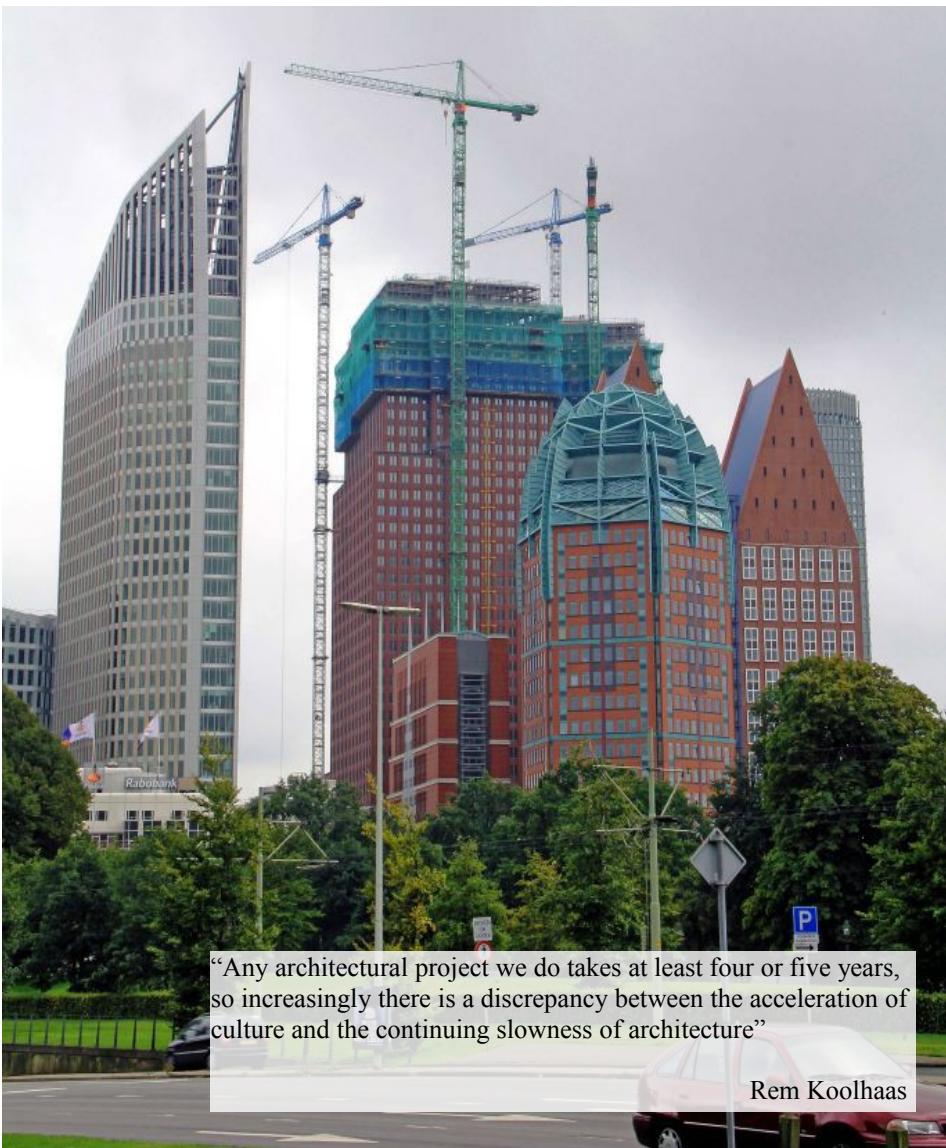
## 4.1  Introduction

The design and implementation of e-government has led to major design and implementation programmes in the Netherlands. In the Netherlands a number of reference architectures have been created in order to support the design and implementation of e-government in governmental organizations. A reference architecture is a general design that can be customized so that it fits a governmental organization. The case study that is presented in this chapter contains a set of reference architectures and their design processes. This set has been chosen because the reference architectures in it are refinements of one master reference architecture.

In this case study general social and cultural aspects of public organizations in the context of e-government are described and it is explored how those aspects have been considered and incorporated in the reference architectures. Whether the designers regarded governmental organizations as a rational and programmable systems is also explored. Whether the creation of social and cultural meaning, besides the translation of goals, objectives and strategies, have been considered and incorporated in the designs is also investigated. Moreover, how aspects of public organizations that can not be described in formal models and languages, such as cultural and social meaning, have been considered and incorporated in the reference architecture designs is also explored.

This case has been selected because the reference architectures are used actively by design professionals to create enterprise architectures for governmental organizations. Furthermore, both the reference architectures and social and cultural aspects of public organizations that use these architectures are explicitly described in a number of publications and this makes analysis possible. Main data sources are publications regarding the reference architectures and social and cultural aspects of public organizations, annual reports, official communications, official reports, workshop reports and design artefacts.

This chapter contains the analysis, findings and conclusions of the case study. There are no straightforward translations of social and cultural aspects into design constructs and models. Therefore, case data have also been analysed through interpretation in which not only actual descriptions and formal representations of the social and cultural context in the designs have been explored, but also the intention behind them.

The general context of e-government is described first. Then the social and cultural aspects are introduced that have been used in the analysis. After that there is a presentation of the analysis of the design process, the reference architectures, and the way in which the social and cultural aspects have been considered and incorporated. The report closes with a number of conclusions that are structured according to the propositions that have been identified in the literature review in chapter 2 in order to analyse which propositions are supported, rejected or indecisive and whether new propositions have been found.

# 4.2 General context

### E-government

E-government aims to enhance the interaction between government and citizens through the application of new electronic means. It focuses on service delivery, law enforcement, and citizens participation. Four principles have been formulated in e-government (Postma and Wallage 2007): (1) governments are always accessible to citizens; (2) citizens can choose how information relations with government are formed; (3) governments clarify to citizens their rights and duties concerning electronic government; (4) governments provide clarity on the opportunities for electronic participation that citizens have.

The OneStopShop government service delivery concept is an example of the enhanced interaction between citizens and government. It has been based on the 'one stop shopping' concept in operations management (Bekkers and Zouridis 1999; Cook 2000; Meghan 2000; Efthimios 2008) and is a service delivery approach in which public service delivery is integrated from a citizen's, or customer of public services', point of view (Kubiceck and Hagen 2000). New governmental service delivery concepts are not confined to the Netherlands. OneStopShop government is for example also implemented in the United States, Canada, and Australia (Leben and Bohanec 2003).

In OneStopShop government citizens obtain all relevant governmental services for a specific need in a single 'shop', they do not have to repeat their service requests at several counters. According to Zuurmond, Mies et al. (1999), the social design principle in this concept is the need of the customer and the structural design principle is the question pattern that citizens use to obtain governmental services. Classical quality criteria such as legality, legal security and equality are complemented in OneStopShop with requirements such as speed, customer service and customer orientation (Zuurmond, Mies et al. 1999).

A prime design requirement in OneStopShop government is pro-activity. According to Derksen, Enckevort et al. (1995), it means that the role of government is transformed from umpire, to player, to service deliverer. In the report *Voorbij het loket* (Beyond the counter) the Ministry of Home Affairs introduced the pro-active requirement in the service delivery concept in the Netherlands. It is the self-triggering of service delivery processes by government organizations immediately after the occurrence of a change somewhere in the public domain in a person's situation that requires changes in services already provided or requires new services to be delivered. A prerequisite for this is the sharing of customer information amongst all involved governmental organizations (Ministerie van Binnenlandse Zaken 2000). *Voorbij het loket*, in line with international practice, introduced service clustering around 'life events' as a structuring design principle for pro-active service delivery. 'Life event' is a metaphor that describes a specific situation or event in the life of a citizen or the life of an organization that requires the delivery of a set of public services and products (Claudiu, Gabriel et al. 2006). The birth of a child, death, emigration, getting married, founding a company and hiring employees are examples. The ultimate goal of service

delivery based on life events is that all public services that need to be obtained in such an event are clustered and delivered, preferably electronically, to the citizen or company as soon as the life event occurs (Vintar, Kunstelj and Leben 2002).



A single shop
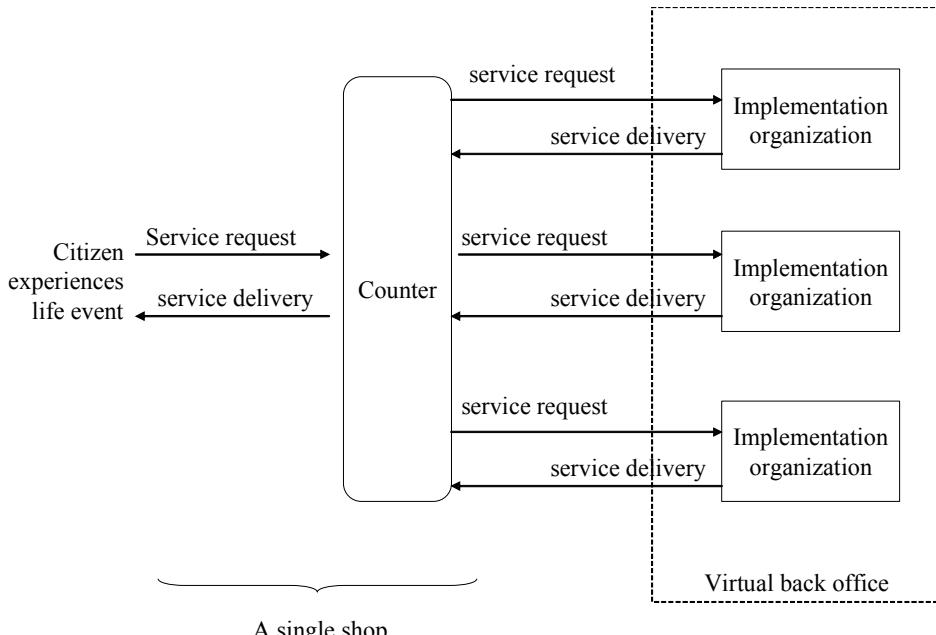
**Figure 19: The basic structure of OneStopShop government**

Through these developments the functional and geographic boundaries of units and organizations blur (Frissen 1996). In OneStopShop government the customer obtains all products and services after making a request at a physical or electronic counter (Figure 19). The premise is that citizens or companies, in principle, are not interested in what part of the government they face, as long as they get the services they need. From that point of view it is obvious that public service counters should be integrated, instead of being segmented according to the logic of government. A consequence is that the citizen or company does not know which public organizations are involved in the actual delivery of services. The customer only experiences a front office. The governmental implementation organizations together form, from the perspective of the customer, one virtual back office. The front office is used to communicate with the customer. It can be an internet site, a call centre or a physical counter. Technical architecture elements, such as work flow management, case management, and web services, dispatch service requests to the back office and secure the delivery of the required public services and products to customers.

Four different maturity levels of OneStopShop government have been defined. According to Vintar, Kunstelj and Leben (2002), the front office produces at the lowest maturity level only a list of governmental organizations that are needed to fulfil services in the context of a certain life event. At the highest maturity level all the required services that are relevant for the life event are completely delivered electronically to the

citizen or company. At this maturity level the citizen or company experiences the government organizations as being one virtual back office. The front office in this design can be a life event portal, a call centre, and a physical counter. All the functionality and technology that is needed to link the back office to the front office are concentrated in a mid office.

According to Bekkers and Zouridis, the design of this service delivery concept was initiated in the 1980s as a reaction to initiatives in the public domain to work with efficiency targets and business-like management because, from the perspective of citizens, governmental service delivery was slow, inefficient and highly compartmentalized. The compartmentalization is confusing to citizens because it is not consistent with the governmental service delivery expectation they have. According to Herbert and Martin (1999), citizens expect that their need for governmental services and products can be clustered and can be fulfilled by one, or at most a few, public service organizations, preferably electronically. These expectations were seldom implemented in governmental service delivery. Bekkers and Zouridis argued that this can result in declining trust in public governance, because service delivery is the core of public administration. New service delivery concepts, such as OneStopShop government, were therefore needed to restore trust in local and national politics in the Netherlands, Western Europe generally, the United States, Canada, and Australia (Leben and Bohanec 2003).

In December 2002 the vision on e-government changed. OneStopShop government became a means to an efficient government that is capable to solve social problems in an efficient manner. It was used to reduce bureaucracy and regulatory zeal, enhance freedom of choice for citizens and companies, and to improve the quality of public service delivery and public management. The premise of OneStopShop government was that service delivery times decreases through smart application of information technology because it enables information sharing and data integration between governmental organizations. ICT can unlock the relevant data within governmental implementation organizations, make them electronically accessible to other public organizations, and data can be retrieved fast when electronically accessible and available. Web technologies enable customers to enter and complete transactions in less time. Likewise, the use of the internet enables digital and remote service delivery to citizens. The application of ICT decreases processing time for civil servants even more when they have real-time and electronic access to all necessary information and service requests.

The sharing of data between governmental organizations has led to another development: i-government. I-government can be regarded as the evolution of e-government. It has been introduced by the WRR, 'Wetenschappelijke Raad voor het Regeringsbeleid', in March 2011 (WRR 2011). WRR is the scientific counsel for government policy in the Netherlands which forms a bridge between academic expertise and policy. According to the WRR researchers, i-government is the next step after e-government. In i-government the focus of government transformation is shifted from a technical perspective to an information perspective. This shift is necessary to get a grip on the numerous information flows that are created and used in governmental service delivery, control and care. These information flows are starting to act as independent organisms since government bodies add new flows, connect to flows, change flows, and

re-direct flows to their liking, without proper policy and coordination. The WRR researchers argued that this proliferation of information flows and the connection to transactions and controls start to determine the way in which government function. The effects are not all positive. Cases were reported by WRR in which citizens have become tragic victims due to incorrect information flows or incorrect interpretation of information in service delivery and controls. They urged for better understanding of this phenomenon and appropriate policies in order to control it.


## Implementation of e-government

Since 1999 almost eighty large scale projects have been initiated in the Netherlands in the context of e-government (Ter Horst 2007). In the period from 1996 to 2002 the programme called OL2000 realized the first implementation of the new service delivery concepts (Ministerie van Binnenlandse Zaken 2001; Kenniscentrum Elektronische Overheid 2005). In the ICTAL programme the Dutch government worked together with companies on the reduction of the administrative burden for businesses through the application of a general ICT infrastructure that enabled efficient information sharing between enterprises and the government. NUP, the national implementation programme for service delivery and e-government, has been initiated to design and implement a nation wide technical infrastructure to support electronic government and the new service delivery concepts (NUP 2008). LEAF, Life Events as connecting factor, was commissioned by the Dutch government in 2009. It was active until June 2011 and designed and implemented general web services for life event based service delivery.

Several organizations were founded in The Netherlands to design and implement e-government. On April 11 in 2001 ICTU, ICT implementation organization, was founded and in 2003 the Manifestgroep was started. ICTU was founded in order to support the implementation programmes of e-government. The organization houses programmes that implement e-government, customer-orientated service delivery and other programmes in which the application of ICT supports the transformation of Dutch government (Van Boxtel 2001). Standardization and re-use of generically applicable software solutions are central themes of the programmes that ICTU houses. The Manifestgroep is a collaboration of government organizations that focuses on innovation in the public sector and was founded so they might learn from each other and share experiences on matters such as service delivery to citizens, IT-architecture, and procurement (SVB 2006; Manifestgroep 2003; Manifestgroep 2007). The Manifestgroep initiated internet portals that focus on certain life events such as emigration and immigration and participated in the research programmes such as 'Kanalen in balans' concerning communication and distribution channels of governmental services and 'B-dossier' concerning needs of citizens and companies, integration of services of different governmental agencies and technological possibilities. The motto of the group is that government determines the tasks but the client should control the delivery of service. This motto makes the perspective of the citizen the central theme: it translates into a service delivery concept in which the citizen gets combined information from different agencies simultaneously, for example tax information combined with information regarding social security. The design

principles of the Manifestgroep are: a common authentication mechanism exists for customer contacts; a common standard exists to connect to and exchange information; customer information is collected once at a counter and then shared between all public organizations; service delivery processes and data are standardized in the public domain; reliability and confidentiality of service delivery processes and data are ensured; and customer inquiries are handled directly. The efforts of the Manifestgroep resulted in DigiD, a nation-wide e-government authentication mechanism.

In 2003 e-government implementation shifted from central to local government: both therefore now shared responsibility for the design and realization of e-government. In 18 April 2006 government, the provinces, municipalities and water control boards reached an agreement on implementing e-government for the period 2008-2011 (NUP 2008). On 30 May 2011 the implementation programme began to focus on implementation. The national programme was re-named i-NUP which covers the implementation period from 2011 until 2014 (Donner 2011).

In the European contexts programmes were also initiated to realize an infrastructure for e-government and service delivery. The IDABC, Interoperable Delivery of European e-government Services to public Administrations Businesses and Citizens, programme was commissioned by the European Commission and was active from 2005 until 2009 in the realization of e-government; it designed and implemented internet portals and e-government software services. The programme was succeeded by the ISA, Interoperability Solutions for European Public Administration, programme in 2010 which is part of the Digital Agenda for Europe (Buzek and Malmström 2009).


### The application of reference architectures

Postma and Wallage (2007) recommended that the Dutch national reference architecture NORA should be used as the guiding instrument in the development of e-government. A *reference architecture* is the constructs, methods, models, and tools that are needed to design and build consistent and integrated enterprises throughout their life-cycle (Bernus and Nemes 1999; Chalmeta, Campos et al. 2001). A *reference model* is an agreed upon standard conceptual representation of a system that can be used to derive other models or to evaluate models; it can also propose a migration path from a current situation to a future state (Patankar and Adiga 1995). Reference architectures are regarded as necessary in the transformation of a governmental organization towards a service orientation (Goutier and Van Lieshout 2010). Around 1990 the design of e-government and the new service delivery concept produced a number of frameworks and technical architectures consisting of what were at that time new information and communication technologies. The OL2000 programme delivered a reference architecture for an electronic counter (Ministerie van Binnenlandse Zaken 2001; Kenniscentrum Elektronische Overheid 2005). Governments now increasingly recognize the significance of reference architectures as a means to improve services and efficiencies by electronic means, on the basis of the one stop shop concept (Janssen and Hjort-Madsen 2007; Wimmer, Scholl et al. 2008). According to Janssen and Hjortt-Madsen (2007), national reference architectures promise to fill the gap between policy and implementation. They are used to represent and model e-government in terms of

organizational structures, business processes, information systems, and infrastructures. The Dutch reference architecture for example describes different building blocks for e-government and the relation between them, and also contains a number of design principles.

The Dutch national reference architectures are based on a framework for architecture (Figure 20) that was developed in 2002 by Van den Dool, Keller, Wagenaar, and Hinfelaar (2002). Their architecture framework consists of a business-architecture layer, an information-architecture layer, and a technical-architecture layer. Each layer has several domains: an actor domain (who); a product domain (what); and a process domain (when and where). An integration architecture is used for the connection between the layers and the domains. Maintenance and security are separate components. They claimed that an architecture model is needed as a communication and steering instrument in e-government because it provides a direction to standardization processes and discussions regarding the generic services that should be implemented, and a general reference. They also referred to the architecture definition of IEEE 1471 in which architecture is defined as the fundamental organization of a system. For them this definition is applicable to e-government, a city, a building, an application, a computer, and so on. To them it can be applied to all domains where components and relationships between components exists.

| | Actor | Product | Process |
|---|---|---|---|
| Business architecture | Organization Architecture | Product Architecture | Process Architecture |
| Information architecture | Application Architecture | Content Architecture | Communication Architecture |
| Technical architecture | System Architecture | Data Architecture | Network Architecture |

Security ... Maintenance

Principles
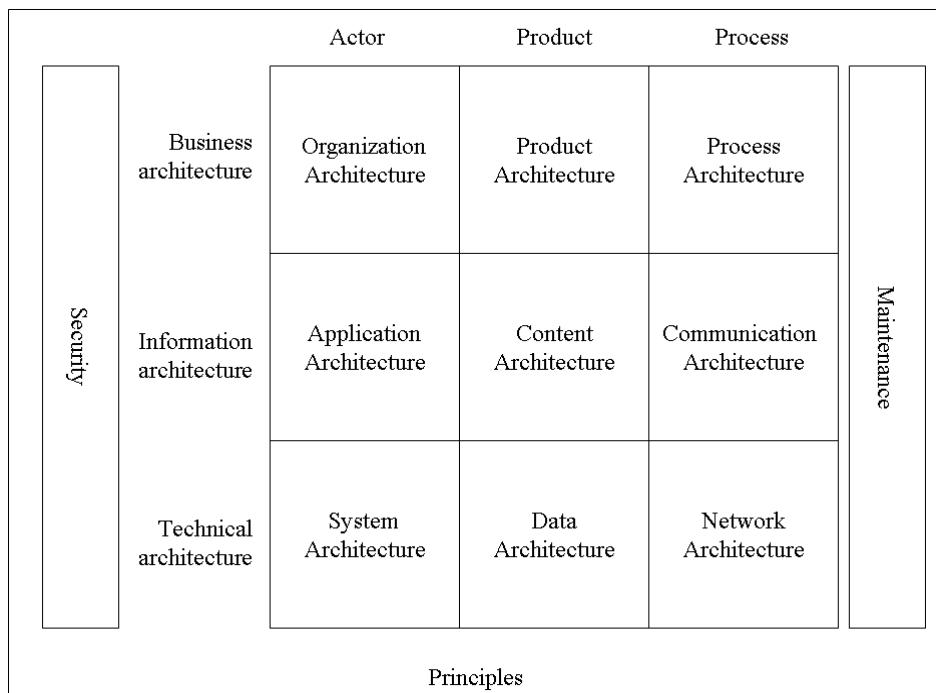
**Figure 20: The framework, according to Van den Dool, Keller et al. (2002)**

## 4.3 Social and cultural aspects of public organizations

### Social and cultural developments in society

The environment of public organizations is changing rapidly. Schnabel et al. (2000; 2004) contended that 'individualization', 'informalization', 'informatization', 'internationalization', and 'intensification' are major transformation processes in society. In the 'individualization' process the dependence between individuals and between individuals and organizations reduces. It influences the arrangements and individual choices about social security and working conditions. The 'informalization' process is the opposite of formalization and excludes formal structures. It flows from individualization since individualization leads to less hierarchy in society and more equality in human relationships. As a consequence of informalization the distinction between private and public, work and home, free time and work time fades. It is the process by which the meaning of information changes. Information is no longer presented to the individual; instead the individual searches pro-actively for information with technology providing services to support the information selection process. It enables people to find, select and apply information from all available information sources in divers organizational, national and international networks. 'Internationalization' relates to the availability and accessibility of information on international networks. Due to this transformation boundaries, distances and time become less relevant in daily life. 'Intensification' represents peoples expectation that life will be more dynamic, varied, rewarding, intense and intensive.

All these transformation processes lead to new requirements for work, relations, family life, free time and sport. Gephart (2002) described globalization, ecologization, digitalization, individualization and politicization as the major developments in society that influence the design of organizations. He summarized the new organizational design in two defining features: (1) self-control and (2) self-management. Work itself should be of main concern because work roles and occupational membership are dominant aspects of individuals' lives. In the design of the new workforce power and decision making is decentralized. The new workforce that Gephart describes is comparable to the organization that is described by Clegg and Hardy (1996). For them organizations become decentralized, and distributed around internal networks of divisions, and hierarchy is only one means to coordinate and control actions across people, knowledge, time and space. According to Mumford (2006), decisions in organizations are more and more based on expertise and this is due to the shift of manufacturing jobs to service jobs, and the growth in highly skilled knowledge workers and part-time employment. The role of expertise in decision making refers to the increased wish of workers to be respected and acknowledged by employers and society in their skills, expertise and professionalism (SVB 2009). Employees are said to need to organize their own lives on the basis of their unique capabilities, experience and professional qualities (Ministerie van Binnenlandse Zaken 2006; SER 2006; Ministerie van Binnenlandse Zaken 2009). The same has been asserted about the civil servants of the future (De Ruig, Kemper et al. 2008), and about self-realization in

the labour market (Vogelaar, Groenland et al. 2007). A conclusion from Ruig, Kemper et al.'s research is that what civil servants expect from governments, in the role of employer, is a professional working environment exists that is adaptive to individual qualities and ideas, that make civil servants responsible for the proper execution of work processes and results, and rewards them accordingly. According to them, professional organizations have: (1) a structure that supports professional autonomy and freedom; (2) a culture in which the formal position and hierarchy are less important in terms of acknowledgement, rewards and authority; and (3) coordination mechanisms that are based on the application of knowledge and skills. In those organizations authority, rewards and acknowledgements are based on performance, professional expertise and loyalty to profession.

Researchers on the attractiveness of government employment and the role of employment conditions in that attractiveness, conclude that civil servants prefer a working environment that encourages continued learning and personal growth. A research conducted by CAOP (2006), the largest knowledge and service centre in the Netherlands about the labour market and labour relations in the public domain, report that for the vast majority of entrants into the public sector, the work content is the main reason for choosing a job in the public domain. Sufficient autonomy and adequate options to organize work are very important. The consequence of these requirements is that civil servants want to be trusted by employers and managers in their job execution.


## The social web

As has been said, the 'informatization' process is related to new technologies such as Web 2.0. Web 2.0 is about people (O'Reilly 2005): it includes communicating, sharing, participating and connecting. Because Web 2.0 is about people, almost all internet sites and other web 2.0 instruments have networking capabilities that link people with others, share information, enable participation and connect people with topics. Web 2.0 can also be called the 'social web' (Van Berlo 2009; Naghib-Bukman 2011). It includes various types of internet sites such as LinkedIn, Facebook, Hyves, YouTube, Wikipedia and Yammer, all of them focus on interaction between users and the culture that this new type of interaction creates (O'Reilly 2007). Web 2.0 is based on participation, mass collaboration and social networking via the internet (Kelly 2005). It is about the ability to collect and manage the vast amount of data that is published on the internet and includes the collective power of small sites, small transactions, small products and other small 'things' that make up the bulk of the web's content. It includes 'crowd sourcing', co-creation, user-generated content and wisdom of the crowd (Naghib-Bukman 2011). Users are motivated to participate without the foresight of remuneration or profit and participation is based on the need to connect with peers, to express oneself and to become well-known or famous (Wunsch-Vincent and Vickery 2006).

According to O'Reilly an important principle of Web 2.0 is that the service automatically gets better the more people use it. A lesson he draws is that users add value to the internet and network effects of those user contributions are the key to market dominance in the Web 2.0 era. He claimed that there are two radically different business models: (1) based on platforms without owners that are tied together by means

of protocols, open standards and agreements for cooperation; and (2) based on a platform that is owned by a provider whose massive installed base and tightly integrated operating system and interfaces give control over the programming paradigm. The architecture of Web 2.0 is based on the first business model and is referred to as the architecture of participation: there is a small core that contains a basic service or data that users can utilize to add their own services or data extensions. Examples of this participation architecture are networking sites such as LinkedIn and Facebook, sites to share movies such as YouTube, and software development environments that allow users to create and share applications such as Google application engine and SourceForge.

The Web 2.0 concept also has consequences for public administrations. In a report from the Ministry of Home Affairs consequences are published. Frissen et al. (2008 p. 3-5), reported that the Web 2.0 concept enables new forms of communication and cooperation between governments and citizens. They referred to Leadbeater and Cottam who argued that society may be evolving towards a user-generated state in which citizens themselves perform previously state-maintained collective tasks. They predicted that the role of citizens in service delivery shifts from primarily consuming to sharing, rating, ranking, amending and adding. Citizens become innovators and investors rather than passive consumers through participation in the design of services. According to Frissen et al., the Web 2.0 phenomenon can be described as the existence of openly accessible and decentralized platforms for active involvement of users on the internet, where users form networks, work together, maintain friendships, share, exchange, trade, and create. Information, knowledge and creativity from social networks are all applied by users in the development or enhancement of public service delivery. They called this radical emancipation of users the most characteristic element of Web 2.0.

The new culture based on the possibilities of the internet and Web 2.0 is visible in society, for example in the constructive and destructive powers in society that can be evoked through social network sites like Facebook. Naghib-Bikman (2011) contended that as far as government is concerned, Web 2.0 will lead to active participation of citizens and public servants in the design of service delivery and decision making, open organizations, less hierarchy in public organizations, and self-organization.

**Horizontal networks**

In social networks there is hardly any hierarchy. Everyone has the same rights. According to Berlo (2009), the position in the social network is based on the contributions one makes to the community, the ideas and the effort one displays in the network. Shirky (2008) contended that a horizontal network that includes self-regulating, mass-collaboration, maximum decentralization and flexibility is the most important organization form of this century. These horizontal networks are the opposite of the dominant hierarchical centralized organization form of the twentieth century.

The transformation of bureaucratic organizations into loosely coupled fluid networks is described by Castells (2000; 2006). He contended that since the 1970s the world has entered a process of structural transformation, because of the emergence of

information and communication technologies. He argued that in the relation between technology and society technology is society. Microeconomics-based network technologies are the driving force to the development of a society based on networking. The new digital technologies allow networks to master and coordinate resources even when an enterprise is beyond a certain size and complexity. According to Castells, an enterprise network is created to perform a business project. After completion, the network is dissolved and network components are reconfigured to support other business projects. These network structures tend to individualize the relation between capital and labour and require a flexible and mobile workforce that constantly re-educates itself. At the same time these networks are adaptive and flexible because of decentralization. By means of new technologies a network of people and organizations can be established around certain topics. These networks can be simple or can become complex, depending on the type of issue the network addresses. Organizations, groups and individuals can all take part in those networks. For the accomplishment of tasks within private and public organizations all necessary groups and individuals can form a network. A virtual team can be formed for each task.

Social network and collaboration technologies can support this new way of working. With Web 2.0 technologies it is possible to connect all stakeholders in the network so they can work at any time, in any place, and with any device, on the topic at hand. Employees can join a network or initiate one if the organizational structure and culture support this way of working. In traditional hierarchical organizations the clear role, place and set of tasks hinders this kind of organizing. The hierarchical structure makes the organization transparent and enables close supervision of workers, but is also difficult to change and therefore not very flexible.

In Enterprise 2.0 the Web 2.0 characteristics are brought to the workplace. In Enterprise 2.0 the focus is on the practices and outputs of knowledge workers. Mcfee (2006) introduced two ground rules for Enterprise 2.0 technologies: (1) the technologies must be easy to use; and (2) the technologies must not impose any preconceived notions about how work should proceed or how output should be categorized or structured. Thus, technology is applied to support different kinds of collaboration and knowledge work without imposing a specific one. Enterprise 2.0 makes large organizations more searchable, analysable and navigable in some ways than smaller ones, and makes it easier for people to find precisely what they are looking for. Mcfee remarked that the use of these Enterprise 2.0 tools within a company will rely heavily on the behaviour of leaders and managers in a company. At first they should have the courage to introduce and stimulate the use of these Enterprise 2.0 possibilities, and after that refrain from intervening too often or too heavily.

The knowledge work that can be supported by Enterprise 2.0 technologies also support a way of working that is different from the traditional views of the industrial age. The industrial age was focused on close supervision, standardization and the manufacturability of business processes. According to Doorn and Wit (2009), the new way of working with Enterprise 2.0 technologies focuses on knowledge exchange, sharing, creativity, communication and collaboration. According to them, the dominant vertical coordination model of the machine bureaucracy that Mintzberg (1983) described no longer holds today. The traditional power structure and the fixed chain of command is replaced by mutual dependence between directors, management and

workers. All members of the organization are expected to share influence, expertise, knowledge, and relations. Doorn and Wit claimed that business processes in networked organizations are dynamic, unstable and swift. These organizations create possibilities for individual workers to give, take and share responsibility, depending on the task at hand. They also enable actors in business processes to align their work and focus energy on service requests from customers. This horizontal steering mechanism fits better with customer focused service delivery than the traditional vertical coordination model, in which energy tends to be directed to the handling of activities according to policy, the internal structure and procedures.

## 4.4 Dutch reference architectures

As has been said, reference architectures are used as guiding instruments in the development of e-government. They are used to represent and model e-government in terms of organizational structures, business processes, information systems, and infrastructures. Figure 22 presents the basic structure of Dutch reference architectures.

A number of reference architectures exist in the Netherlands. Each reference architecture is created for a certain domain. NORA is the base reference architecture and is based on EIF, the European Interoperability Framework, which is based on international standards. (Bayens 2007). Other reference architectures are GEMMA, which is the reference architecture for municipalities, PETRA, which is the reference architecture for provinces, WILMA, which is the reference architecture for water-board districts, MARIJ, which is the reference architecture for the state service and ROSA, which is the reference architecture for education. The relationship between the architectures is illustrated in Figure 21.
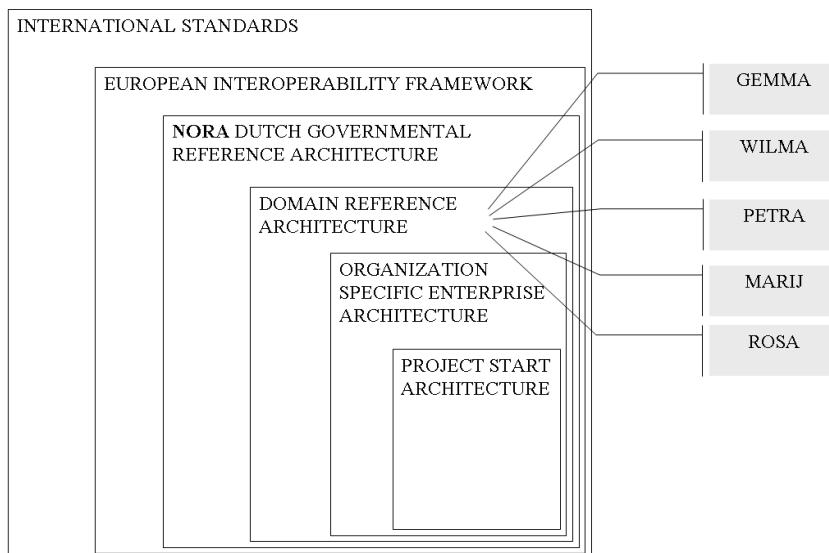


**Figure 21: The relationship between architectures**

NORA, de Nederlandse Overheid Referentiearchitectuur, is the Dutch governmental reference architecture at the country level. It is focused on enabling interoperability between governmental organizations with the aim of enhancing service delivery to citizens and companies. The architecture definition used in NORA is based on the definition of IEEE 1471, the Standard for Architectural Description of Software-Intensive Systems. In NORA a system can be an application, a department of an organization, the whole organization or the total government. NORA complies with international governmental reference architectures It describes a number of electronic building blocks needed to implement e-government, such as authentication services, application forms and transaction mechanisms. It describes how e-government ought ideally function and specifies the requirements of e-government from the perspective of citizens, politicians and companies. Based on those requirements the reference architecture presents principles to guide the design and implementation of the building blocks. The basic reference structure is a front office, business processes, data storages and an arrangement connecting them, as is illustrated in Figure 22.
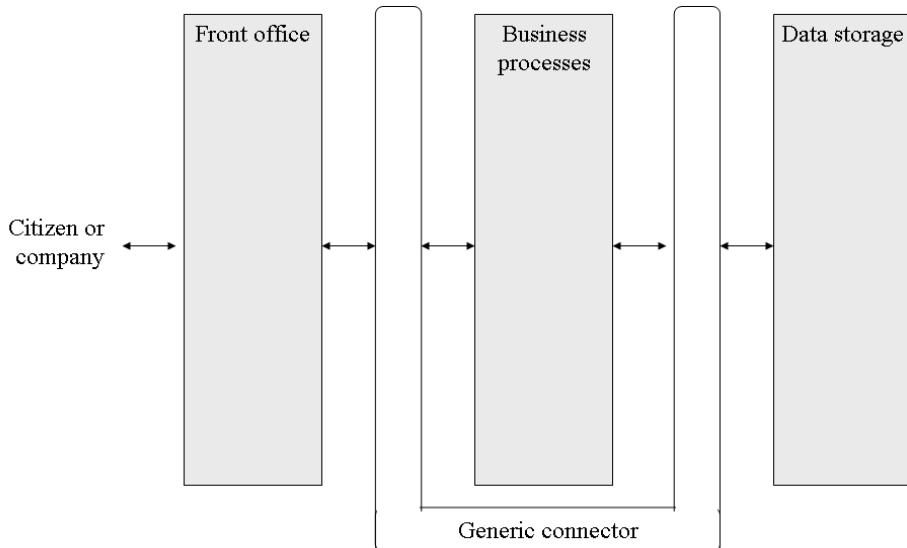


**Figure 22: Basic structure of Dutch reference architectures**

A number of data storages are standardized at the national level, such as addresses of citizens, buildings, car registrations, and incomes. In the reference architecture there is no wrong door for citizens and companies: the government's distribution channels are organized in such a manner that customers of public services can find the right counter relatively easy, for instance by means of intelligent internet portals and standardized front offices and service delivery through the internet is encouraged. In NORA versions 1.0 and 2.0 the goal of e-government is translated into a framework that consists of a business architecture, an information architecture, and a technical architecture. Each architecture displays who acts, what is delivered and how it is achieved. Security and maintenance are two generic dimensions that apply to all

architectures. NORA uses services as the basic artefact in all architectures. Semantic modelling is used to represent objects, events and transformations.

Principles are used to restrict the design space, but does not prescribe domain-specific architectures in detail.

GEMMA, de Gemeentelijk model architectuur, is the reference architecture for *municipalities*, the framework for e-government at the local level. It is based on NORA and refines that architecture to the municipality domain. It focuses specifically on the specific products and services that municipalities deliver. A specific GEMMA architecture component between the front office and the data storage is the 'mid-office' that includes case management, business process and work flow management elements are incorporated. This is illustrated in Figure 23. The main purpose of the mid-office is to connect the front office to the data storage. The principles in GEMMA are focussed on themes such as case management, standardized data stores, generic elements, re-use of NORA architectures.
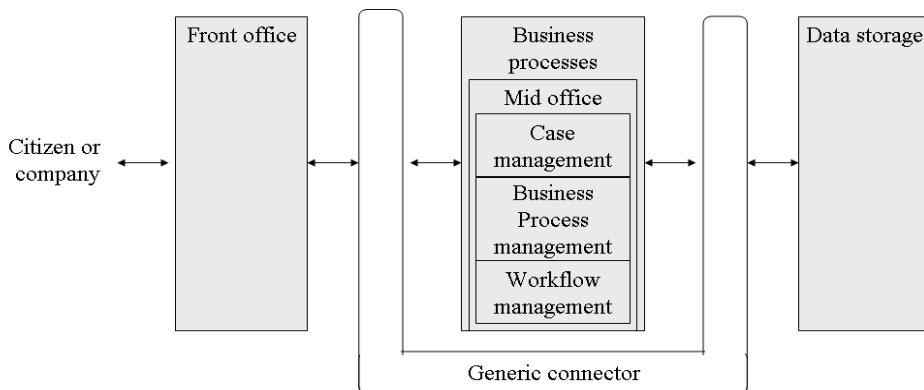


**Figure 23: Basic architecture of GEMMA**

PETRA, de Provinciale Referentie Architectuur, is the reference architecture for *provinces*; it is the refinement of NORA on the provincial level. Version 1.2 was published in February 2011. Time and place independent work for civil servants get special attention in this architecture, because of, the character of work on provincial level. Provinces deliver low volume and high complexity services in which geographic information and cooperation with public and private organizations, often with conflicting interests, is important. Area development, physical infrastructure, geographic information and the living environment on a supra-regional level are accentuated in this architecture.

WILMA, de Waterschaps Informatie en Logisch Model Architectuur, is the reference architecture for *water-board districts*; it is the refinement of NORA on the water-board level. It is described in a so called WIKI environment, an internet environment in which registered users can freely create and edit web page content, that went into production on the 5th of December 2011. The architecture is used as a tool for water-board districts to make decisions regarding shared information services. This

domain architecture is focused on the primary tasks of the water boards, such as qualitative and quantitative water management and waste water management.

MARIJ, de Model Architectuur Rijksdienst, is the reference architecture for *the public service* and Dutch government in general. MARIJ version 2.0 is called "Architectuur Rijksdienst 2.0". It is the refinement of NORA applied to the government as a whole and consists of a main document, a working document and appendices. It is the reference architecture that guides the transformation of the highly fragmented and compartmentalized government towards a more integrated, unified, efficient, smaller and company-like structure. It is an architecture that makes it possible for all 1600 government organizations with different sizes, cultures, maturity levels, tasks and so, to work together, share information and deliver products and services in a uniform and standardized manner. In MARIJ 2.0 a distinction is made between civil servants that are architects, and those who are not but benefit from architecture or architectural processes.

ROSA, de Referentie Onderwijs Sector Architectuur, is the reference architecture of *education*; it is a refinement of NORA and focuses on the education domain. The purpose of ROSA 2.0 is to enhance the exchange of information between organizations in the education domain. It is not published in documents, but in a so called WIKI environment.

## 4.5   Social and cultural aspects in the reference architectures

In the literature review in chapter 2, social and cultural aspects of organizations were identified as the specific concern in this thesis. Social aspects are: the roles that employees have; the possibilities for employees to have variety in their work; and possibilities that employees have for self-regulation and self-determination; opportunities of employees to make decisions that they can call their own; and the sense of control and recognition that employees gain. Aspects of culture in this thesis are: symbolism; norms and values; the shared identity; and the core set of beliefs and assumptions. These are considered as bearers of the culture of an enterprise that can be reflected upon and incorporated into an enterprise architecture design. Temporal aspects related to these social and cultural aspects are also studied. One of these is the dynamic between purpose, structure, processes and culture in an organization. Another is the influence an enterprise architecture design has on the social system and the culture of an organization. A third aspect of time is the influence that a social system and the culture of an organization have on an enterprise architecture. Other aspects of time are the phase and focus of an organization.

**Social aspects in the reference architectures**

The introduction of NORA states that computers take on more and more of the civil servants' tasks. The principles are formulated at the level of citizens, entrepreneurs and politicians. Their requirements centre on quality of service, the amount of regulation, the organization of the government, and the relationships with local governments. According to principles P12/P13, public organizations are autonomous in their design of

governance: it is the subsidiary principle of the reference architecture. Principles P1/P9/P20 state that the application of ICT is maximized in the execution of business processes. Principle P20 advices to use of work flow management systems to support civil servants so that the system allocates tasks to them and takes care of interfaces with other applications. The principle states that the work flow management systems is used to gain higher productivity, better work quality, and robust interfaces with other applications. Furthermore, it is stated that work flow management applications are managed by business process applications to take care of the overall management of business processes. Management information systems and data warehouses are used to check and manage operations. Principle P18 states that every governmental organization must be able to trace and check all the activities of their employees. There is no other reference to social aspects in the reference document. In the strategy section of NORA 3.0, the role and position of civil servants in governmental organizations is not mentioned. In its tactical section the employee is only mentioned in connection with some front office activities such as gathering of customer information and transferring service calls to service providers.

GEMMA version 2.0 is focused on service delivery to citizens and entrepreneurs. Case management is its central theme and certain roles of employees, such as customer contact, orchestrator and expert, are part of the case management model. GEMMA presents a generic process architecture consisting of eight business processes. It describes the preferred way of working. Its aims are to reduce complexity and enhance efficiency. The premise of GEMMA is that process management will lead to effective and efficient processes. It does not prescribe the role and position of the civil servants in those processes. The social aspects are not mentioned in GEMMA.

In PETRA version 1.2, case management and service orientation are basic elements, with case management as the governing instrument to deliver services to customers. Principle P3.1.5 states that standardization is used to increase mobility of employees and to simplify human resource management and people management. Principle P3.3.6 states that the employee is responsible for service delivery. Regarding geographic information specifically, a collaboration between the civil servant and specialists is advised. According to principle P3.3.10, there are three roles in process management: setting policy frameworks, management, and execution. The responsibility of proper process execution is delegated to line management. The information architecture is prepared for time and place independent work. Just like GEMMA, PETRA applies business process management systems, work flow management systems and case management to the implementation of business processes. The integration of human, organization, basic infrastructure and information systems is only mentioned in the section on information security.

WILMA does not contain a model that represents the organization. Quality of labour is an explicit principle. Principle PR.OR.03 states that employees are given a healthy and challenging work environment. This principle is used to formulate some requirements regarding education, delegation of responsibilities, adequate support in information, and equipment. The principle is only related to the durability principle. Both case management and uniform and standardized processes are invoked. In the context model of the architecture, the customer, regulator, supervisory authority, partner and supplier are mentioned as stakeholders. The reference architecture is said to enable

civil servants from different departments to co-operate more easily, and to assists them in understanding policies and governing processes. A strategic goal of the architecture is that Dutch government is a good employer for employees with ambition, competence, loyalty and integrity. Accordingly, the goals of the architecture are to stimulate and increase the flexibility and craftsmanship of employees, and to stimulate and create career opportunities of experts.

In MARIJ it is claimed that the government is an attractive employer with a good reputation. Accordingly, employees are trusted in their expertise, are supported in their growth and development, and are given opportunities to make their own decisions regarding careers and way of working. Appendix 10 elaborates these principles. Principle MP01 states that efficiency must be maximized. Therefore, tasks need to be standardized. Efficiency is also the theme of principle MP03 which makes standardization a necessary condition for efficiency. Principle MP07 states that standardization enables transferability of civil servants between governmental organizations and enhances cooperation between employees. According to principles MP08 and MP20, employees have their own digital working environment and should be enabled to work independently of time, place and device.

In ROSA the focus is on information architecture. Architectural principles are related to innovation, quality of service and efficiency. No references regarding the social aspects are to be found.


### Cultural aspects in the reference architectures

In appendix D of NORA support of management is mentioned as a cultural factor that influences the possibility of transforming a governmental organization in the direction of e-government. There are no other references to cultural aspects. In the strategy section of NORA version 3.0 culture is only mentioned in the context of interoperability. In the tactical section, culture is not mentioned at all. In GEMMA version 2.0 there is no reference to culture. PETRA version 2.0 mentions that additional principles regarding culture are needed, but does not identify them. WILMA has no explicit references regarding the culture aspects. In MARIJ culture and norms are mentioned in the introduction, but there are no other references. In ROSA there are no references to cultural aspects at all.


### Temporal aspects in the reference architectures

NORA versions 2.0 and 3.0 do not refer to temporal aspects except in the appendix, in which a phased implementation based on a plateau planning method is explained. In GEMMA the reference architecture is considered to be the ultimate goal. There is a reference to the phase a municipality is in, in respect of the implementation of the architecture. Depending on the maturity of the organization, a simple, moderate, or complex form of case management can be implemented. There is no other reference. In PETRA version 2.0 no references are to be found to temporal aspects. Nor are there any references in WILMA, in MARIJ, or in ROSA.

# 4.6    Conclusions

An issue reported in the design and implementation of e-government and OneStopShop government is that of overcoming the dominance of technology and traditional organization models in the design and implementation programmes and supporting organizations (Frissen 2007; Postma and Wallage 2007; Algemene Rekenkamer 2008; Docters van Leeuwen 2009). Postma and Wallage (2007) reported that e-government should not be just about technology. They advised the application of NORA.

A reliance on ICT is observed in the reference architectures where it is claimed that computers take on more and more of the tasks of civil servants. A goal that the reference architectures supports is the maximum application of ICT in the execution of governmental business processes, by means of case management systems, work flow management systems, and business process management systems. Moreover, management information systems and data warehouses are referred to as instruments to check and manage operations.

Another statement regarding the transformation in the direction of e-government is that new developments in ICT like Web 2.0 are insufficiently deployed in the public sector (Frissen 2007). Support for this claim can be found in the reference architectures, since they do not say much about the application of Web 2.0, social networks and other networking tools. Other observations of Frissen, such as the use of a closed and hierarchical organizations model, the strong technological and instrumental perspective of the transformation, close supervision of workers by management, and the implementation of business processes that characterize the classical bureaucratic organization can also be found in the reference architecture designs. The reference architectures describe conflicting views regarding the role and autonomy of employees and the use of technology in governmental organizations. The employee is regarded as an independent professional who renders services to citizens. However, models in the business and application layers of the reference architectures, such as process and application models, do not mention social aspects such as independence and professionalism of workers.

This conflict of perspectives is also present in i-government. The WRR researchers (2011) described i-government as a kind of machine that can make decisions almost independently of human interaction by applying ICT. In i-government the decisive role and position of the government servant in the transactions is minimized. In the WRR report no reference is made to cultural or social aspects of public organizations. Much focus is on 'efficiency' and 'control'.

The observations of the High Council of State in the Netherlands (Algemene Rekenkamer 2008) that business and ICT are separate domains can be observed in the implementation of e-government. For example, the ICT design and implementation of e-government components has been assigned to ICTU. Furthermore, the design approaches that are described in the reference architectures illustrate that the latter are the product of the design efforts of ICT and enterprise architecture professionals.

Regarding the social aspects of public organizations, the conclusion must be that in the reference architectures some attention is given to the roles of civil servants in public organizations. The possibilities for civil servants of variety in their work, self regulation and self determination, and of making decisions they can call their own are

all addressed. However, attention is not evenly distributed throughout all layers of the reference architectures. Furthermore, these aspects are not consistently used in the models.

A few references have been found to cultural aspects. Most of them refer to the importance of giving due consideration to cultural aspects in the transformation. Regarding symbolism, norms and values, the shared identity and the core set of beliefs and assumptions the conclusion is that they are not explicitly considered and incorporated in the reference architectures. Whether this is deliberately or not is uncertain. Some cultural aspects, such as norms and values are perhaps considered and incorporated indirectly.

The analysis of the reference architectures regarding the temporal aspects leads to the conclusion that social and cultural aspects are not considered by the designers as variables. Time is mentioned only in relation to the implementation of enterprise architectures. This conclusion means that the dynamic between purpose, structure, processes and culture, the influence an enterprise architecture design has on the social system and the culture, and the influence that a social system and the culture of an enterprise have on an enterprise architecture are all ignored by the designers. Whether this is deliberately has not been determined.

## Analysis of the propositions

In chapter 2 propositions were formulated about the consideration and incorporation of social and cultural aspects into enterprise architecture designs. These propositions have been tested in this case study. The results are as follows:

1. The proposition that the enterprise architecture discipline regards organizations as rational and programmable systems is supported by the findings of this case study. The reference architectures regard public organizations as bounded social systems with specific structures and unified goals that act more of less rationally and more or less coherently. Consequently, the reference architecture designs presents models and principles in different layers that describe the rational, objective and consistent reality of public service delivery.
2. The proposition that the enterprise architecture discipline acknowledges that in a design social and cultural aspects of an organization should get equal amount of attention as the technical aspects is not supported by this case study. Social aspects are briefly considered, but are not incorporated in the models and layers of the architectures. Cultural aspects are not considered at all. Much attention is paid to the technical aspects of organizations in the reference architectures.
3. The proposition that the constructs and models in the enterprise architecture discipline do not support the incorporation of social and cultural aspects that can not be described formally has been neither rejected nor accepted in this case study. The reason is that some social aspects, such as quality of work, have been described in natural language in the design and have been used in requirements and some principles. However, there is no consistent use of these descriptions throughout the different architecture layers, models or principles of the reference architectures.

4. The proposition that the enterprise architecture discipline focuses on the objective reality of organizations and that there is no attention to the creation of cultural meaning is supported by the findings in this case study, which concludes, that symbolism, norms and values, the shared identity and the core set of beliefs and assumptions are not explicitly stated by the designers in the various layers of the reference architecture. Furthermore, no references have been found to the relation between the enterprise architecture and cultural aspects.

5. The proposition that time creates an unwilling and unwanted complexity in an already complex design can not be rejected nor accepted in this case study because no references have been found at all regarding the dynamic between purpose, structure, processes and culture, the influence an enterprise architecture design has on the social system and the culture, and the influence that a social system or a culture of an organization has on an enterprise architecture.

6. A new proposition is that the separation of a design process into two processes, one of which focuses on the social system and cultural aspects of public organizations, and the other on the enterprise architecture design, leads to omissions of social, cultural and temporal aspects of organizations in reference architecture designs.

7. Another new proposition is that the combination of a professional organization, that gives a lot of responsibility to employees, and an efficient organization, with a high level of automated and pre-described work processes, in one reference architecture creates ambiguities and inconsistencies in a design regarding social and cultural aspects of organizations. The reason for this is that such an reference architecture present both a perspective on operational efficiency and a perspective on flexible and professional civil servants.

# 5 CASE STUDY II:
# THE ENTERPRISE ARCHITECTURE OF THE SVB

"Form ever follows function"

Louis Henry Sullivan

# 5.1   Introduction

The design and implementation of e-government has led to major change programmes in governmental implementation organizations. A major change programme in such an organization is the case study that is presented in this chapter. In the programme a new enterprise architecture was designed. The case study explores whether the enterprise architects regarded the organization as a rational and programmable system. The case study also explores whether the enterprise architects acknowledged that the social and cultural aspects of the organization should get equal amount of attention in the design as compared to the attention that the technical aspects received, and whether the creation of social and cultural meaning, apart from the translation of goals, objectives and strategies was considered and incorporated into the formal models, principles and descriptions. There is also an examination of how aspects of the organization, such as cultural and social meaning, that cannot be described in formal languages have been given consideration and are incorporated in the enterprise architecture design. Finally, the consideration and incorporation of temporal aspects into the enterprise architecture design is explored.

This case has been selected because: (1) a purpose of this programme was to design and implement a new cultural and social environment for the organization; (2) at about the same time, a new enterprise architecture had to be designed and implemented; and (3) the programme was part of the e-government transformation which has been explored in the case study in the previous chapter. For these reasons it was possible to explore how the new social and cultural context has been thought about and incorporated in the enterprise architecture design.

The starting date of this case study was January 2008, when the design process formally began. On 18 March 2010 the detailed enterprise architecture design process formally finished. On that day the executive responsible for service delivery, announced that the implementation phase of the programme was starting. That announcement marked the end of this case study.

The gathering of data took place during that period. Main data sources were annual reports, internal communications, official reports, workshop reports, design artefacts, conversations with enterprise architects and other project members, ICT experts, managers and directors of the organization. Data have also been gathered by means of observation during the design process, participation and interviews.

In this report the general context of the design is introduced first. After the introduction, the social and cultural aspects of the organization are introduced. The design process and the completed global and detailed enterprise architecture designs are analysed using the aspects described in the literature review (paragraph 2.4). Data have also been analysed through interpretation. Not only actual descriptions and formal representations have been interpreted, but also the intention behind them and the meaning of these descriptions and models.

The conclusions of this case study are reported in the light of the propositions set out in the previous chapter, paragraph 4.6, with a view to finding out which of these propositions hold in this case as well.

# 5.2   General context

**SVB, the social insurance company**

The SVB or 'de Sociale Verzekeringsbank' is a governmental implementation organization founded in 1901. The organization has about 4,9 million clients, 3200 employees, 11 branch offices and one head office. It is situated in the Netherlands and it has branch offices spread across the Netherlands delivering services directly to customers. The organization structure is presented in Figure 24 and Figure 25.
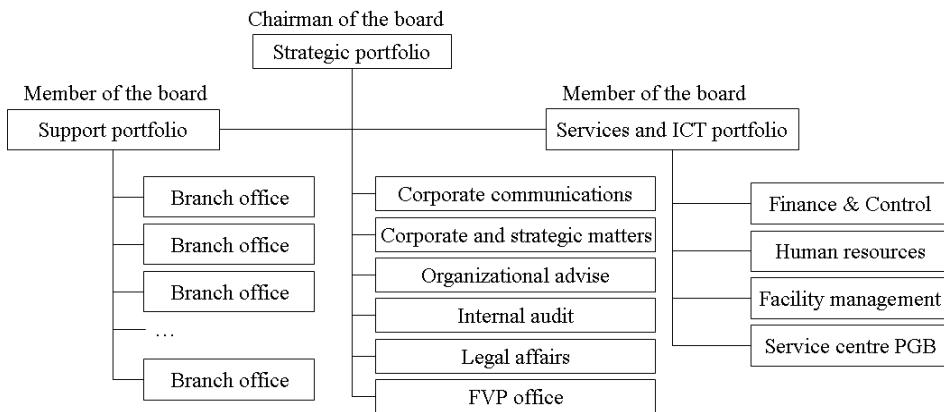


**Figure 24: Organization structure of the SVB**

The head office takes care of policy preparation and the coordination of policy implementation. It is also in charge of centralized production processes, such as monthly benefit payments, facility management, ICT support and self service functionality on the internet.

Employees of the organization implement Dutch financial insurance schemes such as child care benefits and state pensions. They ensure that the governmental financial insurance schemes are received only by those who are entitled to them, in the correct amount, on time, in accordance with the law, and in an efficient and cost effective manner. The scope of the organization is the complete financial file of citizens concerning social security and social care (SVB 2010). Stoové, who was the chairman of the Board of Directors in the case period, referred to all Dutch citizens as customers of the organization. This means not only citizens who receive social benefits, but also citizens who seek information. According to him, employees of the organization feel committed to society, contribute actively to society by sharing knowledge with other agencies, and participate in discussions concerning the important and dynamic field of governmental social security (SVB 2005). He emphasized that being friendly to customers is important because good service delivery leads ultimately to trust in the government. If citizens have no faith in public organizations, because civil servants do

not listen to them or are too bureaucratic, then they feel less involved in democratic society. Therefore, implementing organizations are the front soldiers of democracy (Stoové 2006).

Head office in Amstelveen

Branch offices Spread across The Netherlands

Insurance Office in Amstelveen

PGB Service Centre

PGB Service Centre

The Supplementary Pension Insurance Foundation (FVP)

Bureau for Belgian and Bureau for German Affairs

Representation abroad
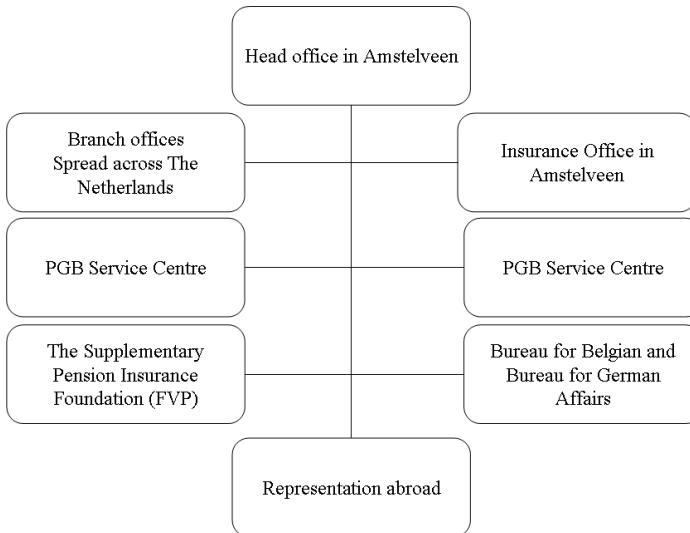
**Figure 25: The SVB organization**

The Executive Board from 2007 to 2010 emphasized SVB's long term ambition to become the best service-oriented and context-aware executor of personal schemes of Dutch government. For that reason the organization had to set the standard for governmental service delivery. They formulated four ambitions to accomplish this: (1) excellent execution of the organization's primary task; (2) excellent service delivery to customers; (3) being distinctive in human resource management; and (4) investing in the future, showing innovative behaviour and being socially involved. They also formulated four critical success factors that needed to be monitored in order to check progress on these four ambitions: (1) efficient, legally correct and timely payment of benefits; (2) a customer focused service delivery; (3) a process-driven approach and stimulating work environment; and (4) cooperation with other public and private organizations.

In the annual plan for 2010 the primary focus of the Executive Board was on employees, the image of the company and sustainability (SVB 2009). This focus was translated into three targets. The first was to understand how the ambitions and skills of employees match the overall ambitions of the organization. Employees should be aware of their own qualities and areas of development in service delivery. The second was investing in the future. This means that sustainability and innovation should be an integrated part of going concern. The third target was that everyone in the organization delivers excellent work. Furthermore, all employees should be visible to and approachable by customers.

These targets were also clarified in an additional letter setting out the Executive Board's aspirations (Stoové, Vermeulen et al. 2010). The board explained that the target of better customer service should also result in an increase of social security applications by citizens. It should also lead to increased information-sharing amongst governmental agencies, especially in the social security domain. Furthermore, it should stimulate a pro-active attitude of employees towards customers about changes in their registration, or changes in regulations and the consequences of those changes for benefits customers receive. Elements of excellent customer service that the board members mentioned were self service websites for citizens, well educated and experienced service delivery teams. For that reason employees were regarded by the executive team as the talent and capital of the organization. Workers were indispensable for excellent customer service and should therefore be well equipped for their role, and be willing to grow continuously in knowledge and experience. The board members continued to explain that operational efficiency is also a target because the operating budgets that the organization receives from central government will remain the same or decrease, while the complexity of legislation increases and the customers base for state pensions grows rapidly due to the ageing population. According to the board members, increased efficiency must be accomplished through process innovations and increased process automation. Furthermore, better process accountability and increased customer satisfaction contributes to the necessary operational efficiency. Another aspiration they explained in their ambition letter was the need to increase organizational flexibility which should be obtained by means of better re-use of information that was already available elsewhere in governmental registrations, new and flexible information systems, and a transformation of the law-oriented service delivery teams into integrated service delivery teams that deliver services based on a range of social security laws and regulations, and which are triggered by life events of customers.

### Influences from the environment

According to Wartna (2008), the environment of the SVB is complex and multifaceted. The organization deals with many parties, such as citizens, clients and national, local and international governmental organizations. Each party has certain characteristics, can have interests conflicting with those of other parties, and can influence other parties. Citizens for example expect tailor-made service delivery from governmental organizations whereas national government strives for efficient, uniform and standardized delivery of services in order to reduce the implementation costs at the macro level. Citizens influence governmental organization via politics, law and legislation, their behaviour and expectations.

A development in society is that customers expect to be served in a highly personalized and integrated manner (SVB 2008). They expect instant responses to their service requests, preferably at a place and time convenient for them, and they expect to be served in a single service call. The service delivery concept that accommodate this is OneStopShop government or service delivery based on life events, introduced in the case study of the previous chapter. In that service delivery concept the group of services that citizens regard as integrated parts of a certain life event will be delivered as if it

were one service (Coenen, Van Gils et al. 2010). Examples of life events are getting married, giving birth, or immigration.

Another important development in society, also described in the previous chapter, is that workers want to be respected and acknowledged for their skills and expertise. Rinnooy Kan in the annual report of 2009 (SVB 2009 p. 34), claimed that workers have the strong wish to organize their own lives through the utilization of their competencies and professionalism. Therefore, management should invest in talent development and should incorporate this in their human resource management tasks.

Demographic change is another factor in the environment that bears on the SVB's operation. The population in the Netherlands is ageing. Consequently, more citizens will apply for and receive state pensions. This increases the workload of the organization and will increase operation costs if the efficiency and productivity of the organization remains unchanged

The restructuring and decentralization of governmental tasks is another influencing factor. Responsibility and implementation of governmental tasks are decentralized to local governmental agencies. These agencies are clients of SVB. They contract it to implement certain financial benefit schemes. Consequently, clients of the SVB are a mix of national and local governmental organizations.

This decentralization trend also leads to co-operation between governmental organizations on a national and local level, and thus too influences the organization. The consequence is that the organization has to find and keep its position in the chain of implementation organizations. Financial benefit schemes that are assigned to the organization today can be allocated to other governmental organizations if the SVB has no clear position. The assignment of tasks to other governmental organizations can happen if the latter are able to operate at lower cost.

Internationalization is the last influencing factor that Wartna describes. This trend includes the increased mobility of people and workers across borders. The effect of this mobility is that workers can obtain social security rights in different countries. Consequently, national and international citizens can pay social security fees in different countries and they have to be informed about their rights and duties, and have to receive all benefit payments which they are entitled. This necessitates co-operation with a variety of international governmental organizations in order to calculate and pay the right amount of social security benefits to international customers.


### The change process from 2001 to 2010

In 2001 the Executive Board announced a multi-year change process, which is sketched in Figure 26. The change process started in 2001 for several reasons: as a reaction to service delivery complaints from customers; as a response to the trends in society; and in order to implement the recommendations from the Work and Income Inspectorate, IWI (Inspectie Werk en Inkomen (IWI) 2004; Inspectie Werk en Inkomen (IWI) 2005). IWI is the independent regulator for the Minister of Social Affairs and Employment and is intended to contribute to the effective functioning of the system of work and income by means of inspections. Recommendations in their reports focus on customer communication and customer service. The main purpose of the change process was to

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change the organization into an excellent and efficient service delivery organization. The organization had to become the Number One implementer of public personal financial schemes in the Netherlands and services had to be delivered to citizens at any time, and any place (SVB 2008). It led to the target of the change programme, which started in 2005, to enable every 4,8 million customers to contact the organization by means of any distribution channel, such as the internet, the counter, telephone and email, at any time. Furthermore, the customer should always be able to contact an employee of SVB who is able and willing to service the customer in an expeditious and appropriate manner. This service level was applicable for the delivery of any specific government social security scheme that is executed by the organization, such as child care or state pension, and in situations in which there is concurrence with financial schemes that are implemented by other governmental organizations.

Start of long term
change process

Start of the multi year
change programme

Approval of new
business model iBVM

Start pilot implementations
integrated service teams

Approval new business
enterprise architecture

Start implementation
integrated service teams

Delivery of detailed
designs

2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
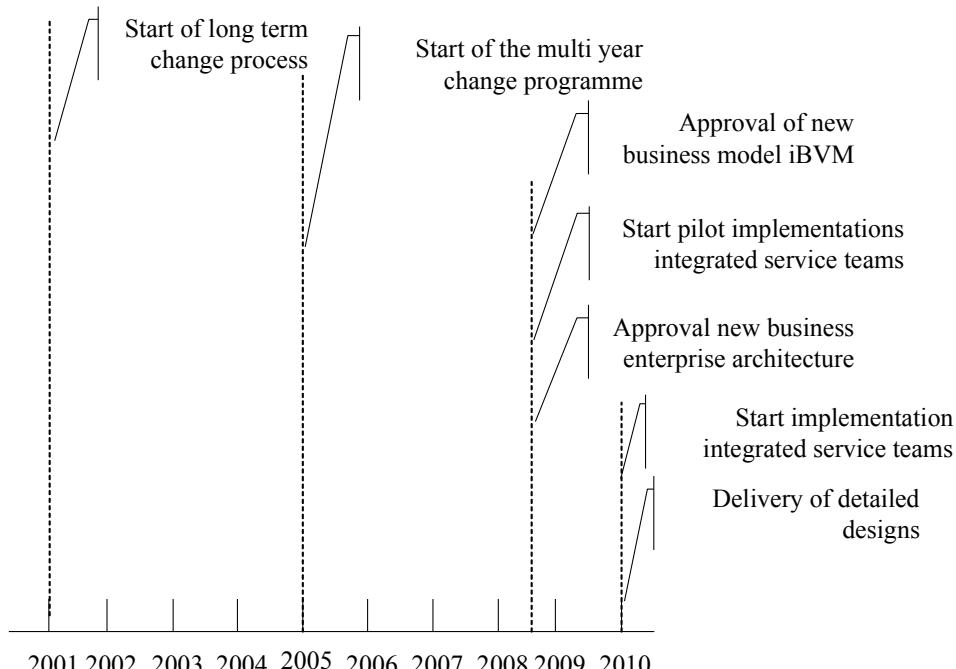
**Figure 26: The change programme from 2001 until 2010**

The Board of Directors called the programme 'SVB-Tien', where 'Tien' (i.e. ten) stands for excellence and for the year 2010 in which the transformation had to be implemented. The goals of the change programme were summarized in the words: 'High Tech, High Touch'. 'High tech' means that productivity is improved through increased application of ICT for routine work. 'High touch' means that customers can use self-service internet-sites in combination with personal services that are delivered by service teams for complex service deliveries.

The change programme had to create and implement new designs for the organization and ICT. An important precondition for these was their alignment with trends in society such as professionalism and individualism. At the same time they had

to enable the organization to increase its productivity and cost efficiency. Therefore, a completely new way of working and organizing was designed. Products, services, the organization, processes, information and technology were all redesigned. The resulting design was called 'the integrated business model', or 'iBVM'. This new business model was approved by the Executive Board in the summer of 2008 and is explained in the next paragraph. iBVM was the guiding instrument in the design, building and implementation of the new organization and the training of employees. A new enterprise architecture was needed because current information systems could not support iBVM effectively. Therefore, an aim of the programme was to replace all the information systems by new ones, preferably packaged software with minimal custom-build additions.

The design of new enterprise architecture took place in a part of the programme that was responsible for the renewal of processes and ICT (SVB 2007). In November of 2008 the final version 1.0 of the new target enterprise architecture design was completed. and accepted by the programme director. In 2009 and 2010 the new enterprise architecture design was supplemented with detailed business, information and technical designs. These designs were implemented in a 'demo' that used a set of standard packaged software solutions from the Oracle corporation. In March 2010 and November 2010 the first release of the solution went into production. It was the implementation to support the application and delivery of the voluntary governmental insurance for state pension.

Another part of the programme was responsible for the new organizational design and implementation. It was responsible for the set-up and introduction of integrated service teams, training schedules and changed human resource processes. In 2008 and 2009 a pilot implementation of the new organization was planned and carried out in eight branch offices. The purpose of the pilot was to test the performance of the new service delivery concept in practice. This pilot implementation delivered positive results and so the Executive Board communicated at the end of 2009 its intention to implement the integrated service teams in all the branch offices from 2010 onwards, and to train employees to become integrated service team members. A consequence of this decision was that the new organizational design had to be supported by current information systems, because the necessary new systems were not ready.


### iBVM, the integrated business model

The design process that led to the integrated business model was needed to translate the strategic goals of the SVB, the recommendations of IWI and trends in society into business operations and ICT support services (Wartna 2006; Wartna 2008; EBI 2009; Wartna 2009). 'Integrated' means 'complete' or 'in which nothing is missing'. It means that all products and services needed to fulfil a service delivery request from a customer are integrated into one single delivery.

In the new business model there are three production lines (Boss 2007). The first production line is self-service by citizens, by means of internet-sites that guide them in the service delivery process. The second production line is fully automated and is linked electronically to business processes in other governmental organizations. It

maximizes business processes efficiency. This production line is 'the factory' and is used for fully automated cases such as the prolongation of rights granted and monthly benefit payments. The third production line maximizes customer attention. This production line contains a mix of self-service internet sites, semi-automated processes and personal assistance. It contains the integrated service teams. A service request will always be dealt with in the production line in which it originates. Temporary switching between production lines in service delivery occurs, but were considered to be rare. They occur for example when automated or semi-automated processes require manual interventions. The essence of iBVM is summarized in the following six principles:

1. The organization delivers integrated services to its customers. This principle is derived from the OneStopShop government service delivery concept in e-government, introduced in paragraph 4.2, in which service delivery is triggered by life events. Its consequence for the SVB employee is that he/she should become skilful, customer-oriented and empathic to what is important for the customer. This customer orientation is regarded as a major challenge for employees, business processes, systems and partners since employees, processes and IT systems were until then primarily focused on internal productivity and procedural correctness (SVB 2005).
2. Service delivery is customized. This principle is derived from the wish of citizens that their personal preferences can be integrated in governmental service delivery processes.
3. Service delivery can be initiated anywhere within the organization. The consequence of this principle is that there are no 'wrong doors', or entry points, for customers. A service request can be initiated in any distribution channel such as an self-service internet-site, telephone, email or a physical counter. A general guideline resulting from this principle is that the customer is serviced by the same employee from initial request until complete service delivery. Specialists can be involved when highly specialized products or services are needed and other employees can be involved on special request of the customer. Then a part of the work, or the complete service request, can be delegated. This principle led to an organizational change. Until 2006 each branch office had its own group of customers who lived near that office. In the new business model branch offices serve all customers, no matter where they live.
4. Service delivery respects the clients' different preferences and requirements. This principle is important because of the increased number of clients, like local government, that outsource their financial benefit processes to the SVB. The SVB's future depends on the number of tasks that these clients assign to them. This demands that it should be able to incorporate the clients' preferences and requirements in service delivery processes, otherwise their tasks are assigned to other organizations.
5. The life event of the customer is the unit of work in service delivery and in governance processes. This principle is the consequence of the first principle in which the life event is introduced in service delivery processes. The implementation of this principle is that a client, customer or manager can ask

service teams about progress is in the delivery of the integrated service, triggered by a life event, such as a divorce, of a certain customer.

6. The organizational design and implementation is flexible and agile. The purpose of this principle is that the organization is no longer structured along the lines of financial benefit schemes, such as child care or state pension and thus the customer is no longer confronted with the internal structure of the organization. This is a consequence of the third principle. Flexibility, agility and standardization are primary requirements for the new organizational design, as a necessary response to the growing customer base for state pensions, the shrinking numbers of employees, and the productivity levels that must be achieved. They are also necessary for responding efficiently to peaks in service requests. Therefore, an important iBVM requirement for business processes and supporting information systems is that they can be adapted in a timely manner to the changing environment, such as changes in legislation or regulation (Wartna 2008). A consequence of this principle is that each business process should have a flexible design. The separation of knowledge elements, such as business rules, from process flow elements, such as splits and joins, is the implementation of the flexibility requirement in process designs. In this set-up of business processes the process flow remains unchanged when changes occur in knowledge elements, such as a change in law or legislation.

A consequence of these six principles was that the traditional 'law oriented' service teams were transformed into 'integrated' service teams of twenty to twenty-five employees that can deliver the range of products and services that the organization offers. Another consequence was that the traditional separation between a 'front' and 'back' office was eliminated: the two were integrated. Consequently, there was no longer a need for a call centre in the front office that used computerized telephone menus. In the new organization structure customers always get an integrated service team member on the telephone. Furthermore, in the new integrated design employees were expected to do all the work, that was previously divided between front and back office workers, themselves. The employee became the personal contact person for customers, and their service delivery case manager. The employee became also responsible for planning, monitoring, and managing these cases. For this reason, employees needed new skills such as customer awareness, decisiveness and self-reliance to function well. Wartna (2009) therefore contended that in iBVM the employee is a highly educated and experienced professional who is responsible for organizing and performing all the work according to his or her own understanding of the situation, organizational values, and the relevant legislation. In order to gain and maintain the appropriate skills and knowledge employees should be supported by continuous training, management, and by knowledge systems. Employees should also be regularly assessed on their competencies, values and the desired behaviour towards customers.

## 5.3 The social and cultural context of the design

### The cultural context of the design

In 2002 SVB was a silent force, despite the fact that billions of Euros of social security benefits were paid each month to customers. According to Van Wijk (2004), almost no one in society knew about this performance because the organization was quite invisible to society at large. This was an undesirable situation for the Executive Board, because invisibility is an obstacle in acquiring new contracts from clients such as national and local governments. Furthermore, the focus on the high performance resulted in a culture in which employees lost sight of the rationale behind social security legislation and focused solely on producing output efficiently. The organization had to become something in the forefront of the minds of potential clients. Therefore, employees needed to become more empathetic to citizens and had to increase customer focus in service delivery processes. For that reason the Executive Board started working on the re-positioning of the organization in government in 2002. The board initiated a culture project to form a new identity for the organization and employees. The project had as its goal to re-establishing a sense of pride amongst employees. This was achieved by means of a creative change process in which employees rediscovered the values of the organization and in which they rediscovered that they too were invaluable to the company and were very much needed if the ambitions of the organization were to be realized. A corporate story was created that depicted the personality, positioning and perspective of the organization. In that story the position of the organization in society and the promise of the organization was expressed in the motto: 'Throughout life'. The message was that the organization is more than a financial benefit payment factory. Its employees actively deliver a contribution to the quality of life for its customers by means of the social security benefit entitlements they grant to citizens for the duration of life, from birth to death. The corporate message was that anyone comes in contact with SVB in connection with either the finer or the inevitable things of life: as a child, as parents, as widower of widow, attending school, working or being retired. In those situations SVB pays and manages social security benefits. That was the message of SVB: it promises to be there for everyone in society. The renewed identity was summarized as follows in annual reports since 2002: (1) SVB is a solid and loyal performer; (2) the organization members are involved in the preparation and review of new legislation and advise government on the practical feasibility of new legislation; and (3) the organization has an undisputed position as an independent and government-bestowed authority for the management of individual social security. The personality of the organization has been described in annual reports in the form of the following organizational values: (1) undisputed in the implementation of Dutch social security schemes; (2) connected with trends in society; (3) being an inspiring source of knowledge for clients and citizens; and (4) being a reliable partner of clients such as national and local governments in the delivery of social security services. The organization wants to be distinguished from other governmental organizations in virtue of its customer focus and careful enforcement of entitlements, its actively seeking of

cooperation with other parties, and service delivery from the perspective of citizens. The organization is dedicated to social security in which the human dimension counts and is positioned in the middle of society so it can reflect on what is happening with citizens and can anticipate to relevant new developments. Cooperation is seen as the key competence of employees (SVB 2009; Inspectie Werk en Inkomen (IWI) 2007). This applies to all situations, between colleagues, in consultation with a client, or in solving a problem for a citizen. Therefore, employees are organized in conjunction with each other, understand, and manage the work processes they are involved in.

The organization is regarded by management as a process-oriented organization. It is a typical governmental service implementation organization in which standardization of operational processes is desired, because of stringent quality demands such as legal validity, timeliness and uniformity of implementation (by law). For this reason, operational process responsibility has been delegated as much as possible to branch offices and employees. Therefore, it is important for the SVB to be a learning and people-oriented organization. Employees should be continuously developing and growing within the organization. For that reason, growth and development of talent are central themes in the human resource management policy. According to Bergkamp who was the human resource director in 2009, SVB has a good working atmosphere and there is much collegiality (Incompany 2009). She claimed that the organization has well educated employees who are given many opportunities to keep on growing. Employees feel involved in and are committed to providing social security to citizens, are professional and diligent in carrying out social security schemes, and focus on quality of service delivery (SVB 2009). Furthermore, employees like to work together, have the ability and willingness to adapt to changing circumstances, and are aware of what is happening in the environment of social security. Employees deliver an active contribution to the reduction of poverty and in the promotion of social participation in the Netherlands (Stoové, Vermeulen et al. 2010).

Although the corporate identity has been formally proclaimed, there is in fact not one SVB culture. Each branch office can have its own culture and its own way of working, especially in the area of debt management, money recovery and quality management (Roland and Verheij 2007; Kievit 2008; Lesmeister, Meerens et al. 2008; EBI 2009). The culture in a branch office depends on the implementation of law and legislation in the organizational structure, processes and supporting information systems. Traditionally, much has been prescribed in clear rules of conduct from which little deviation is possible for teams that work with child care state benefits. That way of working is implemented in business processes, work arrangements, capacity planning, work allocation and work inspection. The supporting child care information system is process-oriented and prescribes the way of working in detail. Consequently, employees that work in child care benefit schemes are accustomed to direct supervision and many work inspections. This changed in 2006 when prescribed quality-checks on all output were removed from business processes and replaced by random inspections. That change was an indicator of professional maturity regarding employees in the child care benefit domain. These employees have a middle or higher education level, preferably with a focus on social legal service delivery. Teams that work with state pension financial schemes, the other major social security scheme that the organization implements, are accustomed to implement more than one financial scheme. Here there

are not as many prescribed rules of conduct as in the child care domain. Furthermore, there is less supervision and responsibilities regarding capacity planning, the inspection of output, and selection of work from the backlog have been delegated to the workforce. The supporting information system is data-oriented and allows employees to plan and perform tasks themselves. These employees are accustomed to professional freedom regarding planning, organizing and job execution. Consequently, they dislike too much inference and close supervision from management. They generally have middle and higher education levels, preferably with a focus on delivering financial services.

Another cultural aspect is how fast changes are implemented by the organization. The prevailing culture is that changes in the organization are preferably implemented in an organic fashion and take place alongside trends in society (Incompany 2009). It is critical for the position the organization has in government that trends in society are accommodated by the organization as soon as possible, preferably before society demands them. Therefore, the organization started changing in 2002 in anticipation of expected shifts in customer preferences, even though customers at that time were content with the way in which they were served. According to Bergkamp, big bang implementations are avoided by management as much as possible. Incremental transformation is preferred because many citizens depend on the monthly and quarterly payments from the organization and small disturbances can have huge implications for citizens that depend on those payments. Therefore, transformations are implemented in small steps and time is taken to test and learn from them. That is why the organizational transformation towards integrated service teams was organized as a growth path and pilot implementations were used (Roland and Verheij 2007; EBI 2009). A phased approach was the preferred strategy for the renewal of the information systems: going concern should continue with as little disturbance as possible. For that reason new information systems were introduced step by step in the going concern (SVB 2006). Quality levels were expected to remain constant in the transition period. Therefore, given the importance of the legacy systems in current service delivery and the projected remaining life span of that legacy, new information systems should be able to work with the legacy for a period of time (SVB 2007). Consequently, work flow functionality should be removed step by step from the legacy and be replaced by new work flow functionality. Thereafter, other legacy functionality should be replaced by new functionality. The transformation towards the integrated business model also affected other parts of the organization besides information systems such as business processes, the structure of the organization, service delivery and human resource management. In the transformation all these aspects should be dealt with in relation to each other. A consequence of such a phased approach was that not all principles, parameters and models could be worked out in detail because of the period of time between design and implementation (Van Bruggen, Van den Assem et al. 2007). Therefore, enterprise architecture models were first described on a generic level. Detailed models were created after that in detailed design projects.

Another relevant cultural aspect was that employees were accustomed to the fact that the home address postal code of customers were used to assign customers to a specific branch office. Through this allocation mechanism each branch office had its own fixed base of customers that it served. Customers were expected to visit that branch office when they needed information or needed to be serviced. Furthermore, customer

data management was the sole responsibility of the branch office that serviced that customer. Intentions of the new design were to remove the fixed allocation and to introduce a free flow of information through the organization and other national and international governmental organizations. This fixed allocation of customers was abandoned in the new integrated business model, because a branch office was expected to deliver services to a wide range of national and international customers. In the integrated model the customer was no longer restricted to a particular branch office and could use various distribution channels such as the internet, and other governmental organizations (Stoové, Vermeulen et al. 2010). Consequently, actual customer data needed to be available in all distribution channels, at any time and they therefore cease to be the exclusive property of a specific branch office. Consequently, the organization should become one virtual organization from the perspective of a customer and should have only one customer information database. Thus, the residence of the customer was no longer important in the determination of the location where service delivery should take place. This was consistent with the trend in society in which citizens act increasingly independently of time and place. In the new design the boundaries of the head office and branch offices should fade. Furthermore, the sixth principle in iBVM regarding agility and flexibility, illustrated SVB's desire to be an organization in which the production lines are agile and flexible. Agility and flexibility were needed as a response to the increased speed and frequency of changes in law and legislation, customer preferences and requirements of new clients (SVB 2010).

Another cultural aspect is the dynamic between employees of the organization and employees of other national and international governmental organizations in delivering a range of public services, including social financial benefit schemes. Such a set of organizations forms a chain that is agile and flexible and is formed around a certain topic in a certain public social security domain, such as work and income. These chains increase in importance because a number of governmental organizations deliver services that are triggered by life events such as 'being without work' (SVB 2006). Typical organizations that can form these chains are municipalities and other public organizations that implement governmental social security services, such as the tax authority. Van den Brink (SVB 2009 p.49), the director of the governmental organization that calculates and collects fees for the Exceptional Medical Expenses Act, said that the customer should feel that governmental services are delivered as if there is only one nationwide implementation organization, whilst in fact there are many organizations that contribute to that service delivery. Consequently, information is exchanged with other local, national and international public organizations and there is one nationwide service delivery process for each life event.


**The social context of the design**

Customer service skills, independence and decisiveness are regarded as the pillars of the transformation from the traditional employee purely focused on the production of output to the new integrated service team member focused on satisfying the customer. Furthermore, the objective of management is to offer a stimulating work environment where employees are constantly challenged to grow and take responsibility for their

own career. Therefore, the integrated service teams of iBVM should be primarily regarded as a working and learning community in which continuing progress is the central theme. Consequently, there must be clarity amongst team members about which results are correct or incorrect. A prerequisite for such a learning community is an open culture in which mistakes are allowed to occur and are discussed openly in order to learn from them, without feeling threatened with punishment when mistakes occur. IWI (2007) reported that the enlargement of the responsibilities of SVB employees has improved motivation and employee satisfaction in 2006.

Social aspects are more explicit in iBVM than cultural aspects. According to Wartna and Hooimeijer (2007), the reason for this is that iBVM has a direct effect on teams and employees. Another reason is that the effect on teams and employees influences other processes like recruitment of staff and service team managers, appointment of staff service team members, assessment of quality and work behaviour and rewarding of team managers (Cluistra and Graafland 2006). In iBVM team members are highly qualified, customer focused, and are able to create an overview of their work because they perform a wide range of tasks such as processing social benefit applications, handling house calls and complaints, exchanging information nationally and internationally, and signalling evidence of fraud. They are able to manage their own workload, work together, and support and coach each other. Team members should understand what excellent service delivery is, and should have the ambition to excel in service delivery, be aware of their talents, and know when they need support or can give support. Moreover, iBVM employees are capable of performing their integrated service delivery tasks and organize their own learning process. Wartna and Hooimeijer indicated that coaching will mainly be done by the team leader who manages and facilitates the team, ensures that the proper level of education and experience is present in the team, and facilitates the development of team members when proper levels are not present. The team leader is formally responsible for attaining the necessary team performance levels. However, in practice team leaders delegate this responsibility to the team. The team leader and service team members together select cases that need inspection because in the integrated service team only a part of the total amount of output is inspected. Wartna and Hooimeijer argued that high availability and flexibility of service team members leads to the avoidance of task and regional specialization of service teams and team members because specialization reduces flexibility, adaptability, production capacity and throughput. Ten principles have been formulated to summarize the way of working in integrated service teams:

1. Every customer is unique.
2. Listen to the customer and ask questions.
3. Finish the work as much as possible by yourself and in one go.
4. Realize that the work is only finished when the customer is satisfied.
5. Work accurately and quickly.
6. Take right and legally correct decisions, as soon as possible.
7. Ask for support from colleagues and support colleagues yourself.
8. Address inappropriate behaviour of colleagues and be open to criticism.
9. Be responsible for the results of the team.
10. Be allowed to make mistakes, as long as you learn from them.

Besides these aspects of the social system of iBVM, there are characteristics of its technical system: work flow management; knowledge management; and customer information management.

A number of issues were raised concerning the social system and work flow management (Kievit 2008). The first question was to what level of detail the work is predefined in work flow management systems. Standardization of processes contributes to the efficiency and reliability of operations. However, standardization reduces flexibility and professionalism in service teams. A global process definition in work flow systems that includes standardized process activities like registering, evaluating, deciding, checking and paying, leads to a professional work environment in which employees can make their own decisions concerning the detailed interpretation and execution of process activities. Therefore, a detailed definition of work flow activities will restrict professional freedom. Furthermore, a work flow management system can allocate work directly to workers. However, such an allocating mechanism seems to delegate backlog responsibility to the system instead of to the team, the team member or the team leader. According to Kievit, a design in which capacity planning and work allocation are assigned to an information system reduces the opportunities for individual workers to organize their work. In iBVM backlog management is the responsibility of the whole team. Teams allocate work items to team members in consultation with each other. Software to support work flow management can enhance the management of the work flow and can contribute to the implementation of the integrated business model. Added values of work flow management are real-time availability of work flow information, forecasting functionality, automated allocation of work, automated prioritizing of process activities, automated switching of resources in the work flow, automated capacity planning, and the possibilities of adding business rules to process execution. Those are all valuable inputs to determine the level of automation in work flow management. Kievit suggested that work flow management functionality should allow enough possibilities for employees to organize their own work and make their own decisions. The technical system should not become a suit of armour for the social system, because in reality many decisions in the organization and execution of work are made on the basis of practical criteria that are not always formulated explicitly in advance. Kievit claimed that the technical system should support this, otherwise it can become a burden to employees. Employees are professionals and mature in the execution of their assignments. Therefore, they need opportunities to make decisions and take responsibility in work allocation and execution.

Another issue that was raised was knowledge management. According to Brontsema (2009), who was responsible for the pilot implementation of the integrated service team concept, team members in the pilot indicated that knowledge sharing is very important in the integrated service team concept. She said that knowledge management systems are essential, because it is impossible that an employee has all the necessary knowledge required for the financial arrangements and the life events that are handled by the service team.

In addition to work flow management and knowledge sharing, employees need easy access to all information regarding the customer, including an overview of actual service delivery processes. This complete overview of customer information enables employees to deliver services in an integrated and effective manner. An internal

research group that examined the central administration for customers and clients, and the possible effects of a centralized administration on the organization, concluded that the centralized administration will serve the integrated service teams well because team members no longer have to examine multiple administrations in order to find all relevant customer information (Lesmeister, Meerens et al. 2008). Lesmeister concluded that the quality and use of the data will increase because there is only one administration that needs to be managed and the data it contains can be used for all kind of services. Advantages of a central customer administration are standardization of queries for customer data, mutation processes of customer data, a better overview of customer information, and higher customer data quality. A consequence of the centralization of customer data is that branch offices or teams are no longer in charge of the administration of customer data, but the centralized administration is.

In the pilot implementations of the service teams a number of uncertainties arose that needed to be addressed in the enterprise architecture design. There were uncertainties about the effects of the new way of working on production quality, stocks, and productivity. Other uncertainties concerned working with different kinds of information systems and different financial benefit scheme laws and regulations, and the availability and sharing of knowledge. The new enterprise architecture design should accommodate possibilities of organizing work, of ensuring data quality, and of creating customer communication in an integrated manner (Brontsema and EBI 2009; EBI 2009).

## 5.4   The enterprise architecture design

### The design process

In 2007 the SVB announced the enterprise architecture project (SVB 2007). The announcement set out three prerequisites for the new enterprise architecture design. First of all, the enterprise architecture design should implement iBVM, the integrated business model. Second, the design should be independent of law and regulations. This meant that law, regulation and other business rules should not be embedded in organizational structures, business processes or software code. The third requirement was that the enterprise architecture design should be generic. This meant that business processes are no longer designed in a manner that they are specific to one type of service request. Instead, they are standardized and uniform. Furthermore, information structures and information systems should also be standardized and uniform.

In January 2008, four month after the formal announcement of the project, the enterprise architecture design process started. The project included three design teams. One team described the existing enterprise architecture. Another team designed the new enterprise architecture. The third team introduced enterprise architecture management processes in the organization in order to be able to use, work with and enhance the enterprise architecture design that the second team designed. The existing enterprise architecture was described in the period between January and May 2008. The deliverable (Coenen and Oord 2008) with the existing enterprise architecture contained

a description of the ninety-two business processes, hundred information objects and more than hundred sixty applications. The introduction of the enterprise architecture management processes started in January 2008 and finished in December of that year (Tol and Uding 2008). In that period an enterprise architecture team, an architecture communication strategy, a governance model including work processes, an enterprise architecture method based on TOGAF, an enterprise architecture design language called ArchiMate and a repository to store the design were introduced. The second team, that had to design a new enterprise architecture, started in January 2008. The first final version of the new enterprise architecture design (Project team 2008 main document; Project team 2008 appendices) was delivered in November 2008. The models in the new enterprise architecture design were abstract and relatively global. Therefore, a detailed enterprise architecture design was necessary to bridge the gap between the abstract models and the detailed designs that were needed to build information systems. In March 2009 an new design project started to create a detailed design in addition to the final version of the new enterprise architecture. The project delivered the detailed design in March 2010.

## The enterprise architecture design

In paragraph 2.3 of this thesis a number of definitions of an enterprise architecture were discussed. According to the Open Groups definition, an enterprise architecture is composed of components, their structures, interrelationships, and principles to guide the design and evolution. This definition has been used in the SVB design. For that reason the new enterprise architecture design (Project team 2008) contains principles and models. The principles are:

1. Service delivery is integrated and based on life events.
2. The use of advanced electronic communications is maximized.
3. Applicative functionality is implemented once in the application architecture, and data are stored only once in the application architecture.
4. In the process design knowledge elements are identified and separated from the process flow elements. Consequences of this principle are that legislation or regulations are not embedded in IT systems, processes or data structures. This makes the design flexible and adaptable to changes. Furthermore, the absence of a software coding effort for the implementation of changes in legislation or regulation enables the business to be in control of the implementation without the intervention of the ICT department. Moreover, it reduces the dependence of the business on the ICT organization.
5. Application logic is separated from application data.
6. The organization structure is not embedded in processes or information systems.
7. Customer information is asked only once to a customer and are then re-used in all relevant services. Consequently, a customer will never be asked to

provide data that are already known to the organization or within the public domain.

8. There is one generic process design that can be used for automatic, semi-automatic and manual processing of work.

Besides these principles, the new enterprise architecture design comprises business, application and technical architecture models. Conforming to enterprise architecture practice (paragraph 2.3), those architecture models are organized in layers that are aligned to each other by means of business, application and technical services. The basic structure of the SVB's enterprise architecture design is presented in Figure 27.
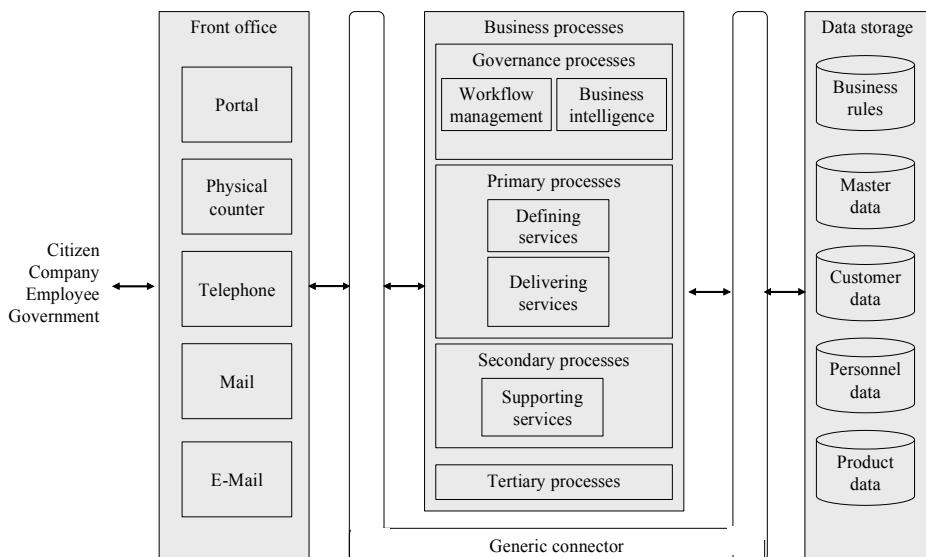
**Figure 27: Basic structure of the enterprise architecture design**

The business architecture layer contains, in accordance with TOGAF and ArchiMate, a business function model, business requirements, business services, an information object model, a process model and application services that serves as linking pins to application components in the application architecture layer. Principles and high level design requirements from the integrated business model are described in the introduction section of the enterprise architecture design document (Project team 2008 main document p. 15-18) and are used as explanations in the business architecture layer. The design was based on the Dutch reference architecture called NORA, which stands for Dutch governmental reference architecture and was described in paragraph 4.4. The structure of NORA is visible in the application architecture layer. The new enterprise architecture design meets the three basic conditions that were formulated at the start of the design: it is the translation of iBVM; it is independent of specific law; and is generic. Basic elements in the new enterprise architecture design are work flow management, a central administration for customers and clients and a dashboard with customer information. Research findings from internal research projects concerning

work flow management (Kievit 2008) and the centralization of customer data (Lesmeister, Meerens et al. 2008) were given consideration and were incorporated in the design.

## The new enterprise architecture detailed design

The detailed design of the enterprise architecture has been described in a conference paper (Coenen, Van Gils et al. 2010). Basic elements in the detailed design were: re-usable process components; business rule management; and a generic governance process. The basic structure of the detailed design is illustrated in Figure 28.
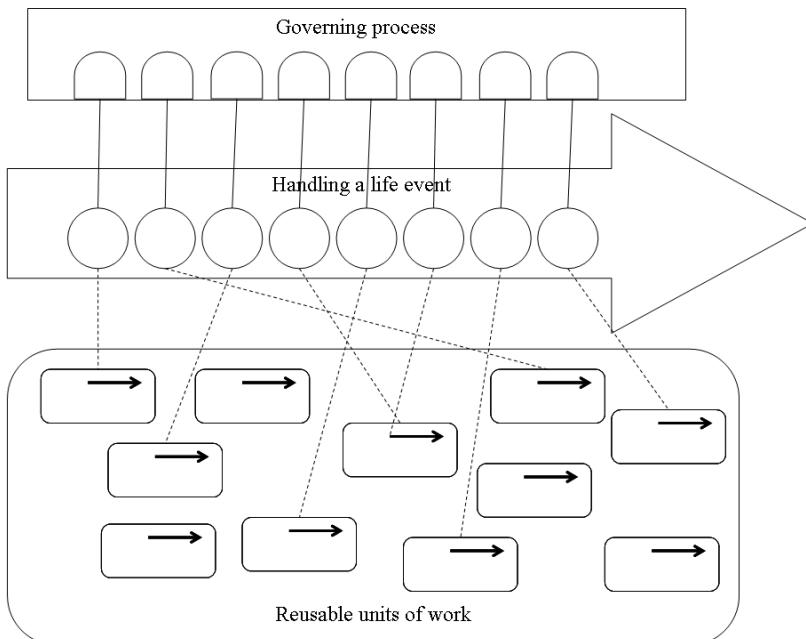


**Figure 28: Handling life events with re-usable components, adapted from Coenen, Van Gils et al. (2010)**

According to Coenen et al., the detailed enterprise architecture design consists of three basic concepts. The first concept is the life event of the customer which triggers the work for employees and management. The second concept is a general process execution and management model that provides the execution of the work, together with a governing process that directs the process. The third concept is a business rule concept that represents the desired or mandatory behaviour of the organization's members. Business rules can be regarded as knowledge elements that restrict or constrain relations between business objects. For example, the business rule that an employee can not get a state pension. According to Coenen, Van Gils et al., life events focus on a citizen's perspective and are used for identifying public services that are related to specific situations that citizens face, such as 'changing address'. A life event can trigger one or more public service requests that should be executed in an integrated manner. So for

example, with the life event 'changing address' as the trigger, a service delivery process changes the address of the customer in all products the customer has. In these service requests business rules are needed for decision making and governing the flow of the business processes. In the detailed design modelling, decision rules are not embedded in the process flow. They are designed separately and used in processes by means of knowledge services. Processes are modelled in the design using re-usable building blocks. These can be combined dynamically to handle any given life event. They are independent of each other and are recognizable as specific tasks for employees. Due to this dynamic process design a governing process has been included. That process is designed to orchestrate the order in which process steps are executed. Furthermore, it governs the proper execution of the integrated service delivery. It ensures that service delivery handles all services needed in the life event in a timely manner. Therefore, impact analysis of the life event in terms of the services that need to be delivered should be correct. Time constraints in service delivery are prescribed by law or the organization's service level agreements. In order to keep track of time the governing process exchanges status information with the building blocks or process steps it governs.

## 5.5    Social and cultural aspects in the design

**The consideration and incorporation of social aspects in the design**

In the literature review presented in chapter 2 Mumford (2006) was cited who argued that a socio-technical design should express three values: (1) rights and needs of employees get equal attention in the design compared to the attention that is given to the technical side of the organization in the design; (2) employees should be able to participate in and influence decisions that concern them; and (3) the importance of creating and developing knowledge and the importance of working in teams. The social context of the enterprise architecture design of the SVB was analysed in paragraph 5.3. In the framework, presented in paragraph 2.4, a number of social aspects were included that are relevant in socio-technical designs such as the responsibility employees have, the possibilities employees to vary in work, possibilities to make decisions, and possibilities for self-regulation. All the social aspects of that framework are given consideration and have been incorporated in iBVM. In iBVM team members are highly qualified, flexible, customer focused, have an overview of their work, manage their own workload, feel responsible for the team performance, work together, and support and coach each other. Furthermore, the employee is regarded as a highly educated and experienced professional who has the responsibility to organize and execute work according to his or her own understanding of the situation, organizational values, legislation and regulation. In this paragraph it is investigated whether these social aspects are present in the new enterprise architecture design.

An observation is that the new enterprise architecture design focuses on the technical side of the enterprise. This observation is based on the following findings: (1) the principles of the enterprise architecture design are only focussed on the functional

and technical aspects of iBVM; (2) the application layer is dominant in the design; (3) the social system and the employee perspective are absent in the design; and (4) there is no reference to aspects of the social system in the architecture layers.

Another observation is that social aspects of the new socio-technical system in iBVM, such as the responsibility of workers to make their own decisions and plan their work, the level of professionalism, and the higher level of education of workers are given consideration in the introduction section of the design document, but are not incorporated in the business, application and technical architecture layers, nor are they included in the principles. Furthermore, the new design describes perspectives of different stakeholders, such as customers and clients. Management has moreover argued that employees are essential stakeholders in the organization, especially in the integrated business model. However, there is no explicit employee or integrated team member perspective in the new enterprise architecture design. Furthermore, principles concerning the team member are not contained in the set of principles of the enterprise architecture design. The absence of an employee perspective that focuses exclusively on employees makes it difficult to determine how the aspects of the social system of iBVM have been incorporated into the design. Social aspects that are completely missing are for example that team members know their own talents and know when they need coaching and can give support. Again, team members organizing their own learning process is no part of the new enterprise architecture design. Furthermore, there is no reference to team leader roles like mentor on skills and knowledge. Requirements relating to recruitment and appointment of integrated service team members, work behaviour and rewarding are not incorporated in the new enterprise architecture design either.

The analysis shows also that only the social aspects of iBVM that can be translated into functional requirements, expressed by using a language such as ArchiMate, or can be modelled using enterprise architecture concepts have been incorporated into the design. Besides, the social elements that have been incorporated, are mostly included in the business architecture layer. Aspects that can not directly be translated into functionalities or applications, such as the feeling of responsibility, are given no consideration at all in design. Furthermore, there is no attention to how the application architecture supports the aspects of the social system that have been described in the integrated business model. Examples of these aspects are customer service skills, independence, professionalism, and decisiveness. Customer focus is considered, for example in the application component for the integrated customer view. That component delivers functionalities for easy access to and mutations of all customer data. It is unclear how important aspects of the social system, such as independence and decisiveness of employees, are incorporated in the design. There are no references to them in the application architecture layer.

An important conclusion that follows from the observations is that the absence of social aspects in the enterprise architecture design is not consistent with the importance assigned to them in the integrated business model, in the targets that were set by the Executive Board, and trends in society that were described in paragraph 4.3 and are also referred to in the 'Internetspiegel', an instrument produced by the Dutch government to measure employee satisfaction (TNS-NIPO 2009).

## The consideration and incorporation of cultural aspects in the design

In paragraph 2.2 it is illustrated that an architecture can be an instrument to strengthen a culture because an architecture can symbolically express cultural values and is concerned with practical requirements. The cultural context of the design in this case study consist of symbols that are used to illustrate the iBVM culture, the sets of norms and values that integrated service team members hold, the shared identity in the integrated teams and their core set of beliefs and assumptions about the new organization and its environment. In paragraph 5.3 the iBVM culture and other organizational cultural values were explored. They are presented in Table 5. In this paragraph it is explored how those cultural values have been considered and incorporated in the new enterprise architecture design.

A finding is that the new enterprise architecture design has been focused on the objective reality of the SVB that can be captured in business functions, business processes and applications. Another finding is that the cultural values that are presented in Table 5 have not been mentioned in the new enterprise architecture design. Furthermore, it has not been explained in the design documents how the different architecture layers have been aligned with the cultural values of iBVM. Furthermore, the word culture is not used at all in the new enterprise architecture design.

**From an organizational perspective**
1. Creating value for society
2. Being reliable
3. Being loyal
4. Being unquestioned in the implementation of social security
5. Being aware of developments in social security
6. Being an inspiration regarding social security
7. Having a people orientation
8. Being the best employer in public administration
9. Having a learning community
10. Being process-oriented
11. Delegating responsibilities
12. Having a family atmosphere where people dare to be themselves

**From an employee perspective**
1. Being cooperative
2. Being proud of performance
3. Being result-orientated
4. Being committed to social security in society
5. Being willing to grow
6. Taking on responsibility for ones own career
7. Having a willingness to adapt to changing circumstances
8. Being a professional

**Table 5: Cultural values of the design context**

These findings lead to the conclusion that the strengthening of the cultural values of iBVM by means of the enterprise architecture is not considered by the enterprise architects. It can also be concluded that the alignment of cultural values that are embedded in the enterprise architecture design with the culture that the new integrated business model expresses is not considered in the design. Another finding is that there is very little attention in the design to the necessary behaviour of employees and applications that are necessary to support the new culture values. Some cultural elements are given consideration in the introduction section of the design documents and in some descriptions of business functions in the business layer, but are not given any consideration in the other architecture layers. Therefore, another conclusion is that

only those cultural values that can be translated directly and unambiguously into functionalities were considered and incorporated in the design by the enterprise architects. The effect that a subset or the complete set of business functions and application services can have on the cultural values of the organization is not given consideration in the enterprise architecture design. These conclusions also apply to the detailed architectural design that was described in paragraph 5.4, because in it culture and cultural aspects have not been mentioned at all.

The incorporation of cultural values in the new enterprise architecture design can also be analysed using the theory of Lefebvre (Lefebvre 1991) that was presented in paragraph 2.2. From that theory the relation between the enterprise architecture, the organization and employees can be demonstrated. According to that theory, the information systems that employees use can be regarded as the 'physical space' of the new enterprise architecture. This space consists of systems such as work flow management and case management systems that can be seen as symbols of a factory where workers are subordinated to machines because they manage the work of employees and monitor the achievement of efficiency and production targets. No spaces for leisure, knowledge sharing and networking have been found in the enterprise architecture. These spaces could have been created through the incorporation of social media applications, or networking sites. Since formal models such as the abstract process and information models in which knowledge elements are separated from process flow elements are used in the design, it can create a highly rationalistic and bureaucratic mental image of the integrated business model because those models are highly ordered, rational, abstract, complex, and are hard to understand by employees in the operation (Coenen, Van Gils et al. 2010). Furthermore, there are no places in the enterprise architecture design that can be labelled as personal space.

The incorporation of the two different cultures labelled 'high tech' and 'high touch', into a single generic enterprise architecture design was complex because the selected packaged software products supported the 'high tech' culture and the 'high touch' culture required additional custom-build software which was not allowed in the company. This resulted in a dominant focus on the high tech culture which became visible in a demonstration which was held in February 2010. In the demonstration a proof of concept of the enterprise architecture was shown to a group of employees. In that demonstration software architects showed how the integrated service team concept was translated into an application architecture. The applications in that architecture planned and executed tasks, allocated tasks that could not be completed to employees, and managed the workload. The effect of that implementation was that integrated service team members could not organize the work themselves. The functionality demonstrated, and the role of the system in daily operations were not consistent with the role of employees that the integrated service team concept described. Employees that witnessed the demonstration were confused because management promoted a professional environment, the integrated business model illustrated a professional environment, but the supporting packaged software modules seemed to implement a non-professional environment. A senior information analyst summarized the general opinion of the employees that witnessed the demonstration as follows: it is confusing that management hires employees with higher education, so that they can take on the responsibility to work in a professional environment, and at the same time management

demonstrates a new information system in which highly educated employees are only allowed to perform predefined tasks that are assigned to them by the computer.

## The consideration and incorporation of temporal aspects in the design

The temporal aspects that are of central concern in this thesis were introduced in paragraph 2.4. The 'temporal aspects' in this case study are: the dynamic between purpose, structure, processes and culture in iBVM; the dependence of the new enterprise architecture design on the social and cultural aspects of iBVM; the influence the new enterprise architecture design has on the social aspects and cultural meaning that iBVM describes; the relation the enterprise architecture has with the growth and maturity aspects of iBVM; the relation that the new enterprise architecture has with the efficient, effective and innovative elements of iBVM.

The temporal aspects of the enterprise concerning the transformation of the business and supporting ICT systems described in paragraph 5.3 of this chapter indicate that the transformation towards integrated service teams should be in an incremental and organic manner. There should be a growth path for integrated service teams. The going concern should continue with as little disturbance as possible during the transformation, and the organization should grow organically, somewhat ahead of developments in society. Seen from the perspective of the new enterprise architecture design, the strategic target of the enterprise has been translated into a set of models and a set of principles, and the growth path has been translated into a migration plan (Van de Kraats and Hendrikse 2008). In the migration plan the primary focus was on the application architecture that supports elements of the operation such as business processes, data and applications. The migration plan did not focus on social and cultural aspects of the new enterprise architecture and their effects on the organization. Consequently, the alignment of the enterprise architecture with socio-technical elements and cultural values of the organization is not considered. Attention in the migration was on technology and operational efficiency. In the change programme this could most appeared because of the separation of the programme into a technical and business domain. Consequently, temporal aspects such as the dynamic between the purpose, structure, processes and culture of iBVM, the dependence of the enterprise architecture on the social and cultural environment of iBVM, and the influence of the enterprise architecture on social relationships and cultural meaning were not considered in the transformation. This was discussed in management meetings between business representatives and enterprise architects. The discussion focused on whether a professional 'High Touch' design could ever lead to the attainment of the 'High Tech' productivity and operational cost levels. The result of that discussion was that operational efficiency should be the primary aim in the transformation for all customer cases that could be processed completely by computer, such as monthly payments of state pension and automated prolongations of granted rights. For the other cases, the new enterprise architecture should support the employee, and the supporting ICT systems should not impose a solution on employees.

Another temporal aspect is the relationship between the enterprise architecture, the innovative service delivery design that iBVM describes, and the efficient, mature,

phase of the current service delivery design. The joint occurrence of these designs in the migration period meant that there were different types of service delivery tasks occurring simultaneously in the transition period: new, innovative, tasks that were related to life event processing, and straight through processing tasks that were related to law-oriented service delivery. Each type required its own form of organizations, control and execution. Despite these differences, the new enterprise architecture design had incorporated the different types into one enterprise architecture and one set of principles. This gave rise to various issues. One issue was that it was not possible to unambiguously combine a batch processing orientation for straight through processing, and a piece processing orientation for life event handling, in one enterprise architecture design. A batch such as the benefit payments for a certain month, can be processed as if it is a set of cases, but only at the cost of efficiency. Another issue was the co-existence of service delivery based on data mutations, and based on life events. A data mutation such as a change of address can be a result of a life event, and a life event can result in a number of data mutations. The compromise was that each data mutation had to be converted into a life event. An address change, for instance, was transformed into the life event 'divorce' when only one spouse's address changed. In order to cope with these differences a highly abstract process governance and process management model was created that used both data mutations and life events as triggering events to start process execution. According to Coenen et al. (2010), the consequence was that these highly abstract models are difficult for stakeholders to comprehend. This was an unwanted situation because employees have to understand the models in order to be able to translate them into daily work processes, management had to understand the management consequences of the models, the legal department had to establish the legal correctness of the models, and the ICT department had to translate them into application services.

The last temporal aspect in this analysis is the relation between the enterprise architecture design and the focus of iBVM. According to the four phase theory of Hardjono, an organization develops, in ideal conditions, in cycles. The application of that theory to the SVB case shows that the current efficient organization can be designed with a rationalist design method in which formal models can be used. The integrated business model is characterized by flexibility and creativity and can therefore not be designed by using a rationalist design approach because such a method assumes an ordered and objective world. The application of such a method for the new business model has led to a rationalist interpretation of iBVM and resulted in a design that fits well with the efficiency phase of the organization, but is less suitable for the innovation that the integrated business model introduces.

## 5.6   Concluding the case study

On the basis of the findings presented in this case study it must be concluded that the new enterprise architecture design is functional and rational. Social and cultural aspects of the integrated business model are hardly considered or incorporated in the design. The underlying assumption of the new enterprise architecture design appears to be that an organization is a bounded social system with specific structures and unified goals, which acts more of less rationally and coherently. This confirms to the traditional

bureaucratic perspective that enterprise architects have on organizations. Because the new enterprise architecture design has a focus on the ordered and objective reality of the integrated business model it seems that the design unconsciously and unintentionally emphasizes rationalist and bureaucratic values instead of the cultural and social values of professional workers that are emphasized in iBVM. The applied design method that was derived from the TOGAF framework, the architectural language ArchiMate and the reference architecture NORA converted the integrated business model with its explicit cultural and social aspects into a rational, efficient and bureaucratic enterprise architecture with a dominant focus on technology and efficiency.

The organization was aware of dependencies between the social and cultural aspects of the new business model and the enterprise architecture. For example, according to the results of the 'Ruim Baan voor het Service team' project, ('make way for the service team'), in March 2006 there was awareness in the organization of the number of social and cultural aspects of the organization that had be changed in order to align them with the behaviour and attitudes of employees that was needed to implement iBVM. The interactions between technical components of the SVB like information systems, and social components of it such as human resource management had been identified in that project as influencing factors on attitude and behaviour. Another example that demonstrates the awareness of management on the importance of giving consideration to and incorporating social and cultural aspects in the new enterprise architecture design are observations from Kievit and his research team (Kievit 2008). They examined the possible effects of work flow management on social and cultural aspects. For example, they observed that real-time and detailed monitoring functionalities of work flow management systems are not consistent with the professional culture of the integrated business model. They stressed that employees are professionals that need professional freedom and responsibility to act.

A reason why the awareness of management on the importance of considering and incorporating social and cultural aspects of the integrated business model in the enterprise architecture design was not reflected in the design can be found in the way the programme was set up. In the programme were the design and implementation of cultural and social aspects separately organized from the design and implementation of the new enterprise architecture. Management chose an organic design method with pilot implementations to design and implement the cultural and social aspects. The design approach they chose to design and implement the enterprise architecture was highly ordered and structured with fixed delivery dates and fixed cost schedules. The design and implementation of the social and cultural aspects of iBVM started in 2006 and the enterprise architecture design only in 2008. The enterprise architecture design had therefore to catch up with the other design process. The advantage was that the enterprise architecture design benefited from lessons learnt in the other design process. But disadvantages were that the enterprise architects were not aware of developments and dilemmas in the other design process. Moreover, the design team that focussed on social and cultural aspects had to wait until 2008 for decisions from the enterprise architecture design team. Consequently, they had to assume certain decisions regarding the enterprise architecture such as the availability of knowledge systems and the work flow management design. In an internal communication in February 2010 a senior business architect concluded that from the start of the programme the two parts of the

programme had not been connected with each other. Consequently, choices made in the sub-programme about the enterprise architecture design and implementation were predominantly driven by technology rather than by business. He feared that eventually those technological choices would prevail over the social and cultural aspects of the integrated business model.

A characteristic of the enterprise architecture design project was that it consisted of highly educated ICT architects, business architects and information architects educated in systems engineering, information systems design, information analysis, business process management or enterprise architecture. The designers therefore regarded the planning, structuring and controlling processes of the organization as key organizational processes to prevent the organization from becoming unstable, chaotic and unpredictable. This emphasis on planning, structure and control is visible in the new enterprise architecture. Especially with regard to work flow management, positioned as the centralized orchestrator of work. Furthermore, the architects strove for an organizational wide ontology and did not include processes for innovation, initiative and experimentation in the design.

The observation regarding the predominantly technological focus in the sub-programme dealing with the enterprise architecture can be explained in terms of the constructs, models and methods that were used in the design process. They all focussed on technical, programmable sides of organizations. The emphasis on bureaucratic principles in the design can be therefore explained in terms of the use of TOGAF, ArchiMate and NORA. These instruments all support a rationalist design approach. Consequently, the enterprise architects did not consider how the social system and culture influence the application layer of the enterprise architecture and vice versa. Business, application and technical services are used in the design to connect architecture layers with each other. The functionalities of these services are all focused on the efficient execution of business processes. The new enterprise architecture design, especially the application layer, focuses on standardization of business processes and tasks. Work allocation is performed by the centralized work flow management application component. This centralization and the dominant role of software in work flow management is not in accordance with the social and cultural aspects of the integrated business model such as the professional freedom employees have to organize, execute and inspect their work. Furthermore, the design restricts opportunities to implement the cultural value that management trusts employees in the work they do and the quality of work they deliver to customers.

The dilemma the Executive Board, directors and management faced regarding operational efficiency and the freedom of workers to organize, execute and inspect their activities is also a reason why social and cultural aspects are not incorporated in the design. The dilemma is that detailed work flow definitions and task specialization are considered to be necessary by management to obtain highly standardized, high volume and cost effective business processes, such as monthly prolongations of rights granted for child care benefits and state pensions. These business processes for example carry out millions of payments per month, each payment has to be made on time and in the right amount, and the legal basis for each payment has to be checked. The efficient execution of these processes is a core competence of the organization and they cover the majority of all the work the organization does. Consequently, highly detailed work flow

definitions and technology are needed in order to achieve the organization's productivity, reliability and financial targets which have been agreed with clients like national and local governments. However, the avoidance of task specialization in order to obtain a level of production flexibility and agility is a basic requirement in the integrated business model. The dilemma management faced was that the productivity and financial targets seem to be at odds with the efficiency and productivity levels that accompany the professional freedom, high customer service levels and flexibility that the integrated business model assumes. Due to that dilemma the new enterprise architecture design is ambiguous about the role and position of the employee in the design. In the business architecture layer and application layer task specialization is incorporated in the design, in order to reach the efficiency and productivity targets. In the business architecture layer it is argued that in certain cases, mainly the processing of life events, the employee needs freedom to plan and organize work in order to deliver high quality service delivery. However, in the application architecture the work flow management system has total control over all work processes. Consequently, service delivery that is based on life events is organized, planned by software and allocated to workers instead of the other way around. This design led to discussions in the design team. Enterprise architects argued that this design was the proper way to implement the integrated business model because it enabled the organization to achieve high productivity and low operating cost levels. They stated that efficiency can only be achieved by means of high computerized production planning and control. On the other hand, business representatives argued that employees themselves should have the responsibility to organize, plan and execute their work in an efficient and cost effective manner. This was the present situation in a number of branch offices. Management argued that the design should therefore accommodate the employee and not the other way around.

### Analysis of the propositions

In the literature review that was presented in chapter 2 and the first case study propositions were formulated about the way social and cultural aspects of organizations were deliberated upon and incorporated in enterprise architecture designs. These propositions have been tested in this case study. The results are presented below.

1. The proposition that the enterprise architecture discipline regards organizations as rational and programmable systems is supported in this case study. The new enterprise architecture design represents the integrated business model as a bounded social system with specific structures and unified goals that acts more of less rationally and more or less coherently. Consequently, the new enterprise architecture design presents models and principles in different layers that describe the rational, objective and consistent reality of the integrated business model.
2. This case study does not support the proposition that the enterprise architects recognize that the social, cultural and technical aspects of an organization should all receive equal consideration in a design. Only business architects and business representatives paid attention in the enterprise architecture design process to the

social and cultural aspects of iBVM. Furthermore, the policy to use packaged software made it difficult to address and implement social and cultural aspects, because the implementation of some social and cultural aspects, especially regarding work flow organization, needed custom-made software additions.

3. The proposition that constructs, models and methods in the enterprise architecture discipline do not support the incorporation of social and cultural aspects has not been refuted or confirmed by this case study. The reason is that some elements were described in natural language in the design, mainly in the introduction section of the design document and have been used as business requirements. However, there was no consistent use of these descriptions throughout the different architecture layers, models, and design principles.

4. The proposition that the enterprise architecture discipline focuses on the objective reality of organizations and that there is no attention on the creation of cultural meaning is supported by the findings in this case study. The enterprise architecture design is consistent with the rationalist view of organizations. In the enterprise architecture design cultural meaning is not considered. New cultural values of the integrated business model, especially those that could not be translated into functionalities, have not been considered a design parameter by the enterprise architects. Some cultural elements are mentioned in the design document, but are not explicitly used in models and principles.

5. The proposition that the consideration and incorporation of the element of time in enterprise architecture designs is problematic is supported by this case study. Time has been a complex phenomenon in the contents of the design and was a complicating factor in the alignment of the different design processes in the change programme.

6. The proposition that the absence of a single and clear definition of enterprise architecture hinders the formulation of a definition of the enterprise architect and results in an unclear status and role for enterprise architects within an organization is neither supported nor rejected in this case because the team of enterprise architects had just been installed in the case period.

7. The proposition that the separation of the design process into an organizational design process, that focuses on the social system and cultural aspects of an organization, and a design process that focuses on the enterprise architecture of an organization, leads to omissions of social, cultural, and temporal aspects in the enterprise architecture design is supported by the findings in this case.

8. The proposition that the combination of a professional 'high touch' business model that give a lot of responsibilities to employees, and an efficient 'high tech' business model with a high level of automated and pre-described work processes in one enterprise architecture creates ambiguities in the design and leads to mismatches between social and cultural aspects of a business model and those of the supporting enterprise architectures is supported in this case. In the new enterprise architecture design both the perspective on operational efficiency and the flexible and new professional organization are present. This was a cause of confusion in the design process between business management, employees and enterprise architects.

# 6  ENTERPRISE ARCHITECTURE PRACTITIONERS
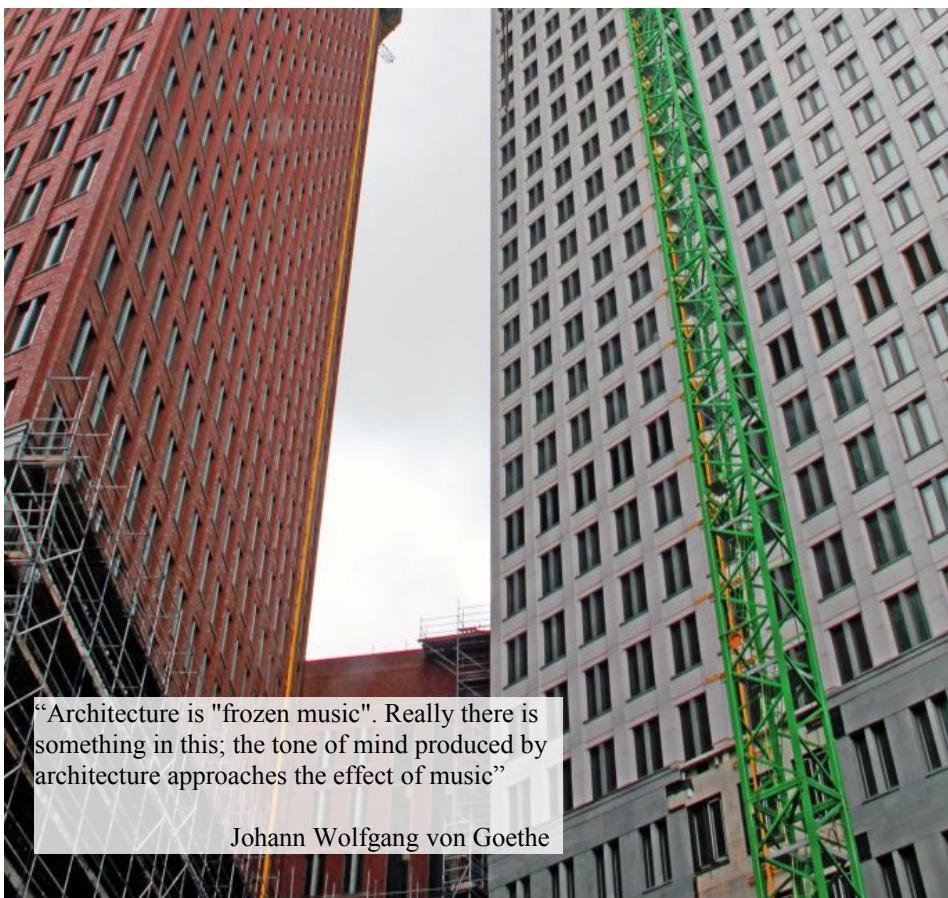
"Architecture is "frozen music". Really there is something in this; the tone of mind produced by architecture approaches the effect of music"

Johann Wolfgang von Goethe

## 6.1  Introduction

The enterprise architecture discipline regards organizations as rational, ordered, and programmable systems. This proposition was supported by the findings in the case studies. The case studies delivered also evidence against the proposition that the discipline acknowledges that social and cultural aspects of organizations should get equivalent attention as the technical side of organizations receives in design processes. The proposition that constructs and conceptual models in the enterprise architecture discipline are adequate to include social and cultural aspects of an organization was neither rejected nor has it been supported by the findings in the case studies. Culture was not considered to be a design parameter in both case studies. The findings in both case studies demonstrated also that the temporal aspects of organizations that are related to the social and cultural aspects of organizations are complicating factors in designs. They complicated both the design itself and the design process. The absence of a single and clear definition of what an enterprise architecture is hindered the formulation of a definition of enterprise architects and resulted an unclear status and role of them within the SVB organization, which was the second case study. Besides these propositions, two new propositions were formulated in the previous two chapters. The first one is that the division of a design into an organizational and an enterprise architecture design process leads to omissions of social and cultural aspects of organizations in designs. The other one is that different phases of an organization cannot be integrated into one enterprise architecture design.

In order to find more support for, or to be able to reject some or all of these research propositions, or to develop new ones, an expert panel has been organized and a survey has been conducted. This chapter describes the results of these research instruments and concludes with the consequences of their results for the propositions.

## 6.2  Practitioners on social and cultural aspects in designs

The purpose of the expert panel was to explore whether the findings of the case studies can be supported beyond the boundaries of the cases. The design of the expert panel was explained in paragraph 3.5. This paragraph presents the results of the expert panel.

### Social aspects of organizations in the design of enterprise architectures

The experts maintained that social aspects of organizations are important in enterprise architecture designs. Regarding the incorporation of the social aspects of organizations in designs, the experts agreed that an enterprise architecture design with its principles and models is not an object that stands apart from organizations. According to them, such a design can be considered as the memory of an organization regarding the way in which business is done. This memory can be perpetuated in graphical representations, principles and descriptions. An enterprise architecture design can also be regarded as a prediction of how business will be conducted in the future. According to the experts, an enterprise architecture design is most often related to the ICT domain of organizations despite that communication, people, the administrative organization, finances, information, law, infrastructure and housing are all important in designing enterprise

architectures. The incorporation of these aspects in a design is considered by the experts to be important because an enterprise architecture is an abstraction of all business operations and can be applied as a guiding instrument in organizational transformations. The experts maintained that after the completion of a design there should be an evaluation of the way the social aspects of an organization have been incorporated into a design, and how the design will influence the social side of an organization. The design should furthermore demonstrate its added value in business terminology and should accommodate the various perspectives that groups within the organization, such as business management or human resource management, have. The business value of a design can lie in the future, or can be a continuation of added value delivered to the business in the past. Furthermore, the models that are used in the design should be presented in a manner that business management uses daily, so that business management can comprehend how the design can influence the social aspects of business operations. Furthermore, the models should be situationally determined, should be fit for use in actual business issues, and should support several business scenarios that should contain models of the current business operation, the future operation, a possible migration path from the current to the future business operations, including impact analyses, and estimations of implementation costs.

The experts distinguished a number of organizational factors that influence which social aspects enterprise architects are able to consider in a design. Two such factors are the internal structure and the culture of an organization. The experts said that in organizations structured according to business functions, such as human resource management, finance, and ICT management, the consideration of social aspects in design processes is usually assigned to business managers and human resource specialists. These specialists have a tendency not to accept enterprise architects 'meddling' with social aspects of the organization such as the possibilities that employees get for self regulation. The experts experienced that attitudes of this kind towards enterprise architects appear to be even stronger when business management allocates the consideration of social aspects of the organization to the business domain and not to the ICT domain, which is the domain to which management generally allocates the enterprise architecture discipline. Another factor the experts singled out regarding the consideration of social aspects of an organization in enterprise architecture design processes is the attention that social aspects of the organization get at top management level. The experts argued that if the Board of Directors primarily focuses on business process efficiency, than they are likely to expect to find the same focus in enterprise architecture designs. Besides, the experts expected to find a relationship between the maturity of an organization in process management terms, for example the maturity levels in quality models such as EFQM, and the amount of consideration given to social aspects of an organization in designs. The experts suspected that if an organization had not reached a maturity level in which social aspects are explicitly considered, valued and managed in business operations, then the enterprise architecture design of such an organization would probably not include explicit references to social aspects such as possibilities employees get to create variety in their work. If enterprise architects do consider social aspects of an organization in a design whereas management of the organization is not ready to incorporate them in daily operations, then there will be a mismatch between the design and the organization.

The design will then probably not be accepted by business management. The experts argued that this mechanism can also be observed in outsourcing deals in which the initial focus is on planning, the business case, and contracting. Social aspects of the outsourcing are in such situations only considered after the conclusion of the contract, when the outsourcing process actually starts. The experts also regarded the type of business as making a difference in the consideration of social aspects of organizations in designs. Health care business for example, with its focus on delivery of care to patients, can have a different perspective on the consideration of social aspects in designs than the banking industry, which seems principally concerned with the efficient processing of financial transactions, or governmental organizations which focus primarily on the legally correct execution of decision processes. Another factor that can influence the possibilities that enterprise architects have to consider social aspects of an organization in their designs is that in the experts' experience the enterprise architecture discipline is perceived by business management as a technical and 'hard' discipline that delivers high level and abstract designs that are of use in the technical (ICT) domain. Furthermore, business managers expect that enterprise architects do not interfere with organizational transformation processes regarding the social aspects of the enterprise. The experts suggested that this attitude towards enterprise architects is prompted by their language and models, especially that of enterprise architects who have primarily been educated and experienced in the ICT domain and who tend to use models that originate from software engineering. Their models can be perceived by business managers as abstract and technical representations of the enterprise. Moreover, enterprise architects with technical education and experience tend to use a language with a strong technical and ICT connotation. The communication skills, competence and language that are taught to enterprise architects seem not suitable to support a proper dialogue with business management regarding the social system of an enterprise. It is therefore difficult for enterprise architects to talk effectively about social aspects of organizations. Furthermore, they tend to act as if they are truly objective observers of organizational reality. Consequently, management seem to perceive enterprise architects as having a one-track mind about organizational reality and as always wanting to carry their point. When enterprise architects join a management discussion, their behaviour tends to lead to a contest with business management about which of them has the correct view of organizational reality. Enterprise architects can therefore be regarded as unreceptive to the idea that there are more realities of organizational life, and as seldom receptive to the idea that an organization cannot be engineered. According to the experts, this attitude towards organizations diminishes possibilities for serious discussion with business management about social aspects of enterprises.

The experts suggested that enterprise architects should develop more political and organizational sensitivity, in order to be able to address the social aspects of an organization in design processes effectively. These competencies are necessary to gain acceptance as a partner of business management with regard to the social aspects of organizations. The experts recommended that enterprise architects should avoid the tendency to place themselves in a management position, because generally that is not the position enterprise architects in fact have within organizations. They should respect business management as the customer and user of enterprise architecture designs. Enterprise architects should see themselves more as advisers of organization members

on matters of enterprise architecture, and as technical experts on ICT topics. An advisory role can be appropriate for discussions with business management regarding the influences of enterprise architectures on the social system of organizations, and the ICT expert role can be suitable in organization back offices and technical domains regarding the effect of the enterprise architecture on the application of information technology in business processes. These different roles require of enterprise architects that they should be flexible and demonstrate an understanding of the coherence and integration of the social, cultural and technical aspects of organizations. Enterprise architects should accept management's perceptions of the enterprise architecture discipline, and should respond effectively to the subjective realities and perceptions of organization members.

The view of the expert panel was that enterprise architecture designs should always be valuable to the business, and that enterprise architects should demonstrate a thorough understanding of business operations. For instance, enterprise architects can add value when they consider trends in society that need to be incorporated in enterprise architecture designs. Furthermore, enterprise architects need organizational sensitivity to select and join relevant design discussions regarding the social aspects of an enterprise and enterprise architectures and should know when and how to focus on social aspects of organizations. They should avoid the use of technical models and abstract language in communicating with organization members about social aspects and should omit unnecessary complexity in discussions with business management concerning social aspects in relation to enterprise architectures. Moreover, an enterprise architecture design should be presented in a manner that is comprehensible and usable for business management in daily operations.

The panel discussion illustrated a general point that enterprise architects need a number of competencies if they are to take social aspects of organizations into consideration in their designs. The experts questioned whether it is possible for an enterprise architect to possess all the necessary competencies such as flexibility, communication, and consulting skills. They argued that it is not likely that an enterprise architect can be both management consultant and ICT architect, although competency profiles of business advisers and enterprise architects look similar. To overcome this, the experts suggested the creation of enterprise architecture design teams with both enterprise architects and business consultants so that the teams are able to communicate with business management and ICT management about the social aspects of organizations in relation to enterprise architectures. Furthermore, the experts stated that it is crucial to the acceptance of enterprise architecture designs within organizations that a design team has sponsorships on senior management or boardroom level. In addition to this, the team should also be positioned outside the ICT domain to avoid the perception of the discipline as technical ICT by members of the organization.

**Cultural aspects of organizations in the design of enterprise architectures**

According to the experts, adequate enterprise architectures for organizations cannot be created without considering cultural aspects of organizations. The experts argued that a fit is required between an enterprise architecture design and the organization's culture

for which the design is made. Cultural values of organizations should therefore be considered and incorporated in designs and enterprise architects should make clear in design processes what cultural aspects of an organization were taken into consideration in the design process and how those aspects are reflected upon in the enterprise architecture design.

The incorporation of cultural aspects of organizations in designs does not appear to be simple. Complicating elements are that it takes many years to change an organization's culture, and that it is not really sure which cultural changes will actually take place in those years. Therefore, it is not clear what cultural elements should be incorporated in a design because an enterprise architecture design is an abstract representation of the state of an organization that generally lays two or three years in the future. Another complication is the structure and management of organizations. As far as the structure of organizations is concerned, it is for example almost impossible to describe the culture of a federated organization because in such organizations there can be many cultures. For example, in a federated insurance company where different types of insurance are housed in various business units, there can be an entrepreneurial culture in the business unit for accident insurances, a culture of careful application of legislation in the business unit for health insurance, and a culture focused on transaction efficiency in the business unit that is responsible for the automated processing of claims and insurance prolongations. This example illustrates that certain organizational structures make it difficult to determine which cultural aspects should be incorporated in enterprise architecture designs. Another example of the same problematic arises in organizations such as hospitals in which different groups each can have its own culture. In a hospital there can be, from a management perspective, a culture to maximize productive time of resources such as medical staff, operating rooms, and equipment such as MRI scanners. At the same time, the workplace can have a culture of maximizing care for patients. It is difficult to determine for such an organization which cultural values should be incorporated in the enterprise architecture design. A third example arises in organizations with geographically dispersed independent offices such as Dutch traffic management in which each office can have its own culture. Traffic jams are basically a local problem, to be solved locally. This leads to cultural issues when reference architectures that can be implemented by standardized traffic control centres, are used to support local operations. The resulting cultural design issue is whether regional cultural differences should be ignored in order to get the necessary nation-wide standardization. Another complicating element to which the experts attributed significance was the origin of an organization. When an organization is the result of a merger of organizations with different cultures, which of the cultures should then be considered and incorporated into a design?

There are no straightforward answers to how a design should address such cultural issues. The experts also pointed to a number of issues regarding the incorporation of cultural values that result from the enterprise architecture discipline itself. They said that the discipline has the potential for enterprise architects to reflect culture values in enterprise architecture designs and cited explicit design choices that can reflect aspects of an organization's culture such as the decision to refer to packaged software in the application architecture layer of the enterprise architecture to emphasize the standardization aspect of a culture, or the choice to use company specific constructs

and models in the application layer that refer to custom-made software to emphasize the uniqueness of a culture, or to highlight the customer perspective in the application layer and to describe in that layer the use of multiple foreign languages on internet sites to emphasize the customer service aspect of a culture. Another issue that worried the experts was that cultural aspects are generally hard to translate in an application architecture and its elements such as application interfaces. This is especially true for cultural aspects that are intangible, such as values and beliefs.

An issue the experts noted was that the enterprise architecture often describes a future state of organizations. However, as was already stated, it is uncertain which cultural aspects will be present in a future state of an enterprise. In order to be able to create a design nevertheless, enterprise architects generally choose not to consider cultural aspects in a design. But eliminating cultural aspects can lead to misalignments between a design and the future state of an enterprise. This misalignment broadens because of the tendency of enterprise architects to present a single enterprise architecture design that includes the complete enterprise, even if the enterprise is composed of different organizations with (perhaps) different cultures. Designs that spread across several organizations are referred to by the experts as 'reference architectures', and generally do not include mention of cultural aspects, nor do they specify to which organizational culture such a reference architecture is particularly appropriate. It is not only private organizations that create reference architectures. They are also created on a national scale, for example the Dutch reference architecture 'NORA', which was described in paragraph 4.4. The conclusions of the first case study, described in paragraph 4.6, showed that Dutch reference architectures do not include references to cultural aspects of governmental organizations.

The experts were concerned about radical cultural effects that can be caused by enterprise architecture designs. For example, enterprise architects can discover in their design process that the design they are creating can only function in a culture that is fundamentally different from the actual one, or that a different kind of employee is needed, or that the operational costs can be reduced significantly by laying off staff. For example a professional culture that is confronted with an enterprise architecture design that is characterized by standardization, work flow management and close supervision as happened in the second case study that was described in the previous chapter. The experts argued that explaining to employees of possible effects of an enterprise architecture design on the culture of the organization should be the responsibility of business management and staff departments. It depends on the culture of an organization, such as the acceptance of enterprise architects by members of the organization on matters regarding the cultural aspects of the organization, whether enterprise architects are involved in the communication of cultural effects of the enterprise architecture design on the organization.

The experts stated that in a design process enterprise architects should comply with cultural decisions made by business management, and not the other way around. The experts argued that in design processes cultural aspects of an organization can be reflected in the way business management and enterprise architects behave towards each other and work together to create enterprise architecture designs. The experts referred to the level of acceptance of enterprise architects in the business domain regarding cultural aspects during the design process as a notable aspect of culture. They

saw culture in an organization as determining which cultural aspects an enterprise architect can or can not consider in a design process. A comparable contention was made in the previous discussion regarding the consideration of social aspects of organizations in designs. Furthermore, the experts contended that the consideration given in design processes to cultural aspects of organizations can be complicated when in a design team designers from different parts of an organization, who can come from different organizational cultures, are involved in a design process. This happened for example in a design process in a merged financial company when enterprise architects from an organizational culture of autonomy had to work together with designers from an organizational culture of collaboration. In that situation the enterprise architects were unable to make decisions about the level of autonomy that the design should support for workers of the merged firm. The experts thought that the maturity level of an organization in terms of the maturity levels of quality management models such as EFQM, can also influence which cultural aspects of an organization can be considered in design processes. They had experienced situations in design processes in which a Board of Directors did not grant enterprise architects to reflect on the cultural consequences that a design could have on the organization. The experts suggested also that the experience of enterprise architects in their field can also determine which cultural aspects are given consideration in design processes.

The experts regarded the consideration of cultural aspects in design processes as especially important because enterprise architecture designs can be used to support organizational transformations. A prerequisite for this is that there is an organizational culture in which enterprise architects are accepted and valued for their advisory skills in cultural matters of business. In such cases enterprise architects can support the cultural aspects of business transformations by means of designs in which cultural aspects are explicitly considered and incorporated. These designs can then be used to clarify to business management what cultural effects can occur as a result of management decisions such as the use of packaged software, work flow management systems, and tight production control systems to implement the application layer of the enterprise architecture in business operations. However, there may be departments within organizations that are well equipped to advise business management on cultural aspects of the organization in business transformation processes with the result that enterprise architects in these organizations are probably not invited for their advice on cultural matters of the transformation. Another aspect mentioned by the experts with regard to the ability to consider cultural aspects of the organization in design processes is the attitude of management regarding their influence on organizational culture. The experts had experience of management cultures in which management believed that a certain culture can be imposed on the organization, and acted accordingly. According to the experts, enterprise architects and their designs can also be of value in such a cultural environment by supporting management in the cultural change they seek.


**Temporal aspects of organizations in the design of enterprise architectures**

According to the experts, the organizational aspects of time that are related to the social and cultural aspects of organizations, such as the dynamic between purpose, structure,

processes, and culture of organizations, should be an integral part of enterprise architecture designs. The experts view was also that it is important that enterprise architecture designs are relatively stable because they can be used as guiding instruments in planned transformation processes of organizations. It may therefore be appropriate in a design process to design exactly the presumed future state of an organization. Such a design can be referred to as 'the dot on the horizon', or as 'the strategic enterprise architecture design'. The panel regarded such a design as assuming an exact and predictable future state of an organization. Its virtue is that is stands above the current fads and fancies of public opinion. If a future state of an organization is highly uncertain, then it should be better that a design remains at bit vague. Such a design can be referred to as 'the blur on the horizon' and can be appropriate when it is impossible, or undesirable, to create an exact design of the future state of an organization. A vague design can be appropriate in situations when many internal and external changes are happening in and around the organization. For example, ICT suppliers may not disclose (or know) how their products are likely to evolve in two to three years time. According to the experts, enterprise architects can also include only the stable parts of an enterprise in an enterprise architecture design when there are numerous uncertainties and changes in the organization. The resulting designs often contain only the relatively stable elements such as principles, business processes and technical infrastructures. These designs can be referred to as 'focussed designs'. So called 'project start architectures' can be created to describe only the part of the enterprise that is under reconstruction. Usually a project start architecture design has the same life-span as the project it is created for.

The experts argued that temporal aspects of organizations can influence design processes frequently because of the co-existence in organizations of design, implementation and change processes. The seriousness of this issue depends on the characteristics and elements of the involved enterprise architecture. For example, the panel members experienced that it will take much more time and effort to simultaneous design, implement, and change elements of an enterprise architecture that was implemented by means of an organization-wide ERP system such as SAP, or to simultaneous design, implement, and change the implementation of the technical architecture layer of an enterprise architecture such as a company-wide wireless computer network, than it will take to simultaneous design, implement, and implement an isolated element of an application architecture layer such as a stand-alone application. The previous mentioned exact design will prompt a lot of change requests in those situations. Enterprise architects can try to resolve all change requests. However, as the experts experienced in practice, that is very difficult to achieve, especially in an organizational context where every change has to be approved by a number of people in different management layers of the organization. This is not a desirable situation because from a business perspective the enterprise architecture design should support business transformation processes and should not be a hindrance. That is a reason why enterprise architects seem to prefer to be less precise in a design and may be reluctant to include temporal aspects in it.

The experts pointed out that dynamics in organizational change processes are seldom in sink with enterprise architecture design processes. In their experience it was almost impossible to respond to and align with all different organizational processes in a

design process. For example, within governments a policy preparation process can take almost a year. After the completion of that process, a policy formulation process can take up to two or three years to formulate a policy. After that a policy implementation process can take almost ten years to implement a policy in daily operations. Enterprise architects are frequently expected by management of public organizations to start an enterprise architecture design process within one year after the completion of the policy preparation process although the outcomes of policy formulation process are needed to design the enterprise architecture. A consequence is that the design probably has to be changed frequently. The experts contended that in private organizations business changes can occur on a weekly basis, especially when preparations for a merger or acquisition take place. It is not always possible to predict when business changes are likely to occur. In federated organizations it seemed particularly difficult to know when and how business changes occur. Enterprise architects can seldom influence the business change agenda, especially when business management believes that the business change agenda belongs exclusively to its own domain and does not allow the enterprise architects access to discussions concerning business changes. The experience of the experts convinced them that business management generally does not involve enterprise architects in these discussions, because they seem to expect that enterprise architects concentrate primary on the technical aspects of business transformations. The enterprise architecture design processes should therefore be very flexible. This can be accomplished for instance by using different design processes that each create specific enterprise architecture designs, each with a different time frame, for an organization. These different design processes can also be appropriate in situations where a lot of uncertainties exists and changes occur in an organization. One of those design processes can create an enterprise architecture design that describes the desired future state of an organization in about two to three years at the enterprise level. This design should be quite stable. One of the design types that were distinguished earlier such as the exact design, the vague design, or the focussed design that only focuses on stable parts of the enterprise, can all be created in such a design process. The experts noted that there is a risk of rejection of the enterprise architecture by business management if the time-period business management focuses on differs from the time-period that is covered in a design. Another issue they raised regarding the transformation processes of organizations was that designs tend not to incorporate the natural growth-path that organizations goes through. The experts argued that an enterprise architect can publish each year a new version of the enterprise architecture of the organization to overcome that issue. At the beginning of each year a version can be created that represents the state of the organization at the end of that year. Another important organizational process related to enterprise architecture design processes is the budget allocation process. That process can allocate each year, or in another frequency, a certain portion of the budget to the design of an enterprise architecture. That process is generally beyond the influence and control of enterprise architects. The design process of an enterprise architecture seldom follows the same process cycle as the budget allocation process. Consequently, it can be complicated to synchronize the allocated budgets with necessary design budgets. To overcome this, the design process can be adjusted to the budget allocation process by dividing the enterprise architecture design process into smaller designs that are aligned with the budget allocation process. Furthermore,

enterprise architects and business management together can create a long-term planning, a release calendar and multi-annual budgets to overcome a mismatch between budget and design cycles.


## Summary of findings

One of the findings from the expert group sessions is that the experts acknowledged that social, cultural and the temporal aspects of organizations are important and should be considered in design processes and incorporated in enterprise architecture designs. However, given the findings in the expert panel sessions a number of factors can be identified that prevent enterprise architects from incorporating social, cultural and temporal aspects of organizations into their designs. These factors seem to apply to all social and cultural aspects of organizations that are of central concern in this thesis. They can be grouped into *organizational* factors, and factors directly related to the *enterprise architecture discipline*.

Of the *organizational* factors that influence the consideration and incorporation of social and cultural aspects of organizations in designs, the first is the attitude of business management towards the social and cultural side of the organization. The second factor is the knowledge and experience of members of the organization on social and cultural matters. The third factor is the maturity level of the organization. The internal structure of the organization, especially the division of the organization into a business domain and a technical (ICT) domain and the status and position of enterprise architecture within one of those domains is a fourth factor. The fifth is the culture of the organization, especially the acceptance of enterprise architects in the business domain regarding social and cultural aspects of the organization.

The first factor related to the *enterprise architectural discipline* that influences the consideration and incorporation of social and cultural aspects of organizations in designs is the methods and instruments that enterprise architects have at their disposal, especially the limited number of constructs, models and design methods that can be applied to incorporate social and cultural aspects of organizations. The second factor is the education that enterprise architects have received, and especially the minimal attention in enterprise architecture education to social and cultural aspects of organizations. The third factor is the enterprise architects' business experience in social and cultural affairs of the organization. The fourth factor is the personality of enterprise architects. The definition of what an enterprise architecture is and which aspects of an organization are included in it is the fifth factor.

Another finding based on the outcomes of this expert panel is that enterprise architects struggle in organizations with relational, process and content issues. The relational difficulties are the relations that enterprise architects want to have and can have with organization members in the business and ICT domain. The process difficulty concerns the role and position that enterprise architects have in design processes, business operations and business transformation processes regarding social and cultural aspects of organizations. This issue arises from the misconception of the role enterprise architects expect to have, and the role that has actually been assigned to them by business management with regard to the social and cultural aspects. The content

problem concerns the scope of the work that enterprise architects perform, and the value that their work adds to the performance of the organization. This issue arises from the fact that, on the one hand, enterprise architects consider the whole enterprise including social and cultural aspects as their domain whereas on the other hand business management regards only ICT matters as the domain of enterprise architects.

A reason for these issues is that there are many competencies and there is a lot of knowledge that an enterprise architect should have mastered in order to be accepted fully and valued in business domains regarding social and cultural aspects of organizations as well as in ICT domains regarding technical elements of organizations. The goal for an enterprise architect should therefore be to have as many competencies as possible. However, it is thought impossible for one person to master all the necessary competencies and knowledge. Therefore, teams of enterprise architects seem to be needed so that all necessary competencies and knowledge are present in one organizational unit.

A finding concerning the influence of temporal aspects such as the dynamic between purpose, structure, processes, and cultures of organizations on enterprise architecture designs and vice versa is that the designs can be applied in organizations as a guiding and steering instrument in business transformations. Prerequisites for this are that enterprise architecture designs are accepted by business management as such instruments, are understood by business management, and are the result of a joint effort between architects and other members of the organization. Also the pace at which designs are delivered to the organization should be attuned to the pace of business changes. Enterprise architecture designs should describe the combined future state of the business and the ICT domain, and they must be both adaptable to changes and stable enough to be able to be used as a guide. For these reasons three design types and three life spans in designs are distinguished to accomplish this: (1) *the exact design* that designs the exact future state of an enterprise; (2) *the vague design* in which some contours of the future state of an enterprise are sketched; and (3) *the focused design* which focuses only on the stable elements of an enterprise. Furthermore, there can be three kind of life-spans in the designs: (1) *long term*, generally two or three years.; (2) *mid range*, generally one to two years; and (3) *short term*, which is generally shorter than a year. Designs with long term life-span are generally referred to as 'strategic enterprise architecture' or 'reference architecture'. Designs with the mid range life-span are generally referred to as 'releases' of an enterprise architecture. Short term designs are generally referred to as 'project start architecture'. The designs types and the life spans can be combined into one design to create designs such as 'an exact long term design', or 'a mid range focussed design'.

Another finding regarding temporal aspects of organizations in relation to enterprise architectures such as the alignment of designs with the phase or focus of an organization is the alignment of organizational processes such as budgeting with enterprise architecture design processes. It is considered almost impossible to take into account all the different business processes in design processes. The creation of several designs described above such as strategic enterprise architectures and releases of enterprise architectures, each with a different life span, can reduce this problem, but can not overcome it.

The final finding based on the results from this expert panel is that the topics described, the issues, and the responses to those issues do not seem to be restricted to a specific industry or sector. They seem to appear in public and private organizations.


### An analysis of the propositions after the expert consultation

The proposition that the enterprise architecture discipline regards organizations as rational, programmable, systems was supported by the results of the case studies. This proposition was discussed in the expert panel. It was acknowledged that enterprise architects have a strong rationalist and engineering view on organizations.

The panel discussed the proposition that conceptual models in enterprise architecture frameworks do not support the incorporation of social and cultural elements of organizations that can not be described formally. The discussion focused on reference architectures and it demonstrated that in governmental reference architectures the selected cultural and social aspects of public organizations that are the focus of this thesis are not considered and incorporated in those designs. It was uncertain whether this was the result of inadequate constructs and models, or followed from the first proposition that states that enterprise architects have a rationalist perspective on organizations. This proposition is therefore not rejected, nor accepted.

The proposition that the enterprise architecture discipline acknowledges that social and cultural aspects should get equal attention in their designs as compared to the attention that is given to the technical side of organizations is rejected on the basis of the findings from the expert panel which demonstrate that it is difficult to consider and incorporate social and cultural aspects of organizations in enterprise architecture designs. These findings led to two new propositions: (1) the behaviour and attitudes of business people towards enterprise architects limit the latter's ability to consider and incorporate social and cultural aspects of the organization in a design; (2) the education of enterprise architects and their experience in 'hard' technical disciplines such as ICT restrict their abilities to consider and incorporate social and cultural aspects of organizations in their designs.

The findings of the expert panel support the proposition that time is a complicating factor in enterprise architecture designs and design processes. The experts focused their discussion on the organizational dynamics within and surrounding the design process. The application of different designs with different life-spans have been suggested by them to deal with this issue although they acknowledged that these suggestions can not solve the problem completely.

The proposition that emerged in the first case study regarding the division of the design process into an organizational and an enterprise architecture design process also appeared during the panel discussions. These focused on the division of an organization into a business domain and an ICT domain, and the position of enterprise architects in those domains. The experts remarked that the position of enterprise architects in ICT domains limits their opportunities of discussing social and cultural aspects of organizations with business management. Furthermore, the experts contended that enterprise architects are searching for their status and position within organizations regarding social and cultural matters of business operations. Those findings are

consistent with the proposition that the unclear position of enterprise architects in organizations makes it unclear what kind of aspects enterprise architects can consider and incorporate in their designs.

The proposition that different phases of an organization cannot be incorporated in a single enterprise architecture design appeared during the discussion of situations in which a vague design type is more appropriate than an exact type of design. Therefore, the findings of the expert panel thus demonstrated the existence of the issue. The experts proposed a design method in which a vague design is created for the long-term state of organizations, and more specific designs are created for the mid-term and short-term state.

The findings of the expert session also illustrated that the discussed issues, problems and responses are not restricted to a particular industry or sector. They were present in the public and private organizations that were represented in the expert panel.

## 6.3   A survey on social and cultural aspects in designs

### Survey design

The social and cultural aspects of organizations that are studied in this research were described in the literature review that was presented in chapter 2. In that chapter literature was cited that demonstrates how social and cultural context of organizations can be considered and incorporated in designs. In order to gain insight in the generalizability of the results of the two cases a descriptive survey has been included in the research besides an expert panel that was described in the previous paragraph. The survey design was explained in paragraph 3.5, which included also the illustration of the survey structure (Figure 18). This paragraph presents the results of the survey. Tables are used to illustrate the results of statistical tests. When there are shaded cells in a table, then they are the median of the responses.

### Characteristics of respondents

An availability sampling technique has been used. It was explained in paragraph 3.5 that a drawback of this approach is that representativeness of the responses is limited to that portion of the population of enterprise architects that has the same characteristics as the respondents. For that reason the characteristics of the group are presented here.

With respect to gender it is found that 8.4% of the respondents were female and 91.6% were male. This distribution is consistent with the distribution of man versus women on the LinkedIn groups that have been used for this survey. However, according to different reports, women in science and technology comprise about 29% of the workforce (Misa 2010). Valgaeren found a percentage of 14%. (Valgaeren 2007) Consequently, the group of respondents in this survey has a different gender mix than would be predicted on the basis of the percentage of women working in science and technology. It means that men and male perspectives on the topics presented in the

survey are over-represented in the responses. As regards age, the distribution of age in the population has a normal distribution curve. The survey was accessible for Dutch and international enterprise architects because the survey was distributed via online LinkedIn groups, and additional effort was put into approaching Dutch enterprise architects. This led to responses from all over the world. It was expected, due to the extra effort to reach Dutch enterprise architects, that the response from Dutch enterprise architects was higher than the response from other countries. In total 74% of the respondents were Dutch. The group of respondents has a high level of education, 64.2% of the respondents have a first stage tertiary education, 23.6% a second stage tertiary education, 4.1% had only upper secondary education and 4.7% had post-secondary non-tertiary education. These characteristics are consistent with a research done by UNESCO researchers. They report that ICT sector employees tended to have an above-average level of education (UNESCO 2011). Respondents worked in private, public sectors and non-profit sectors: 54.7% worked in the private sector, 33.8% in the public sector, 5.4% in the non-profit sector, and 3.4% indicated 'other'. This response distribution across sectors has been reported by Foorthuis, Van Steenbergen et al. (2010) who found that their distribution resembles the distribution found by Obitz and Babu in 2009 (2009) and that found by Bucher et al in 2006 (2006). Another characteristic of the group is the distribution in terms of years of experience: 39.2% of the respondents had five years of experience or less, 38.5% had between six and ten years of experience, and 20.9% had more than eleven years of experience. These values are consistent with a UNESCO report from 2011, which found that ICT sector employees tend to be younger than employees in other sectors (UNESCO 2011). The last characteristic of the group is the role that respondents had in design projects. The roles of the respondents are reported in Table 6. The response 'no value' to a role can mean that the question has not been answered by the respondent, or can mean that the respondent had 'never' performed that role. The last row of the table contains the sum of the responses 'Half the time', 'Usually' and 'Always' and is added to investigate the distribution of roles within the response group. The results demonstrate that the 'other' role has a relative high percentage. About one third of the respondents indicated that they performed this role at least half the time. Analysis of this response revealed that only four respondents indicated that the other role was the only role that the respondent had in design projects. In all other cases it was one of the roles they had in design projects. There is a relatively high number of 'no responses' in the first row of the table. It is higher than the 'no response' rate in the other questions of the survey, where it was 0.7% and once 1.4%. Analysis of the ´no response´ per respondent in this question demonstrated that respondents ticked 'other roles'. Probably they interpreted a no response as 'never', even though 'never' was a possible option. Another explanation is that these respondents did not recognize any role. However, this explanation is less likely because the names of the roles are standardized by the Open Group and this is an organization known to enterprise architects.

| Percentage | H1: Chief architect | H2: Business architect | H3: Systems architect | H4: Data architect | H5: Infrastructure architect | H6: Security architect | H7: Architect consultant | H8: Technical writer | H9: Other |
|---|---|---|---|---|---|---|---|---|---|
| No Response | 9.6 | 4.8 | 7.5 | 9.6 | 11.6 | 13.0 | 8.2 | 15.1 | 34.2 |
| Never | 24.7 | 11.0 | 11.0 | 15.8 | 32.2 | 32.2 | 15.1 | 54.1 | 19.2 |
| Seldom | 15.1 | 21.2 | 25.3 | 35.6 | 20.5 | 32.9 | 12.3 | 15.8 | 14.4 |
| Half the time | 17.1 | 21.9 | 18.5 | 21.2 | 11.0 | 10.3 | 13.7 | 8.9 | 17.1 |
| Usually | 25.3 | 31.5 | 30.1 | 14.4 | 18.5 | 8.9 | 38.4 | 4.8 | 4.8 |
| Always | 8.2 | 9.6 | 7.5 | 3.4 | 6.2 | 2.7 | 12.3 | 1.4 | 10.3 |
| At least half the time | 50.6 | 63 | 56.1 | 39 | 35.7 | 21.9 | 64.7 | 15.1 | 32.2 |

**Table 6: Roles of respondents**

## Elements that are included in enterprise architecture designs

'How often do you incorporate design principles, business requirements, business process models, business information models, application models, technical models, the organizational structure, the social system and the culture of an organization in the enterprise architecture design?' The answer to this question was derived from the first question category in the survey. There were 147 respondent that answered these questions. All responses were statistically significant and are presented in Table 7.

| Percentage | A1: Design principles | A2: Business requirements | A3: Business process models | A4: Business information models | A5: Application models | A6: Technical models | A7: The organizational structure | A8: The social system | A9: The culture |
|---|---|---|---|---|---|---|---|---|---|
| No response | 0 | 0.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Never | 0.7 | 2.1 | 2.1 | 3.4 | 0.7 | 6.2 | 5.5 | 36.7 | 46.3 |
| Seldom | 10.9 | 4.8 | 8.2 | 12.9 | 12.2 | 21.9 | 21.2 | 37.4 | 29.3 |
| Half the time | 10.9 | 7.5 | 16.4 | 19.7 | 19.7 | 23.3 | 24.7 | 14.3 | 10.2 |
| Usually | 41.5 | 33.6 | 43.2 | 37.4 | 41.5 | 30.8 | 34.2 | 8.2 | 10.2 |
| Always | 36.1 | 51.4 | 30.1 | 26.5 | 25.9 | 17.8 | 14.4 | 3.4 | 4.1 |
| Chi-square | 92.6 | 137.9 | 81.1 | 49.4 | 68.3 | 24.0 | 34.2 | 75.8 | 89.7 |
| Asymp. Sig. | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |

**Table 7: Elements included in enterprise architecture designs**

The analysis of the Chi-Square values demonstrates that the respondents were very clear about the incorporation of business requirements in an enterprise architecture design. Business requirements, principles, business process models, business information models and application models were all regarded as very important in designs. However, responses demonstrate that the social system and the culture of an organization were seldom incorporated into an enterprise architecture design: more than 70% of the respondents seldom or never incorporated the social structure, more than 75% of the respondents seldom or never incorporated the culture of the organization into a design, and less than 5% always incorporated those elements.

### Social aspects that are important in enterprise architecture designs

'How important is it for you that social aspects of an organization are incorporated in the enterprise architecture design?' The answer to this question was derived from the second question category. This question has been answered by 147 respondents. Responses to questions B6 and B7 are not statistically significant; those to the other questions are. The responses are presented in Table 8.

| Percentage | B1: Roles of employees | B2: Variety in their work | B3: Decisions employees can call their own | B4: Possibilities for self determination | B5: Possibilities for self regulation | B6: Feeling of achievement | B7: Feeling of recognition |
|---|---|---|---|---|---|---|---|
| No response | 0 | 0 | 0 | 0 | 0.7 | 0 | 0.7 |
| Unimportant | 2.0 | 15.6 | 7.5 | 8.2 | 8.8 | 19.7 | 20.4 |
| Of little importance | 4.1 | 27.9 | 12.9 | 15.0 | 16.3 | 24.5 | 21.1 |
| Moderately important | 12.9 | 25.2 | 27.9 | 27.2 | 33.3 | 19.7 | 19.7 |
| Important | 51.7 | 27.2 | 40.1 | 38.8 | 32.0 | 23.1 | 20.4 |
| Very important | 29.3 | 4.1 | 11.6 | 10.9 | 8.8 | 12.9 | 17.7 |
| Chi-Square | 126.2 | 30.4 | 54.8 | 48.0 | 43.2 | 5.9 | 0.507 |
| Asymp. Sig | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.207 | 0.973 |

**Table 8: Social aspects that are important in enterprise architecture designs**

The Chi-Square values of the responses demonstrate that the respondents considered it important that roles of employees should be incorporated in enterprise architecture designs: more than 81% percent of the respondents considered it 'important' or 'very important'. This high percentage can be explained by the fact that business process models that are applied by enterprise architects in their designs require and incorporate role specifications of employees. About 50% of the respondents thought it 'important' or 'very important' to incorporate elements concerning decision making for employees and possibilities for employees to control their own work. About 40% of the respondents regarded it as of little importance or unimportant to incorporate variety of

work for employees into a design. The questions regarding feelings of achievement and feelings of recognition of employees are not statistically significant. The responses to those questions are spread almost evenly over the categories. This spread can be explained from the fact that 'feelings' are hard to describe in enterprise architecture languages, nor are they easily translated into models. This shortcoming in the enterprise architecture lexicon was reported in the literature review (chapter 2) of this thesis. Another finding is that respondents felt it important to incorporate 'decisions employees can call their own' and 'possibilities for self determination' into their designs.

### Cultural elements that are important in enterprise architecture designs

'How important is it for you that cultural elements of organizations are incorporated in enterprise architecture designs?' The responses to this question are found in the third question category. This question has been answered by 147 respondents. All responses are statistically significant. The responses are presented in Table 9.

| Percentage | C1: symbols | C2: norms and values | C3: shared identity | C4: core set of beliefs and assumptions |
|---|---|---|---|---|
| No response | 0 | 0 | 1.4 | 0 |
| Unimportant | 9.5 | 6.1 | 9.5 | 8.2 |
| Of little importance | 25.9 | 14.3 | 21.1 | 17.0 |
| Moderately important | 22.4 | 21.8 | 25.9 | 25.2 |
| Important | 34.0 | 44.2 | 29.3 | 31.3 |
| Very important | 8.2 | 13.6 | 12.9 | 18.4 |
| Chi-Square | 35.8 | 62.9 | 20.9 | 22.5 |
| Asymp. Sig | <0.05 | <0.05 | <0.05 | <0.05 |

**Table 9: Cultural elements in enterprise architecture designs**

At least 40% of the respondents regarded it at least 'important' to incorporate the cultural elements of organizations in their designs. Of these cultural aspects 'symbolism' and 'shared identity' received the least attention in designs, although they were considered moderately important. 'Norms and values' received most attention in enterprise architecture designs: they were considered as at least 'important' by 57.8% of the respondents.

### Aspects of time that are important in enterprise architecture designs

'How important is it for you that aspects of time of an organization are incorporated in enterprise architecture designs?' The answer to this question was derived from the responses of the fourth question category. This question was answered by 147 respondents. All responses in this category of questions are statistically significant and are presented in Table 10. A number of findings stand out. First, the high value of the

Chi-Square test demonstrates that 82.3% of the respondents find it at least 'important' to align the design with the focus of the organization. Furthermore, the phase of the organization was considered 'important' in enterprise architecture designs. About one third of the respondents found it 'moderately important' to include the dependence between a design and the social and cultural environment of an organization (36.1%) and the influence of a design on social and cultural meaning (29.9%). Almost half the respondents (48.3%) found it important to include the dynamic between purpose, structure, processes and culture of an organization in a design. This latter finding is consistent with the finding in the literature review of this thesis (chapter 2) about the enterprise architecture discipline which illustrated that purpose, structure and business processes are considered by enterprise architects as elementary elements of organizations in their designs.

| Percentage | D1: the dynamic between purpose, structure, processes, culture | D2: the dependence between social and cultural environment | D3: influence on social and cultural meaning | D4: relation with the phase of the organization | D5: the relation with the focus of the organization |
|---|---|---|---|---|---|
| No response | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 |
| Unimportant | 4.8 | 11.6 | 15.0 | 4.1 | 0.7 |
| Of little importance | 14.3 | 24.5 | 30.6 | 9.5 | 6.1 |
| Moderately important | 15.0 | 36.1 | 29.9 | 25.2 | 10.9 |
| Important | 48.3 | 21.8 | 17.0 | 44.2 | 49.0 |
| Very important | 17.7 | 6.1 | 6.8 | 17.0 | 33.3 |
| Chi-Square | 80.6 | 40.0 | 31.1 | 72.4 | 122.5 |
| Asymp. Sig | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |

**Table 10: Temporal aspects in enterprise architecture designs**

### Basic assumptions and beliefs

'What are basic assumptions and beliefs of enterprise architects?' The answer to this question was derived from the responses on the fourth question category. This question has been answered by 147 respondents. All responses in this question category are statistically significant and are presented in Table 11.

| Percentage | E1: An enterprise architecture design describes the functional reality of organizations | E2: An enterprise architecture design can be "found" only by those with the proper observing skills, tools and methodologies | E3: An enterprise architecture design can represent intuition, informality and disorder | E4: An enterprise architecture design only makes sense in organizations that are stable. | E5: A single enterprise architecture design can represent both production and innovation processes of an organization | E6: An enterprise architecture is a timeless representation of the vision of the enterprise |
|---|---|---|---|---|---|---|
| No response | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 0.7 |
| Strongly disagree | 1.4 | 8.2 | 4.8 | 37.4 | 1.4 | 18.4 |
| Disagree | 9.5 | 25.2 | 27.2 | 52.4 | 10.9 | 46.9 |
| Undecided | 12.9 | 21.8 | 24.5 | 4.8 | 11.6 | 8.8 |
| Agree | 60.5 | 34.0 | 38.1 | 3.4 | 55.8 | 18.4 |
| Strongly agree | 15.6 | 10.9 | 5.4 | 1.4 | 20.4 | 6.8 |
| Chi-Square | 159.5 | 33.0 | 62.0 | 163.3 | 131.0 | 76.2 |
| Asymp. Sig. | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |

**Table 11: Basic assumptions and beliefs**

Three questions have a Chi-Square value above one hundred, which is an indication of a high conformity between responses to those questions in the group. What stands out is that 76.1% of the respondents were of the opinion that enterprise architecture designs reflect the functional reality of organizations. This is consistent with the findings in the literature review and the case studies. Three quarters of the respondents (76.2%) at least agreed that a single enterprise architecture can represent both production and innovation processes of organizations. This is consistent with the contents of the enterprise architecture design in the second case study that was presented in chapter 5. The findings of that case study also demonstrated that it is very difficult to capture both production and innovation processes in one enterprise architecture design. Less than five percent of respondents (4.8%) at least 'agree' that an enterprise architecture design only makes sense in organizations that are stable. Evidently, the respondents were of the opinion that enterprise architecture designs can be created for both stable and unstable organizations. This finding is not consistent with the 'undecided' response on the statement that 'an enterprise architecture design can represent intuition, informality and disorder', because an unstable organization can contain disorder, informality and intuition. Furthermore, it is questionable whether the functional reality is clear (question E1) in unstable organizations. The response on this question suggest that, in accordance with the findings in the literature review and the second case study that enterprise architects attempt to impose order on organizations, even when no order exists.

# Considerations in the design process

'How often do enterprise architects address certain topics in their enterprise architecture design processes?' The answer to this question is found in the fourth question category. This question has been answered by 147 respondents. All responses in this question category are statistically significant and are presented in Table 12.

| Percentage | F1: How often do you address the goal of the enterprise in the enterprise architecture | F2: How often do you address the integration of processes, inf etc in the enterprise architecture | F3: How often do you address the alignment with culture in the enterprise architecture | F4: How often do you address the alignment with the social site in the enterprise architecture | F5: How often do you address the influence on shaping of meaning in the enterprise architecture |
|---|---|---|---|---|---|
| No response | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 |
| Never | 2.0 | 0.0 | 13.6 | 19.7 | 19.0 |
| Seldom | 10.9 | 2.7 | 40.8 | 48.3 | 34.7 |
| Half the time | 14.3 | 4.1 | 19.7 | 19.0 | 22.4 |
| Usually | 37.4 | 33.3 | 20.4 | 12.2 | 17.7 |
| Always | 35.4 | 59.9 | 5.4 | 0.7 | 5.4 |
| Chi-Square | 71.9 | 130.5 | 50.4 | 90.8 | 32.6 |
| Asymp. Sig. | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |

**Table 12: Considerations in the design**

The question 'how often do you address the integration of business processes, information, applications and technology in the design of enterprise architectures' stands out in this group. The responses to this question were consistent with enterprise architecture practice that was discussed in paragraph 2.3: enterprise architects are mainly concerned with the engineering and integration of enterprise components, such as business processes, information, applications and technology. The responses illustrated also that the respondents seldom considered the alignment between the organization's culture and the enterprise architecture, and the alignment between the social side of organizations and enterprise architectures of organizations. They also seldom addressed the influence enterprise architectures can have on the shaping of meaning in organizations. However, a lower Chi-Square value (32.6) indicates less agreement within the group regarding this influence.

# Influences on the incorporation of social and cultural elements in a design

In the survey design a dependency has been assumed between the number of times that the social system or the culture of an organization is incorporated into an enterprise architecture design by an enterprise architect (questions A8 and A9) and the various other aspects, such as the importance that an enterprise architect attaches to the

incorporation of social or cultural elements of organizations in designs. To examine whether these two dependencies exist, two statistical tests have been applied: the Wilcoxon signed-ranks test, and a ordinal regression test. An ordinal regression test is needed because the Wilcoxon test does not reveal whether the outcome of a variable depends on the outcome of another variable. Consequently, the test does not indicate how an independent variable influences a dependent variable.

The Wilcoxon test is a non-parametrical test and tests if there is a significant difference between two distributions. According to Vocht (2005), the test compares two variables by calculating the difference between sample values, then ranking the differences and after that summarizing the positive rankings and the negative rankings. When there are no differences between both distributions then the conclusion is that the average positive and negative rankings are (somewhat) alike. The statistical significance of the difference is reported in a 'Z' value and a number for the asymptotical significance. The Wilcoxon test allows one to explore whether the importance that an enterprise architect attaches to a certain social or cultural aspect or the organization is significantly higher or lower than the number of times that these aspects have been incorporated in a design by that architect. Table 13 shows the structure in which the outcomes of the Wilcoxon test are presented.

| Answer on question <Y> compared to answer on question: <X> (1) | Neg. ranks | Pos. ranks | Ties | Z (neg. ranks) | Asymp. Sig. (2-tailed) |
|---|---|---|---|---|---|
| <Y1> (2) | (3) | (4) | (5) | (6) | (7) |
| <Y2> (2) | | | | | |

**Table 13: Presentation structure of Wilcoxon test**

In the heading of the table is the question that contains the independent variable (1) compared to dependent variables (2) that are presented in the rows of the table. The column with negative ranks (3) contains the number of occurrences where the rank of the independent variable is lower than the rank of the dependent variable. Column (4), the positive ranks, contains the number of occurrences where the rank is higher and column (5), the ties, contains the number of occurrences where the ranks are the same. Columns (6) Z (negative ranks), and (7) asymptotic significance show the probability that the occurred number of negative ranks is significant different from the null hypotheses, which is rejected when (7) < 0.05.

On the basis of the findings in paragraph 2.3 a number of relations are presumed between the number of times social and cultural aspects of organizations are given consideration and are included in designs and some independent variable, such as the degree of importance that is attached to the inclusion of social aspects of organizations in designs by enterprise architects. The presumed dependent variables were:
- 'The number of times the social system is incorporated in the enterprise architecture design' (question A8),
- 'The number of times the culture is incorporated in the enterprise architecture design' (question A9).

The presumed independent variables were:
- 'The degree of importance an enterprise architect attaches to the incorporation of the *roles* of employees in the design' (question B1),
- 'The degree of importance an enterprise architect attaches to the incorporation of *variety in work* for employees in the design' (question B2),
- 'The degree of importance an enterprise architect attaches to the incorporation of *decisions* employees can call their own in the design' (question B3),
- 'The degree of importance an enterprise architect attaches to the incorporation of possibilities for *self determination* (self determination) in the design' (question B4),
- 'The degree of importance an enterprise architect attaches to the incorporation of possibilities for *self regulation* in the design' (question B5),
- 'The degree of importance an enterprise architect attaches to the incorporation of *feeling of achievement* in the design' (question B6),
- 'The degree of importance an enterprise architect attaches to the incorporation of *feelings of recognition* in the design' (question B7),
- 'The degree of importance an enterprise architect attaches to the incorporation of *symbols* in the design' (question C1),
- 'The degree of importance an enterprise architect attaches to the incorporation of *norms and values* in the design' (question C2),
- 'The degree of importance an enterprise architect attaches to the incorporation of the *shared identity* in the design' (question C3),
- 'The degree of importance an enterprise architect attaches to the incorporation of the *core set of beliefs and assumptions* in the design'(question C4),
- 'The degree of importance an enterprise architect attaches to the incorporation of the *dependence between the social and cultural environment* in the design' (question D2),
- 'The degree of importance an enterprise architect attaches to the incorporation of the *influence on social and cultural meaning* in the design (question D3),
- 'The extent to which an architect agrees with the fact that an enterprise architecture design describes the *functional reality* of organizations' (question E1),
- 'The extent to which an architect agrees with the fact that an enterprise architecture design can 'found' only by those with the *proper observing skills, tools and methodologies*' (question E2),
- 'The extent to which an architect agrees with the fact that an enterprise architecture design can *represent intuition, informality and disorder*' (question E3),
- 'The extent to which an architect agrees with the fact that an enterprise architecture design only makes sense in *organizations that are stable*.' (question E4),

- 'The extent to which an architect agrees with the fact that a single enterprise architecture design can represent *both production and innovation processes* of an organization' (question E5),
- 'The extent to which an architect agrees with the fact that an enterprise architecture is *a timeless representation of the vision* of the enterprise' (question E6),
- 'The number of times the *alignment with the culture of the organization* in the enterprise architecture is addressed in the design' (question F3),
- 'The number of times the *alignment with the social side of the organization* in the enterprise architecture is addressed in the design' (question F4),
- 'The number of times the influence on *the shaping of meaning* in the enterprise architecture is addressed in the design' (question F5).

The possible responses in the survey differed for a number of these variables. Questions A1-A9 could for example be answered by ´never´, ´seldom´, and ´half the time´. Questions B1-B7, and C1-C4 could be answered by ´unimportant´, ´of little importance´ and ´moderately important´. Therefore, the possible answers to questions A were mapped to the possible answers to questions B and C in order to eliminate this difference. Furthermore, each possible response is ranked because that ranking is used in the Wilcoxon test. A description of the mapping between possible responses is used to clarify the meaning of the mapping. The applied mapping and ranking is presented in Table 14.

| Possible response question A | Possible response questions B or C | Ranking | Meaning of this mapping |
|---|---|---|---|
| Never | Unimportant | 1 | If the respondent regards it as *unimportant* whether the element is incorporated in designs, then the respondent probably does not (*never*) incorporate social or cultural aspects of organizations in designs. |
| Seldom | Of little importance | 2 | If the respondent regards it as *of little importance* to incorporate the element in designs, then the respondent *seldom* incorporates the social or cultural aspects of organizations in designs. |
| Half the time | Moderately important | 3 | If the respondent regards it as *moderately important* to incorporate the element in designs, then the respondent incorporates the social or cultural aspects of organizations *half the time* in designs. |
| Usually | Important | 4 | If the respondent regards it as *important* to incorporate the element in designs, then the respondent *usually* incorporates the social or cultural aspects of organizations in designs. |
| Always | Very important | 5 | If the respondent regards it as *very important* to incorporate the element in designs, then the respondent *always* incorporates the social or cultural aspects of organizations in designs. |

**Table 14: Mapping between answering possibilities**

The existence of a relation between the dependent and the independent variables has been examined using an ordinal regression test. This test is needed

because both variables have been measured using an ordinal scale. According to Norusis (2010), the Ordinal Regression procedure in the SPSS software package is an extension of the linear model to ordinal categorical data and can be applied to examine if there a dependence exists between a dependent and an independent variable. This ordinal regression test procedure is based on cumulative probabilities and requires a constant effect of the independent variables on all categories of the dependent variable. This is also known as the test for parallel lines. There are five different models to test the existence of parallel lines: Logit, Probit, Complementary log-log, Negative log-log and Cauchit. From the analysis done on the responses it has been found that the Logit model, which is based on the odds ratio, fits best. It is the log of the odds that an event occurs. Table 15 presents the format that is used to present the outcomes of the ordinal regression test in this paragraph.

| Outcome ordinal regression test (1) Dependent variable: Y | Parallel lines | Model fit (Sig.) | Goodness of fit (sig.) Pearson & Deviance | | Relation |
|---|---|---|---|---|---|
| X1 (2) | (3) | (4) | (5) | (6) | (7) |
| X2 (2) | | | | | |

**Table 15: Presentation of the ordinal regression test results**

In the heading (1) of the table the question that contains the independent variable is described that is compared to a dependent variable. The rows (2) of the table contain the independent variables. Column (3), 'Parallel lines', contains the significance level if parallel lines exist. If the significance level is higher than 0.05, then there are parallel lines which implies that the ordinal regression test can be used. Column (5), 'model fit significance level', indicates how well the observed and expected frequencies match with each other. A significance level less than 0.05 suggests a good model. From the observed and expected frequencies the Pearson and Deviance goodness-of-fit measures can be calculated. If the model fits well, then the observed and expected frequencies are quite similar. The model fits well when the significance levels of Pearson (5) and Deviance (6) are higher than 0.05. Column (7), 'Relation', indicates whether a significance dependence exists between the dependent and independent variable.

In the following sections the outcomes of the tests are presented. At first the outcomes of the Wilcoxon signed-ranks test are presented that indicate whether there is a dependency between two variables, and after that the outcomes of the ordinal regression test are presented to explore whether the dependency is a relation between the two variables.

Comparing answers to question A8 with answers to questions B1-B7
Is there is a significant difference between the answer to question A8 and the answers to questions B1-B7. The Wilcoxon test results are presented in Table 16. As the results demonstrate, the level of importance the respondents attached to the incorporation of social

| Answer on question Bx compared to answer on question: A8: How often do you incorporate the social system in the enterprise architecture | Neg. ranks | Pos. ranks | Ties | Z (neg. ranks) | Asymp. Sig. (2-tailed) |
|---|---|---|---|---|---|
| B1: How important is it for you that roles of employees are incorporated in the design | 3 | 124 | 20 | -9.8 | <0.01 |
| B2: How important is it for you that variety in their work is incorporated in the design | 17 | 76 | 54 | -6.1 | <0.01 |
| B3: How important is it for you that decisions employees can call their own is incorporated in the design | 9 | 104 | 34 | -8.7 | <0.01 |
| B4: How important is it for you that possibilities for self determination is incorporated in the design | 9 | 99 | 39 | -8.5 | <0.01 |
| B5: How important is it for you that possibilities for self regulation is incorporated in the design | 12 | 98 | 37 | -8.0 | <0.01 |
| B6: How important is it for you that feeling for achievement is incorporated in the design | 15 | 78 | 54 | -6.2 | <0.01 |
| B7: How important is it for you that feeling for recognition is incorporated in the design | 18 | 78 | 51 | -6.2 | <0.01 |

**Table 16: Answer on question Bx compared to question A8**

aspects of organizations in enterprise architecture designs is significantly higher than the number of times the social system of an organization was actually incorporated into their designs.

There are several explanations for this difference. For example, the enterprise architecture tools do not support the incorporation of certain social aspects of organizations into enterprise architecture designs. Another explanation can be that the elements described in the questions tested are incorporated in other elements of a design, for example in business process models or requirements. This can be true for employee roles, but not for the other elements of a social system such as possibilities for self regulation. Other explanations may include the training and experience of enterprise architects, and the perception that management has regarding the status and role of enterprise architects.

The results of the regression analysis for these variables is presented in Table 17. As the results demonstrate, statistically significant dependences between variable A8 and B3, A8 and B5, and A8 and B7 were found. A detailed examination of these relationships showed that the level of importance is positively associated with the number of times that the social aspects of organizations are incorporated into a design. Regarding dependence A8-B7, the statistics demonstrate that a relation may exist. However, the statistics on the individual responses on question B7 demonstrate that these could also have appeared by chance. Therefore, there appears to be no relation. The relations that do appear to exist, based on the results of this analysis are presented in Table 18.

| Outcome ordinal regression test Dependent variable: 'How often do you incorporate the social system in the enterprise architecture' (A8) | Parallel lines | Model fit (Sig.) | Goodness of fit (sig.) Pearson & Deviance | | Relation |
|---|---|---|---|---|---|
| B1: How important is it for you that roles of employees are incorporated in the design | 1.00 | >0.05 | -- | -- | -- |
| B2: How important is it for you that variety in their work is incorporated in the design | <0.05 | -- | -- | -- | -- |
| B3: How important is it for you that decisions employees can call their own is incorporated in designs | 0.78 | <0.05 | 0.86 | 0.78 | Y |
| B4: How important is it for you that possibilities for self determination is incorporated in the design | <0.05 | -- | -- | -- | -- |
| B5: How important is it for you that possibilities for self regulation is incorporated in the design | 0.24 | <0.05 | 0.76 | 0.49 | Y |
| B6: How important is it for you that feeling for achievement is incorporated in the design | <0.05 | -- | -- | -- | -- |
| B7: How important is it for you that feeling for recognition is incorporated in the design | 0.29 | <0.05 | 0.28 | 0.29 | N |

**Table 17: Outcome ordinal regression test A8 versus Bx**

| Relation | Description of the relation |
|---|---|
| A8 - B3 | Enterprise architects are less likely to incorporate the social system of an organization into a design when they find it unimportant to incorporate 'decisions employees can call their own' in the design. |
| A8 – B5 | Enterprise architects are less likely to incorporate the social system of an organization into a design when they find it unimportant to incorporate 'possibilities for self regulation' in the design. |

**Table 18: Relations between question A8 and Bx**

An explanation for these relations is that decision making and self regulation can be described using architectural languages. For example, in the period following the period in which the second case study was conducted a work allocation algorithm was included in the design because of complaints from employees that decision making and work regulation had been left too much to computer software. The reason why employee roles do not appear to have a relation with the incorporation of the social system of an organization in a design can be that roles traditionally are regarded by enterprise architects as part of business process modelling and are therefore probably not considered to be related to the social system of organizations.

Comparing answers on question A9 with answers on questions from the C category
The Wilcoxon signed ranked test has been used to examine whether there is a statistically significant difference between the answer on question A9 and the answers on questions C1-C4 concerning cultural elements of organizations. The test results are presented in Table 19.

| Answer on question Cx compared to answer on question: A9: How often do you incorporate the culture in the enterprise architecture | Neg. ranks | Pos. ranks | Ties | Z (neg. ranks) | Asymp. Sig. (2-tailed) |
|---|---|---|---|---|---|
| C1: How important is it for you that symbols are incorporated in the design | 15 | 96 | 36 | -7.5 | <0.01 |
| C2: How important is it for you that norms and values are incorporated in the design | 11 | 109 | 27 | -8.7 | <0.01 |
| C3: How important is it for you that the shared identity is incorporated in the design | 19 | 100 | 28 | -7.4 | <0.01 |
| C4: How important is it for you that the core set of beliefs and assumptions are incorporated in the design | 13 | 103 | 31 | -8.4 | <0.01 |

**Table 19: Question Cx compared to A9**

As is demonstrated by the results, the level of importance that the enterprise architects attached to the incorporation of cultural elements of organizations in enterprise architecture designs is significantly higher than the number of times the culture of organizations was incorporated into designs by them.

There are possible reasons for this difference which are comparable to the explanations described earlier of the differences concerning the social system of organizations and designs. Thus, the enterprise architecture tools can be inefficient when it comes to incorporating cultural elements of organizations into designs. Another explanation may be that cultural elements are not explicitly incorporated in designs, but are implicitly included, for example in business requirements. However, this explanation can not be supported by the findings of both case studies. Other explanations can be the influencing factors that have been elicited from the findings of the focus group.

The results of the ordinal regression analysis are presented in Table 20.

| Outcome ordinal regression test Dependent variable: How often do you incorporate the culture in the enterprise architecture (A9) | Parallel lines | Model fit (Sig.) | Goodness of fit (sig.) Pearson & Deviance | | Relation |
|---|---|---|---|---|---|
| C1: How important is it for you that symbols are incorporated in the design | 0.90 | <0.01 | 0.95 | 0.90 | Y |
| C2: How important is it for you that norms and values are incorporated in the design | 1.00 | 0.05 | 0.50 | 0.21 | N |
| C3: How important is it for you that the shared identity is incorporated in the design | <0.05 | -- | -- | -- | -- |
| C4: How important is it for you that the core set of beliefs and assumptions are incorporated in the design | 0.37 | 0.01 | 0.59 | 0.37 | N |

**Table 20: Results ordinal regression test question Cx and A9**

This analysis demonstrates that there are relationships between A9 and C1, and between A9 and C4. A further analysis of these relationships showed that a high level of importance correspondents with a high number of times that cultural elements of organizations are incorporated into designs. However, the detailed analysis also indicated that the relationship between A9 and C4 statistically is weak. Therefore, this relationship was not accepted as valid. The valid relationship is presented in Table 21.

| Relation | Description of the relation |
|----------|----------------------------|
| A9 – C1 | Enterprise architects are less likely to incorporate cultural elements of organizations into designs when they find it unimportant to incorporate symbols in a design. |

**Table 21: Relation between C1 and A9**

No explanation has been found to explain why only a relationship exists with regard to symbolism and not to the other cultural aspects. Symbols are be visible aspects of the cultural aspects of organizations. The literature review and the expert panel have shown that debates go on in organization science and between members of organizations regarding the definition of 'norms and values', 'shared identity', and 'the core set of beliefs and assumptions'. The conversion of the cultural aspects into behaviour and meaning depends very much on the person that does this translation. In other words these cultural aspects are highly subjective and have a highly interpretivist nature. According to the findings in paragraph 2.3, this nature generally does not correspond with the positivistic stance that enterprise architects take in the design of enterprise architectures.

Comparing answers on question A8 and A9 with answers on questions from the D category

The Wilcoxon signed ranked test was applied to investigate whether there is a significant difference between the answer to questions A8 or A9 and answers to questions from the D category. The test results are presented in Table 22 and Table 23.

| Answer on question D2 and D3 compared to answer on question A8: How often do you incorporate the social system in the enterprise architecture | Neg. ranks | Pos. ranks | Ties | Z (neg ranks) | Asymp. Sig. (2-tailed) |
|---|---|---|---|---|---|
| D2: How important is it for you that the dependence between social and cultural environment is incorporated in the design | 17 | 81 | 49 | -6.7 | <0.01 |
| D3: How important is it for you that the influence on social and cultural meaning is incorporated in the design | 23 | 72 | 52 | -5.6 | <0.01 |

**Table 22: Questions D2 and D3 compared to answer on A8**

| Answer on question D2 and D3 compared to answer on question A9: How often do you incorporate the culture system in the enterprise architecture | Neg. ranks | Pos. ranks | Ties | Z (neg. ranks) | Asymp. Sig. (2-tailed) |
|---|---|---|---|---|---|
| D2: How important is it for you that the dependence between social and cultural environment is incorporated in the design | 14 | 87 | 46 | -7.0 | <0.01 |
| D3: How important is it for you that the influence on social and cultural meaning is incorporated in the design | 16 | 78 | 53 | -5.9 | <0.01 |

**Table 23: Questions D2 and D3 compared to answer on A9**

As the results show, the respondents claim to attach a higher level of importance to the incorporation of the dependence between the social and cultural aspects of organizations in designs than is reflected in the number of times the social system or culture of organizations were actually incorporated in their designs.

There are possible reasons for this difference, which are comparable to those relating to the consideration and incorporation of social and cultural aspects of organizations in enterprise architecture designs, such as the limitations of enterprise architecture languages, design constructs enterprise architecture models, and design methods. Another possible reason is that there are only a few publications in enterprise architecture literature and information systems research regarding the dependence and influence between the social and cultural aspects of organizations and designs. Furthermore, the treatment of this dependence and influence is generally not part of the formal training of enterprise architects such as the TOGAF certification. Other possible explanations have been described in the influencing factors inferred from the findings of the expert panel.

The results from the ordinal regression test are presented in Table 24 and Table 25.

| Outcome ordinal regression test Dependent variable: How often do you incorporate the social system in the enterprise architecture (A8) | Parallel lines | Model fit (Sig.) | Goodness of fit (sig.) Pearson & Deviance | | Relation |
|---|---|---|---|---|---|
| D2: How important is it for you that the dependence between social and cultural environment is incorporated in the design | 0.20 | <0.01 | 0.47 | 0.20 | N |
| D3: How important is it for you that the influence on social and cultural meaning is incorporated in the design | 0.93 | <0.01 | 0.51 | 0.30 | N |

**Table 24: Questions D2 and D3 compared to answer on A8, regression**

The results of the regression test in Table 24 demonstrate that no statistically significant dependencies exist between A8 and D2 or D3. Therefore, no dependence has been accepted, despite the significance levels for parallel lines, model fit and goodness of fit. The reason for this is that the goodness of fit has low Deviance scores.

| Outcome ordinal regression test Dependent variable: How often do you incorporate the culture in the enterprise architecture (A9) | Parallel lines | Model fit (Sig.) | Goodness of fit (sig.) Pearson & Deviance | | Relation |
|---|---|---|---|---|---|
| D2: How important is it for you that the dependence between social and cultural environment incorporated in the design | <0.01 | -- | -- | -- | -- |
| D3: How important is it for you that the influence on social and cultural meaning is incorporated in the design | <0.01 | -- | -- | -- | -- |

**Table 25: Questions D2 and D3 compared to answer on A9, regression**

The results of the regression test in Table 25 demonstrate that there are no parallel lines and thus there are no significant dependencies, because it is the basic condition for the application of the ordinal regression test that parallel lines exist.

Relation between A and E questions

Does the level of agreement on the statements (questions E1-E6) have any relation with the number of times that the social system (question A8), or the culture (question A9) of an organization is incorporated into a design? In order to find this answer, the ordinal regression test has been applied to test if such dependencies exit. The results of that test are presented in Table 26.

| Outcome ordinal regression test Dependent variable: How often do you incorporate the social system in the enterprise architecture (A8) | Parallel lines | Model fit (Sig.) | Goodness of fit (sig.) Pearson- Deviance | | Relation |
|---|---|---|---|---|---|
| E1: An enterprise architecture design describes the functional reality of organizations | 0.50 | 0.55 | -- | -- | -- |
| E2: An enterprise architecture design can be 'found' only by those with the proper observing skills, tools and methodologies | <0.01 | -- | -- | -- | -- |
| E3: An enterprise architecture design can represent intuition, informality and disorder | 0.53 | 0.03 | 0.73 | 0.53 | Y |
| E4: An enterprise architecture design only makes sense in organizations that are stable. | 0.69 | 0.23 | -- | -- | -- |
| E5: A single enterprise architecture design can represent both production and innovation processes of an organization | 0.53 | 0.58 | -- | -- | -- |
| E6: An enterprise architecture is a timeless representation of the vision of the enterprise | <0.04 | -- | -- | -- | -- |

**Table 26: Questions E1, E2, E3, E4, E5 and E6 compared to answer on A8**

Based on the results of the regression test it is found that one dependency is statistically significant. The relation is presented in Table 27.

| Relation | Description of the relation |
|---|---|
| A8 – E3 | Enterprise architects are more likely to incorporate the social system of an organization into a design when they are convinced that an enterprise architecture design can represent intuition, informality and disorder. |

**Table 27: Relation between question A8 and E3**

The ordinal regression test has also been applied regarding question A9: 'How often do you incorporate the culture in the enterprise architecture'. The results are summarized in Table 28. They demonstrate that no dependency exists between the level of agreement on these statements and the number of times the culture of organizations is incorporated into designs. A possible reason for this may be that enterprise architects do not relate these statements to cultural aspects of organizations, because none of the words associated to culture such as 'symbols', 'norms and values', 'shared identity', 'core set of beliefs and assumptions' have been used in these statements.

| Outcome ordinal regression test Dependent variable: How often do you incorporate the culture in the enterprise architecture (A9) | Parallel lines | Model fit (Sig.) | Goodness of fit (sig.) Pearson & Deviance | | Relation |
|---|---|---|---|---|---|
| E1: An enterprise architecture design describes the functional reality of organizations | 0.40 | 0.75 | -- | -- | -- |
| E2: An enterprise architecture design can be "found" only by those with the proper observing skills, tools and methodologies | <0.01 | -- | -- | -- | -- |
| E3: An enterprise architecture design can represent intuition, informality and disorder | <0.01 | -- | -- | -- | -- |
| E4: An enterprise architecture design only makes sense in organizations that are stable. | -- | -- | -- | -- | -- |
| E5: A single enterprise architecture design can represent both production and innovation processes of an organization | <0.01 | -- | -- | -- | -- |
| E6: An enterprise architecture is a timeless representation of the vision of the enterprise | 0.80 | 0.67 | -- | -- | -- |

**Table 28: Questions E1, E2, E3, E4, E5 and E6 compared to answer on A9**

Dependencies between A and F questions
The Wilcoxon signed ranked test has been applied to examine if there is a statistically significant difference between the number of times the social system (question A8) or the culture of an organization (question A9) is incorporated into a design and the importance of the alignment with the social system (question F4) or the culture (question F5) of an organization. The test results are presented in Table 29 and Table 30.

| Answer to question F4 compared to answer to question A8: How often do you incorporate the social system in the enterprise architecture | Neg. ranks | Pos. ranks | Ties | Z (neg. ranks) | Asymp. Sig. (2-tailed) |
|---|---|---|---|---|---|
| F4: How often do you address the alignment with social site in the enterprise architecture | 22 | 43 | 82 | -2.89 | <0.01 |

**Table 29: Answer on question F4 compared to answer on question A8**

| Answer to question F3 compared to answer to question A9: How often do you incorporate the culture in the enterprise architecture design | Neg. ranks | Pos. ranks | Ties | Z (neg. ranks) | Asymp. Sig. (2-tailed) |
|---|---|---|---|---|---|
| F3: How often do you address the alignment with culture in the enterprise architecture | 11 | 75 | 61 | -6.7 | <0.01 |

**Table 30: Answer on question F5 compared to answer on question A9**

The test results demonstrate the existence of a significant difference between the number of times that enterprise architects address the alignment of a design with the social system, or the culture of an organization and the number of times they are actually incorporated in a design. This difference is more explicit for the alignment of a design with the culture of an organization than it for the alignment of a design with the social system of an organization. These differences are clearly visible in Figure 29 and Figure 30. The left graphic shows the responses regarding the social system of an

organization, and the right graphic shows the responses regarding the culture of an organization. As the ascendant lines in the graphics demonstrate, the level of importance enterprise architects attach to the alignment of the social system or culture of organizations with enterprise architecture designs is significantly higher than the number of times the social system or culture of organizations were actually incorporated into their designs.

There are possible explanations for this difference, which are again comparable to the explanations that have been proposed regarding the differences in the consideration and incorporation of the social system and cultural elements of organizations in enterprise architecture designs. One possible explanation is that enterprise architecture tools are not well suited to incorporate social or cultural elements into enterprise architecture designs. Another explanation is that social or cultural elements are implicitly incorporated, for example in business requirements. However, this has not been supported by findings from the SVB case study. Other explanations can be found in the findings of the expert panel. A proposed explanation for the difference of test results for the social system and the cultural elements is that enterprise architects may have fewer design instruments that can be used to incorporate culture, as compared to instruments to incorporate the social system in designs. Furthermore, enterprise architects can have the intention to consider cultural alignment of an organization, but can be hampered by the subjective nature of cultural aspects.
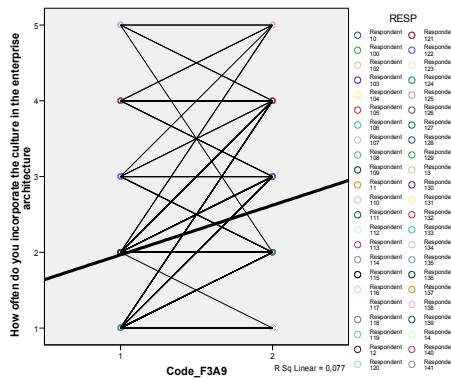


Figure 29: Answer on question A9 compared to F3    Figure 30: Answer on question A8 compared to F4
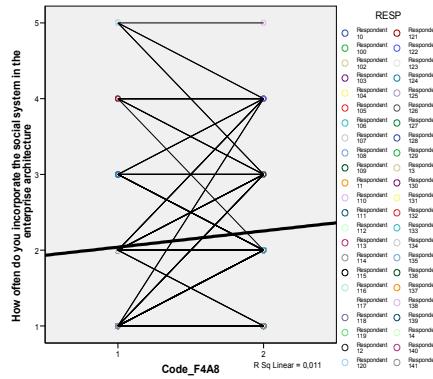
A dependence between questions F3 and F4 and the questions A8 and A9 have also been presumed. An ordinal regression test has been applied to examine these dependencies. The results are presented in Table 31.

| Outcome ordinal regression test Dependent variable: How often do you incorporate the social system in the enterprise architecture (A8) | Parallel lines | Model fit (Sig.) | Goodness of fit (sig.) Pearson & Deviance | | Relation |
|---|---|---|---|---|---|
| F4: How often do you address the alignment with social site in the enterprise architecture | 0.35 | <0.01 | 0.42 | 0.35 | Y |

**Table 31: Questions F4 compared to answer on A8**

A detailed analysis confirmed the dependence between A8 and F4 (Table 32).

| Relation | Description of the relation |
|---|---|
| A8 – F4 | Enterprise architects are more likely to incorporate the social system of an organization into a design when they more often address the alignment of a design with the social side of the organization in enterprise architecture designs. |

**Table 32: Description of relation between A8 and F4**

There were two proposed dependencies regarding the culture of organizations and enterprise architectures. In order to test these, an ordinal regression test has been applied. The test results are presented in Table 33.

| Outcome ordinal regression test Dependent variable: How often do you incorporate the culture in the enterprise architecture (A9) | Parallel lines | Model fit (Sig.) | Goodness of fit (sig.) Pearson & Deviance | | Relation |
|---|---|---|---|---|---|
| F3: How often do you address the alignment with culture in the enterprise architecture | -- | -- | -- | -- | -- |
| F5: How often do you address the influence on shaping of meaning in the enterprise architecture | 0.14 | <0.01 | 0.23 | 0.14 | N |

**Table 33: Questions F3 and F4 compared to answer on A9**

Although all outcomes of the regression test for question F5 seem to indicate a relationship between how often an enterprise architect addresses the alignment of a design with the culture of an organization and how often the influence is addressed that a design has on the shaping of meaning by organization members, no such relationship has been found in the detailed analysis of the results.

Differences between the public and private sector

Are the responses of respondents from the public sector compared to those from respondents that were working in the private sector alike? In order to examine this a Mann-Whitney test has been applied.

Analysis of the data demonstrates that 81 respondents were working in the private sector, 50 respondents in the public sector, 8 respondents in the non-profit sector, and 5 respondents were working in other sectors. In this analysis the 8 respondents working in the non-profit sector were combined with in the group of 50 respondents working in the public sector. The results of the Mann-Whitney Test indicate that there is no significant difference in responses to the first group of questions (elements in an enterprise architecture design), the second group (the importance to incorporate social aspects in a design), the third group (the importance to incorporate

cultural elements in a design), and the fourth group (the importance to incorporate aspects of time). There are however two significant, and two almost significant differences in the responses to the other questions. The test results of the Mann-Whitney test regarding those questions and the responses are presented in Table 34 and Table 35.

| How important is it for you that the dependence between a design and the social and cultural environment is incorporated in a design<br>Mann-Whitney U outcome: 1806,500; Z: -2,411; Asymp. Sig. 0,02 | Public Percent | Private Percent |
|---|---|---|
| Unimportant | 12.1 | 12.3 |
| Of little importance | 17.2 | 32.1 |
| Moderately important | 32.8 | 39.5 |
| Important | 29.3 | 12.3 |
| Very important | 8.6 | 3.7 |
| At least moderately important | 70.7 | 55.5 |

**Table 34: Dependence between a design and the social and cultural environment**

Although the median is the same, the respondents working in the public sector find it more important to consider the social and cultural environment of an organization in a design than the respondents from the private sector do.

| How important is it for you that the influence of a design on social and cultural meaning of organizations is incorporated in designs<br>Mann-Whitney U outcome: 1850,500; Z: -2,205; Asymp. Sig.:0,03 | Public Percent | Private Percent |
|---|---|---|
| Unimportant | 13.8 | 17.5 |
| Of little importance | 24.1 | 38.8 |
| Moderately important | 32.8 | 27.5 |
| Important | 20.7 | 12.5 |
| Very important | 8.6 | 3.8 |
| At least moderately important | 62.1 | 43.8 |

**Table 35: Incorporation of the influence a design has on social and cultural meaning**

Respondents from the public sector find it more important than those from the private sector to consider the influence that a design has on social and cultural meaning of organizations. This finding is consistent with the finding previously presented about the dependence of a design on the social and cultural environment of an organization.

The findings in Table 36 and Table 37 are close to significance, and are therefore also examined. These outcomes are aberrant from earlier outcomes. The results of Table 35 and Table 37 suggest the opposite.

| An enterprise architecture design can be 'found' only by those with the proper observing skills, tools and methodologies<br>Mann-Whitney U outcome: 1970,000; Z:-1,674; Asymp. Sig.:0,09 | Public Percent | Private Percent |
|---|---|---|
| Strongly disagree | 8.6 | 8.6 |
| Disagree | 32.8 | 18.5 |
| Undecided | 24.1 | 22.2 |
| Agree | 24.1 | 39.5 |
| Strongly agree | 10.3 | 11.1 |
| At least undecided | 58.5 | 72.8 |

**Table 36: EA designs can only be 'found' by EA professionals**

| How often do you address the alignment of a design with the culture of the organization?<br>Mann-Whitney U outcome: 1954,500; Z: -1,767; Asymp. Sig.:0,08 | Public Percent | Private Percent |
|---|---|---|
| Never | 13.8 | 13.6 |
| Seldom | 51.7 | 34.6 |
| Half the time | 15.5 | 21.0 |
| Usually | 17.2 | 23.5 |
| Always | 1.7 | 7.4 |
| At least half the time | 34.4 | 51.9 |

**Table 37: Addressing alignment with culture in EA**

On the basis of the findings that there is no statistically significant difference in the responses of respondents from the public and non-profit sector as opposed to those from the private sector on question categories 1, 2, 3 and 4 it may be concluded that the sector in which the enterprise architect was working had little influence on the way in which he/she exercised the profession of enterprise architect. This has also been suggested by the participants in the expert panel. The two statistically significant differences suggest that social aspects and cultural elements get more attention in designs in the public sector than in the private sector. A possible explanation for this difference is that public and private sectors each have different attitudes towards social and cultural aspects of organizations. Traditionally the private sector is more businesslike than the public and non-profit sectors and tends to focus on business results and the technical side of the organization. This has been stated by Trist and Mumford, has been proposed by the experts in the expert panel, and was stated by Bekkers and Zouridis (1999). The results of the two case studies showed however that social and cultural aspects of organizations received also little attention in the enterprise architecture design in the public sector and that the focus of the designs was on businesslike management of public organizations.

## Summary of survey findings

The enterprise architects who participated in the survey regarded their designs as reflections of the functional reality of organizations. For them enterprise architecture designs are not restricted to enterprises that are stable and a single design can represent both production and innovation processes of an organization. They were uncertain about whether it is possible for enterprise architecture designs to represent intuition, informality and disorder. They considered it important to include the relationship with the focus and the phase the organization, as well as the dynamic between purpose, structure, processes and culture into their designs. The influence of an enterprise architecture design on the social and cultural meaning of organizations was not considered to be very important and the respondents seldom considered the alignment between designs and the social system or the culture of organizations.

When the enterprise architects created designs, they incorporated basic architectural elements in it such as business requirements, principles, business process models, business information models and application models. They rarely incorporated social and cultural aspects of organizations in their designs and appeared somehow constrained in incorporating these organizational aspects into designs. The enterprise architects considered it to be important to incorporate roles of employees, decisions employees can call their own and possibilities for self determination into enterprise architecture designs and appeared to be confused about the incorporation of feelings of achievement and recognition of employees.

It appeared in the analysis that the likeliness of the incorporation of social aspects of organizations can be predicted by the way in which the enterprise architects considered the following social aspects: decision making of employees, and opportunities for self regulation. The following basic belief appeared to have a positive effect on the incorporation of social aspects of organizations into designs: the opinion that an enterprise architecture design can represent intuition, informality and disorder. The enterprise architects also included the social system of an organization more often into a design when they were willing to pay attention to the alignment of a design with the social side of the organization.

Regarding culture, the enterprise architects did seldom include cultural elements of organizations in their designs although they considered it to be important to incorporate cultural elements such as norms and values into designs. Symbolism and shared identity got the least attention in a design.

Very little difference has been found between enterprise architects working in the public sector and those working in the private sector as far as these aspects are concerned.

## Propositions based on the findings in the survey analysis

The first proposition that was derived from what was found in the literature review was that the enterprise architecture discipline regards organizations as rational, programmable systems. The findings in the survey analysis provide strong evidence that

enterprise architects indeed regard enterprise architecture designs as the reflection of the objective and ordered functional reality of organizations.

From the analysis of survey responses, the proposition that the enterprise architecture discipline acknowledges that in a design the social and cultural aspects of an organization should get as much attention as the technical side of the organization must be rejected because the analysis shows that the social system and the culture of organizations are rarely incorporated into designs, the influence of designs on social and cultural meaning are not considered to be very important and enterprise architects seldom consider the alignment between a design and the social system or the culture of an organization.

The responses support the proposition that in reality there seems to be no attention in a design process to the creation of cultural meaning, apart from the translation of goals, objectives and strategies of organizations into formal models. However, enterprise architects think it important to consider cultural elements of organizations such as norms and values in design processes although in reality they seldom do include them into their designs. Symbolism and shared identity get the least attention in designs. Therefore, the original proposition's 'no attention' is too strong. It should be 'very little attention'.

The survey response suggests that enterprise architects are restricted in the incorporation social and culture aspects of organizations into their designs. This finding is consistent with the outcomes of the expert panel session and supports the propositions that the attitude of business people to enterprise architects limits the possibilities for enterprise architectures to address social and cultural aspects of organizations in designs, and that an education and experience in 'hard' technical disciplines such as ICT limit the possibility of addressing social and cultural aspects there;

The proposition that time creates an unwilling and unwanted complexity to an already complex design could not be examined because the survey did not produce relevant data and so it is neither rejected nor supported.

The proposition that the division of a design process into an organizational and an enterprise architecture design process leads to omissions of organizational, social and cultural aspects in enterprise architecture designs could also not be examined because again the survey did not produce relevant data. Therefore, this proposition is not rejected nor supported either.

On basis of the survey responses, the proposition that different phases of an organization cannot be integrated effectively into one enterprise architecture design cannot be supported. The responses demonstrate that an enterprise architecture design can represent both production and innovation processes of an organization. However, enterprise architects are uncertain whether an enterprise architecture can represent intuition, informality and disorder. This are characteristics of an organization in the innovation phase.

The final finding in the expert panel was that the topics, issues and responses to those issues are not restricted to a specific industry or sector. That statement is supported by the analysis of the survey responses. It demonstrates that there is much conformity in the responses of respondents from the public and private sector.

# 6.4  Concluding the practitioner consultation

The results of this consultation with enterprise architecture practitioners demonstrate that the social and cultural aspects of organizations identified in the literature review are valued by the practitioners as aspects of organizations, but are not considered to be design parameters in the design of enterprise architectures. The formulated propositions were tested in this practitioner consultation. The results are presented below.

1. The results support the proposition that the discipline regards organizations as rational and programmable systems.
2. The proposition that it is acknowledged that the social and cultural aspects of organizations should get as much attention as the technical side of organizations in a design must be rejected.
3. The proposition that the conceptual models do not support the incorporation of social and cultural aspects of organizations is supported.
4. The proposition that the discipline focuses on the objective reality of organizations and there is no attention on the creation of cultural meaning is supported.
5. The proposition that the consideration and incorporation of the element time of organizations in enterprise architecture designs is problematic is supported by the expert panel.
6. The proposition that the absence of a single and clear definition of enterprise architecture hinders the formulation of the enterprise architect's role and results in a lack of clarity about the position of enterprise architects within organizations is supported by the expert panel.
7. The proposition that the separation of a design process in an organizational design, that focuses on social and cultural aspects, and a design that focuses on the enterprise architecture, leads to omissions of social, cultural and temporal aspects of organizations in enterprise architecture designs is supported by the expert panel.
8. The proposition formulated in the second case study that a combination of an innovative and efficient organization phase in one enterprise architecture design creates ambiguities in the design and leads to mismatches with social and cultural aspects of the organization was neither accepted, nor rejected;
9. The proposition formulated in this chapter, that enterprise architectural topics, issues and responses are not restricted to a specific industry or sector is supported in the findings of the expert panel and the survey.
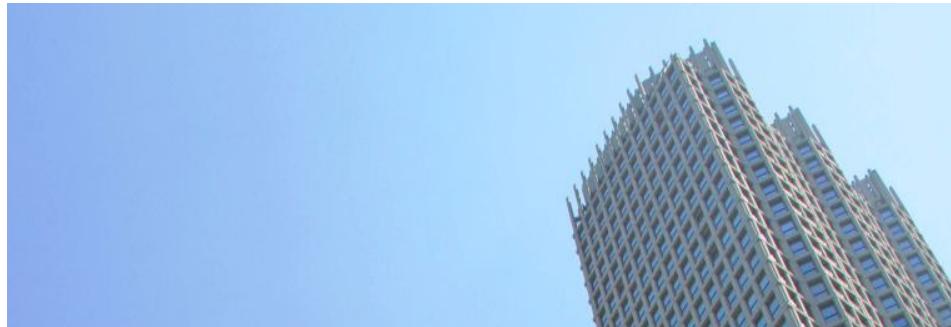
# 7 RESULTS AND INTERPRETATION
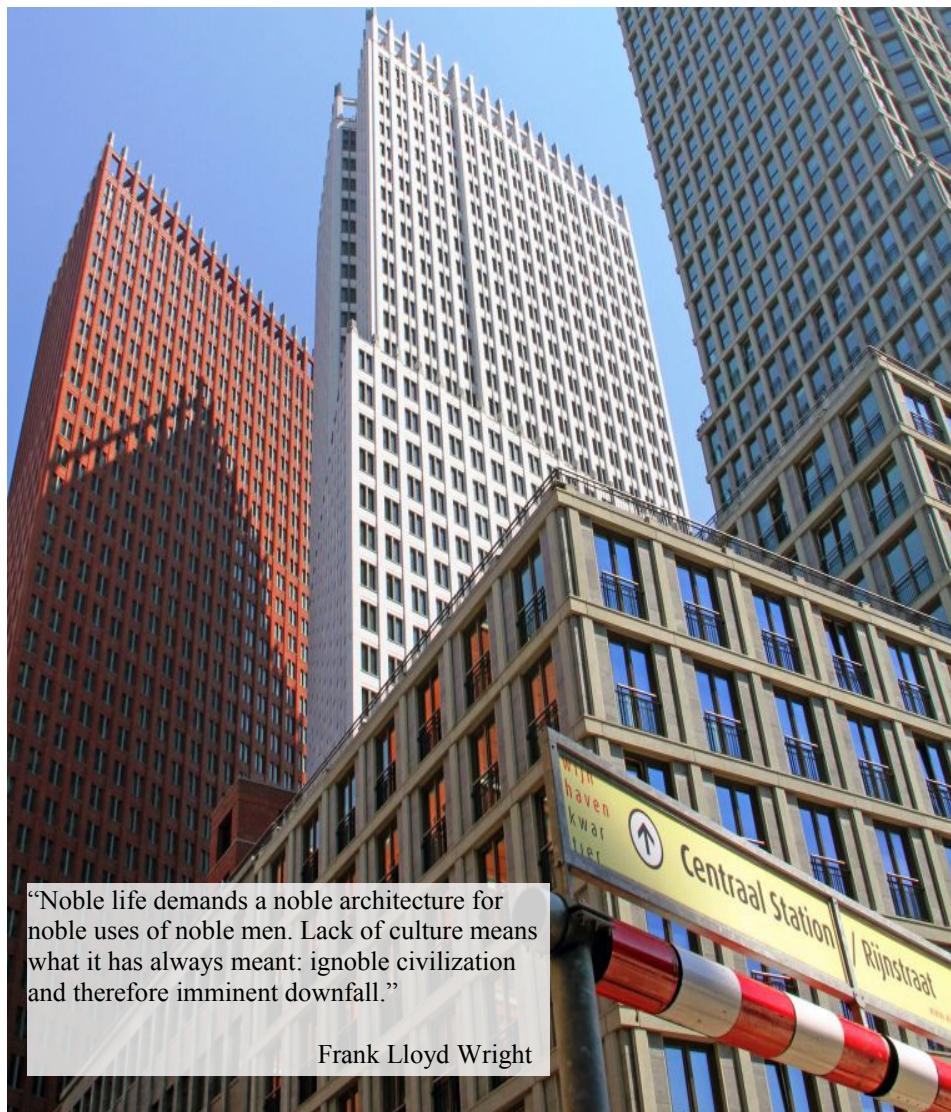
"Noble life demands a noble architecture for noble uses of noble men. Lack of culture means what it has always meant: ignoble civilization and therefore imminent downfall."

Frank Lloyd Wright

# 7.1  Introduction

In this chapter an analysis takes place based on the overall research findings. The analysis focuses on the research questions and the propositions that have been formulated and tested in this research.

# 7.2  How social and cultural aspects are considered and incorporated

On the basis of the literature presented in chapter 2 a research framework was designed that consisted of a number of social, cultural and temporal aspects of organizations that were selected because of their relationship to the socio-technical design school. It has been studied how they are given consideration and are incorporated in designs that are created by enterprise architects. In paragraph 2.4 the framework was presented in Table 3. That table is also presented here.

| Social aspects | Cultural aspects | Temporal aspects |
|---|---|---|
| 1. The roles that employees have in the organization and in business processes | 1. Symbolism | 1. Organizational, social and cultural elements that are not constants but change over time and influence one another |
| 2. The possibilities for employees to have variety in their work | 2. Norms and values | 2. The dynamic between purpose, structure, processes and culture in an organization. |
| 3. Possibilities employees have for self regulation and self determination | 3. The shared identity | 3. The influence an enterprise architecture design has on the social system and the culture of an organization |
| 4. Possibilities employees get to make decisions that they can call their own | 4. The core set of beliefs and assumptions | 4. The influence that a social system and the culture of an enterprise have on an enterprise architecture |
| 5. Feeling employees gain from self determination and recognition | | 5. The relation of a design with the phase the organization |
| | | 6. The relation of a design with the focus of the organization. |

This framework has been used as an instrument to analyse and evaluate Dutch reference architectures (chapter 4), the SVB enterprise architecture (chapter 5) and to analyse the design method that enterprise practitioners use (chapter 6). Both the design process and the design itself were explored in this research.

The findings demonstrate that there are three possibilities with respect to the consideration of the elements of the framework: (1) no consideration, or consideration but no incorporation; (2) consideration, incorporation and no alignment between the element of the framework and elements of the enterprise architecture design; (3) consideration, incorporation, and alignment between the element of the framework and element of the design.

The first possibility, no consideration, or consideration but no incorporation, means that the element of the framework is not given any consideration in the design process. This can be intentional, for example when general management of an

organization has decided that their enterprise architects are not intended to reflect on the aspect, or unintentional, for example because the aspect is overlooked by the designers. It can also mean that the aspect is given consideration, but is not incorporated in the design at all. In that situation there is no evidence in the design documents that the aspect has been considered by the designers. For example, no evidence was found in the first case study showing that designers have taken into account the symbolic value that an enterprise architecture can have on civil servants. The second possibility means that an element of the framework has been given consideration in a design process and has been incorporated in a design, but that it is not aligned with one or more elements of the enterprise architecture. This can occur for example when the social aspect of an organization regarding self-regulation for employees is described in business requirements, but is improperly implemented in the application layer, for example because too much work automation is used. Other examples of the consideration and misalignment of elements of the framework with elements of enterprise architecture designs were found in the second case study concerning the enterprise architecture design for the SVB. Consideration and alignment, the third possibility, means that an element of the framework has been given consideration in a design process, is included and aligned with design elements. For example, in the second case study the application layer of the design was aligned with the efficiency phase of the organization.

In addition to consideration, research findings indicate that there is a degree of incorporation of the elements of the framework in enterprise architectures designs. The possibilities depend on the chosen design structure such as interrelating architectural layers, design elements such as requirements and models, and the used design method such as TOGAF that were described in paragraph 2.3. For example, an element of the framework can be considered and only be aligned with the design principles of a design, or it can be aligned with the principles and elements of the business architecture layer. In more abstract terms the degree of incorporation of elements of the framework can be (1) descriptive, which means that de element is described in general and possibly ambiguous terms such as requirements; (2) normative in principles, which means that the element is described in verifiable rules using unambiguous natural language; (3) normative in business logic, which means that formal constructs and models of the business architecture layer are used to represent the element; (4) normative in application logic, which means that formal constructs and models of the application architecture layer are used to represent the element; (5) normative in technical terms, which means that formal constructs and models of the technical architecture are used to represent the element. An element of the framework is fully incorporated in a design if it is included in all the five levels.

Figure 31 is created when the three possible considerations and the five degrees of incorporation of an element of the framework are plotted against each other. In each cell it can then be indicated, for example by means of hatching, for an element of the framework how it is considered and, included in a design. For a more detailed analysis, each row, or architecture layer, can be subdivided into the elements of which it is built up. For example, the business architecture layer of the Dutch reference architecture NORA can then be subdivided into the organization structure, products and services, and business processes.

Figure 31: Consideration and incorporation of elements of the framework in a design

The figure can be used to present the results of a design analysis. Figure 32 for example demonstrates the pattern when an element of the framework is considered and aligned with the enterprise architecture and is completely integrated in the design. Figure 33 demonstrates the pattern that emerges when an element of the framework is not considered at all. The figures show the extremes. In practice, mixed patterns will emerge.



Figure 32: Consideration and alignment



Figure 33: No consideration, no alignment

Using the data from the first case study, the diagrammatic representation can demonstrate how the social, cultural and temporal aspects of organizations are considered and incorporated in the reference architectures of e-government (Figure 34, Figure 35, Figure 36).
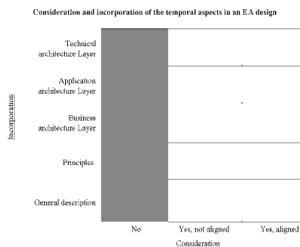
**Figure 34: The consideration and incorporation of the cultural aspects**
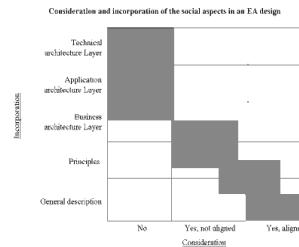
**Figure 35: Consideration and incorporation of the social aspects**
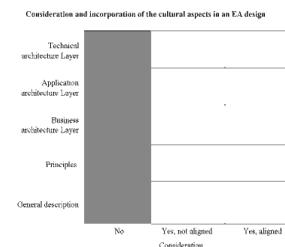
**Figure 36: Consideration and incorporation of the temporal aspects**

Figure 34 illustrates for example that the cultural aspects of organizations that were selected in this research are not considered and therefore not included in the reference architectures of e-government, such as NORA, that were examined in this thesis. The same applies to the temporal aspects of organizations, as is shown in Figure 36. The selected social aspects of organizations are generally considered and aligned with the general description of the reference architectures. Figure 35 shows that the social aspects of organizations and their translation into architectural models are less aligned when the architecture is more normative. The figure also illustrates that there is no consideration of the aspects in the application and technical layers of the reference architectures. In these layers the focus of the designs was on products, services and business process functionalities.

Using the data from the second case study, the diagrammatic representation (Figure 31) can also be used to demonstrate how the social, cultural and temporal aspects of the integrated business model of SVB were considered and incorporated in the enterprise architecture. That representation will be very similar to the figures outlined above because the case findings of the second case were to a large extent similar to the findings of the first case.

## 7.3   Factors influencing consideration and incorporation

**Influencing enterprise architecture factors**

On the basis of the findings of this research, factors that influence how enterprise architects consider and incorporate social and cultural aspects of organizations into enterprise architecture designs can be inferred. The factors identified that are related to the *enterprise architecture discipline* are:

1.  *The definition of what an enterprise architecture is*. In the literature review was found that there are many definitions of enterprise architecture. This was for example stated by Zachman in 1987. The findings of the expert panel lead to the

conclusion that these different definitions make it indeterminable what the contributions of an enterprise architecture are to an organization;

2. *The role and position of enterprise architects within an organization* is the second factor. This factor is related to the lack of clarity about what enterprise architecture actually is. The findings in this research indicate that it is not clear for business management what enterprise architecture stands for. Consequently, there is much debate about the role, position and status of enterprise architects in organizations. This debate started with the introduction of the enterprise architect in the 1990s and continues to this day. Both the second case study and the expert panel indicated that this lack of clarity leads to power and knowledge struggles and misperceptions between business management and enterprise architects. Another consequence is that the added value of enterprise architects for organizations is not clear;

3. *The tools (such as frameworks, methods and languages) enterprise architects use* is the third factor. This research indicates that at the moment there are limited possibilities for enterprise architecture tooling to incorporate social, cultural and temporal aspects of organizations into designs;

4. *The training and experience of enterprise architects* is the fourth factor. The second case study and the expert panel indicate that there is in enterprise architecture training and experience little attention to social and cultural aspects of enterprises. They also demonstrated that enterprise architects are often highly educated and experienced in the technical domain of organizations;

5. *The personality of enterprise architects* is the fifth factor. The literature review, the case studies, the expert panel, and the survey all indicate that enterprise architects have a personality that is characterized by a positivistic and an engineering approach to enterprises. This mentality prevents enterprise architects from considering and incorporating social and cultural elements of organizations in enterprise architecture designs since these are 'subjective' and cannot be engineered.


### Influencing organizational factors

It is not only the five factors related to the enterprise architecture discipline itself that influence how social and cultural aspects of organizations are considered and incorporated in enterprise architecture designs. As a result of the research conducted here, five *organizational* factors can also be seen to influence how enterprise architects consider and incorporate social and cultural aspects of enterprises into enterprise architecture designs. These factors are:

1. *How business management considers social and cultural aspects*. The literature presented in chapter 2 demonstrated that from at least the 1960s onwards there has been much criticism of the dominant focus of business management on the technical side of organizations. Trist (1981) noted also that the implementation of socio-technical designs is not straight forward to implement and Mumford (2006) observed that information technology subordinated workers even more to the machine than the assembly line did. Furthermore, she argued that the attention to the social side of organizations depends on the availability of scarce resources in

the economy. The workforce is nowadays not the scarce resource. Money is. For example, the unemployment rate in the Euro area was in May 2011 9.9% (Eurostat 2011) and in February 2012 10.8% (Eurostat 2012). In recent years, with money as the scarce resource, there was a strong focus on cost control and efficient deployment of human resources. This focus was reported in the expert panel as a reason why social and cultural aspects of organizations get little attention in enterprise architecture designs. The organization in the second case study now faces major cuts due to government cutbacks (Kamp 2011). This influences its cost structure (SVB 2011). According to labour unions this can lead to majors cuts in the workforce of the organization and can also bring the development of the integrated service teams to a halt (ABVAKABO FNV 2011). In 2012 the SVB announced in their annual report that there must be a staff reduction of more than 600 posts (SVB 2011);

2. *The management's view of the nature of social and cultural aspects* is the second factor. Trist noted in 1981 that social aspects of organizations are difficult to consider in the design of organizations because of the subjective nature of them. According to him, a worker has personal preferences that can change over time. This makes it hard to capture these aspects in a design. The organizational culture too is elusive and time-dependent. The literature presented in the literature review demonstrated the existence of different perspectives on organizational culture. For example, there are international, national, organizational and individual differences in the way in which organizational culture is experienced and expressed (Romm, Pliskin et al. 1991; Avison and Myers 1995; Gallivana and Sriteb 2005). The second case study illustrated that the SVB had different cultures. The findings of the expert panel also demonstrated that organizations, especially merged ones, can have different cultures within them. Nevertheless, management of the SVB formulated a vision on social aspects and the preferred culture of the organization. That vision was used as a guide in the transformation of the organization and the introduction of the integrated service teams. This illustrates the importance for management to be explicit about the social and cultural environment of an enterprise architecture design;

3. *The separation of an organization, or change program, into a business part and an ICT part* is the third organizational factor. This separation has been observed in both case studies and was noted by the experts in the expert panel. There is also a scientific academic discipline called business-IT alignment that studies this separation. That discipline has demonstrated that it is difficult to bridge the gap that emerges through this business ICT separation (Tapia 2009; Slot 2010). The research for this thesis indicates that in the context of e-government the social and cultural aspects of organizations were assigned to the business domain of organizations. The technical aspects of organizations were assigned to the ICT domain. The socio-technical design tradition is opposed to this separation. It proposes an integrated design in which both the business and ICT domains participate. Splitting the e-government design task in an organization and an enterprise architecture design task appeared to be a reason why the social and cultural aspects of organizations received little attention in the Dutch governmental reference architectures;

4. *The composition of the design team* is the fourth organizational factor. The literature presented in chapter 2, the case studies and the expert panel all demonstrated that the composition of a design team influences how social and cultural aspects of organizations are considered and incorporated in enterprise architecture designs. The findings illustrated that frequently the design of enterprise architectures is done by teams that consist mainly of enterprise architects, ICT experts and other technical design professionals. Such a composition can lead to a very limited consideration of social and cultural aspects of the organization for which a design is made;

5. *The way that business management perceives the enterprise architecture discipline and enterprise architects* is the fifth organizational factor. The second case and the expert panel demonstrated that business management tend to regard enterprise architects as ICT experts who know much about ICT-related topics but little about social and cultural aspects of organizations. Business management is seen to prefer to consult the business's own functional specialists when it comes to social and cultural aspects of the organization. The research suggests that the these management perceptions are in part due to the unclear definition of what an enterprise architecture is and what value it adds to an organization. The SVB case study and the expert panel demonstrated that this perception can effect the role, position, and status of enterprise architects in organizations, especially with regard to the consideration of social and cultural aspects of organizations in designs.

### Proposed relationships between the ten factors

The ten factors described do not stand in isolation. The research suggests that there are influences between them. These influences were not explicitly studied in the research, but rather are assumed and not proven. The assumed influences are illustrated in Figure 37. In that representation each ellipse represents a factor. The arrows between them represent a possible influence. The arrows point in the direction of the influence. It is not indicated in the resulting diagram whether the influence is positive or negative; that depends on the actual value of each factor. For instance, if enterprise architecture is understood to include social and cultural aspects of organizations, that presumably has a positive effect on the incorporation of those aspects in a design, whereas the exclusion of those aspects from the identification probably has a negative influence on the consideration and incorporation of the social and cultural aspects of organizations in enterprise architecture designs.

Each of the influences proposed in the model are explained by describing the influences that each factor has on other factors. First, the enterprise architectural factors are described, followed by the organizational factors.
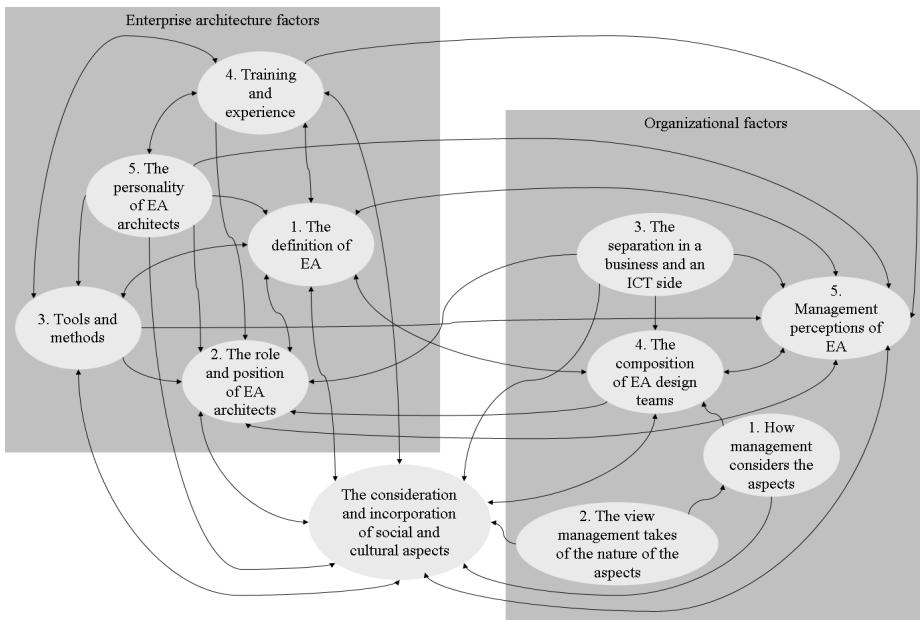
**Figure 37: Perceived influences between factors**

The proposed influences regarding factors related to the *enterprise architecture discipline*:

1. *The definition of what enterprise architecture is* probably influences the training and experience of enterprise architects. If social and cultural aspects of organizations are left out of the definition, then they will probably not be included in training. Furthermore, enterprise architects will then probably not gain any experience of considering and incorporating social and cultural aspects of organizations in their designs when those aspects are not regarded as part of enterprise architectures. The definition probably also influences enterprise architecture tools en methods. A definition that includes social and cultural aspects of organizations will probably lead to tools and methods that support the incorporation of them in designs. Furthermore, the definition probably determines the role and position of enterprise architects in organizations. It also influences the composition of enterprise architecture design teams. For example, when the definition includes social and cultural aspects of organizations, then teams are needed that can deal with them. Finally, the definition probably influences management's perception of the enterprise architecture discipline and the relationship between enterprise architecture and social and cultural aspects of the enterprise. Altogether there are seven probable influences identified that result from the definition of what enterprise architecture is. This suggests that the definition has much influence on how social and cultural aspects of organizations are considered and incorporated in designs;

2. *The role and position of enterprise architects within organizations* probably influences the definition of enterprise architecture. When enterprise architects are allocated to ICT related departments, then members of the organization probably expect that the enterprise architecture of the organization will refer exclusively to the ICT related elements of the organization. The role and position probably also influences management's perception of enterprise architects. The findings in this research suggest that this factor has much influence on how social and cultural aspects of organizations are considered and incorporated into designs;

3. *The tools, such as constructs and frameworks, and methods that enterprise architects use* probably influences their training and experience. If tools and methods are based on a positivistic philosophical stance, then training will probably be structured accordingly. Furthermore, if the consideration and incorporation of social and cultural aspects of organizations are not supported by design tools and methods, then it probably affects the training and experience of enterprise architects. Design tools and methods probably also influence the definition of enterprise architecture. According to the publications surveyed in the literature review, design tools and methods of the enterprise architecture discipline focus on the technical, programmable elements of enterprises. That focus probably influences the definition of enterprise architecture, and also the management's perception of enterprise architecture and the role and position of enterprise architects within organizations;

4. *The training and experience of enterprise architects* probably influences design tools and methods. If enterprise architects are trained and experienced in the consideration and incorporation of social and cultural aspects of organizations in their designs, then it probably will influence their design tools and methods. At first tools and methods will be inadequate, but gradually they probably will probably improve based on needs and wants of enterprise architects. Architects trained and experienced in considering and incorporating social and cultural aspects of organizations will probably also influence the definition of enterprise architecture. Furthermore, such training and experience probably will influence management perception of enterprise architects and probably influences the role and position of them within organizations;

5. *The personality of enterprise architects* is probably also influential in various respects. It probably influences training and experience of enterprise architects because the personality of enterprise architects influences how much attention social and cultural aspects of organizations get there. It probably also influences design tools, methods and the definition of enterprise architecture. The findings of the expert panel demonstrate that the personality of enterprise architects influences their position and role within organizations as well as how they are regarded by management. The research findings do not indicate if the personality of enterprise architects is more or less a constant or can be affected by training, design tools, design methods, the role and position within an organization and the definition of enterprise architecture. Changes in those factors will probably also attract other kinds of practitioners to the discipline.

The proposed influences regarding factors related to the *organization*:

1. *The view management takes of social and cultural aspects of the organization* probably influences the composition of enterprise architecture design teams. Findings in the SVB case study suggested that management regarded social and cultural aspects of the integrated business model as important for the transformation of the organization. The findings illustrated that management had deliberately chosen to include business architects and business consultants in the enterprise architecture design team. They had to ensure that the social and cultural aspects of the integrated business model were not overlooked by the design team. However, management also decided to organize the design and implementation of the social and cultural aspects of the integrated business model in a separate design team. This resulted in a separation between the design teams that was not bridged practice. The enterprise architecture design team increasingly focussed during the design on the ICT-related aspects of the integrated business model and neglected other aspects, and the other team focussed on the social and cultural aspects of the integrated business model and did not consider the ICT-related aspects;

2. *The separation of an organization or change programme, into a business part and an ICT part* will probably influence management's perception of enterprise architects, because such a separation will probably lead to an either/or decision, with enterprise architects allocated either to the business domain or to the ICT domain. This is likely to influence the role and position of enterprise architects within organizations. A separation between business and ICT will probably also influence enterprise architecture design teams because enterprise architecture is frequently allocated to the ICT or business domain of organizations;

3. *The composition of the design team* probably influences management perception of enterprise architects and their role and position in organizations. This research demonstrates that when the enterprise architecture design team does not contain designers that attend to social and cultural aspects of organizations in a design, then it will probably reinforce the idea that enterprise architects only understand technical aspects of enterprises. That will probably also influence the definition of enterprise architecture;

4. *Management perceptions of the enterprise architecture discipline and enterprise architects* probably influences the definition of enterprise architecture. The literature review, the second case study and the expert panel all suggest that if the perception is that enterprise architecture is merely about ICT-related aspects of organizations, then that perception will probably be reflected in the definition. Furthermore, the perceptions probably influence the composition of design teams and the position and role of enterprise architects within organizations. The research suggests that this factor has considerable impact on how social and cultural aspects of organizations are considered and incorporated in enterprise architectures;

5. *The view of management regarding the elusive nature of social and cultural aspects of organizations* probably influences how management considers social and cultural aspects of the organization. For example, in the second case study management considered social and cultural aspects of the organization as existing and changeable objects in the organization.

In summary it can be stated based on the findings in this research that of the above mentioned influences, the definition of what an enterprise architecture is, the role and position of enterprise architects in organizations, and management's perception of enterprise architects and the enterprise architecture discipline all have considerable impact on how social and cultural aspects of organizations are considered and incorporated in enterprise architectures.


**The factors projected on enterprise architecture design in e-government**

The introduction to this research in chapter 1 refers to a number of reviews that explored why the transformation processes in Dutch government are falling behind, are focused on technology and pay little attention to social and cultural aspects of governmental organizations. This research demonstrates that it is the definition of what an enterprise architecture is, the role and position of enterprise architects in governmental organizations, and management's perception of enterprise architects and the enterprise architecture discipline, as well as the design process of e-government itself and the advocacy of enterprise architecture frameworks that are also reasons for the dominant focus on technology and the limited attention that is paid in governmental enterprise architecture designs to social and cultural aspects of organizations. The ten factor model demonstrates which factors contribute to the actual situation in the transformation process. This is illustrated for each factor of the model.

The first case study demonstrated that *the definition of what an enterprise architecture is in e-government* is based on systems theory. The definition focuses on engineering of governmental organizations and strives for the integration of organization components. *The role and position of governmental enterprise architects in the transformation* is the delivery of technical expertise regarding the application of technology. The enterprise architects are positioned as technical experts. *The tools and methods in the context of e-government* do not adequately equip the designers to consider or incorporate social and cultural aspects of governmental organizations. Examples of such design tools are the Dutch reference architectures (NORA,PETRA,GEMMA,WILMA), the design method TOGAF and the architecture language ArchiMate. *The training and experience of governmental enterprise architects* are aimed at the application of the previously mentioned tools such as the Dutch reference architectures. The first case study demonstrates that *the personality of governmental enterprise architects* can be characterized by a positivistic way of thinking about organizations and the transformation of government. *How management in governmental organizations regards social and cultural aspects* is eminent visible in the Dutch reference architectures since they make no reference to social and cultural aspects of governmental organizations. *The separation of the transformation into a business part and an ICT part* is clearly visible in the foundation of ICTU, an organization that concentrates on the design and implementation of innovative ICT-related solutions into Dutch society. Consequently, *the composition of governmental enterprise architecture design teams* is based on technical skills and expertise. This is visible in the group of designers that contributed to the creation of the reference architectures. All group members have a technical background. *The perception*

*management of governmental organizations has of the enterprise architecture discipline and enterprise architects* is that the discipline sees public organizations as programmable systems and focuses on the technical side of organizations. This has been stated in the second case study. *The view of management regarding the elusive nature of social and cultural aspects of organizations* can be derived indirectly from findings of both case studies. Those findings suggest that social and cultural aspects of governmental organizations are subordinated to the businesslike and efficient execution of governmental business processes which is achieved by the maximum use of ICT in those processes. This view is also derived from the finding that in the Dutch reference architectures there is no reference to social and cultural aspects of governmental organizations. Consequently, all these factor values have to be changed in order to alter the focus in the transformation process from a predominantly technical focus to a more balanced focus in which social and cultural aspects of governmental organizations are considered and incorporated in enterprise architecture designs.

## Comparing influencing factors with factors from IS research

Information systems research itemizes also factors that influence the design quality of information systems and acceptance of a design by users. Table 38 presents a comparison between these factors and the ones identified in this research.

| Enterprise Architecture factors | Comparable factors found in IS research |
| --- | --- |
| 1. The definition of what an enterprise architecture is | -- |
| 2. The role and position of enterprise architects within an organization | -- |
| 3. The tools such as frameworks, methods and languages enterprise architects use | Constructs and models (Clancey 1993). Modelling (Herrmann and Loser 1999; Herrmann, Hoffmann et al. 2004). User requirements (Markus and Mao 2004). Conceptualization (Iivari and Iivari 2011). |
| 4. The training and experience | Skills of the design team (White and Leifer 1986). |
| 5. The personality of enterprise architects | Cognitive style and personality (Zmud 1979). |
| **Organizational factors** | **Comparable factors found in IS research** |
| 1. How business management considers social and cultural aspects | Power structure of and politics in the organization (Markus 1983). |
| 2. The view of management with respect of the nature of social and cultural aspects | Organizations culture, the values and beliefs (Romm, Pliskin et al. 1991; Pliskin, Romm et al. 1993; Robey and Azevedo 1994; Claver, Llopis et al. 2001). The fluid and nuanced nature of social activity (Ackerman 2000). |
| 3. The separation of organizations into a business part and an ICT part | Socio-technical design (Mumford 2006) and user participation (Markus and Mao 2004) |
| 4. The composition of enterprise architecture design teams | Personality and situational variables of designers and users (Zmud 1979). Relation between designers and participating users. (Markus and Mao 2004). |
| 5. The perception business management has about the enterprise architecture discipline and enterprise architects. | -- |

**Table 38: Factors found in this study compared to factors found in IS research**

A number of these factors were included in the literature review of chapter 2. Almost all factors that have been identified in this research are also listed in information systems research. Only the factors regarding the definition of enterprise architecture, the role and position of enterprise architects in organizations and the perception business management has about the enterprise architecture discipline and enterprise architects are new. The literature review demonstrated that different publications highlight different aspects. No publications were found in information systems research and software engineering research in which all these aspects are considered in relation to each other as has been done in this research.

## 7.4 Evaluation of the research propositions

A number of propositions have been formulated in the research. The literature survey led to the initial set. These propositions were tested in the research. New propositions were added during the research. Each proposition is categorized in Table 39 below as supported, rejected or undecided. The reason for these verdicts can be found in the conclusion of each chapter. For example, the analysis of the proposition in the first case study can be found in paragraph 4.6.

| Proposition (no and summary) | Case study 1 | Case study II | Expert panel | Survey |
|---|---|---|---|---|
| 1. Organizations are regarded as rational, programmable, systems | Supported | Supported | Supported | Supported |
| 2. Social, cultural and technical aspects of organizations all get equal attention in designs | Rejected | Rejected | Rejected | Rejected |
| 3. There are no design instruments to incorporate social aspects of organizations | Undecided | Undecided | Supported | Supported |
| 4. Focus in a design is on the objective reality of organizations, not on cultural meaning | Supported | Supported | Supported | Supported |
| 5. Time creates an unintended and unwanted complexity in designs | Undecided | Supported | Supported | Undecided |
| 6. The absence of an EA definition results in an unclear position and role for enterprise architects in organizations | Not tested | Undecided | Supported | Undecided |
| 7. The separation of organizational designs from EA designs leads to omission of social, cultural aspects of organizations in EA designs; | Supported | Supported | Supported | Undecided |
| 8. A focus on professionals and one on efficiency in a single EA design creates ambiguities which will lead to design conflicts; | Supported | Supported | Not tested | Undecided |
| 9. The topics, issues and responses in this research are not restricted to a specific industry or sector. | Not tested | Not tested | Supported | Supported |

**Table 39: Full set of propositions and verdicts on them**

The analysis of the propositions allows the conclusion that enterprise architects regard organizations as rational, ordered, programmable systems that are goal-driven and have interacting elements that can be invented, defined, designed and built, in short 'engineered'. The literature review demonstrated that the concept 'enterprise engineering' is indeed used by enterprise architects to characterize their discipline (IFIP-IFAC 1999; Kosanke, Vernadat et al. 1999; Zachman 2007). This illustrates their basic rationalism. Their ultimate goal is to generate enterprise architectures from highly rational and formal models by advanced information systems (Soley 2000; Mellor, Scott et al. 2002). Enterprise architects therefore emphasize that a holistic, integrated view of all aspects of enterprises is needed to design enterprise architectures. However, this research confirms that the focus of enterprise architecture designs is exclusively on functional and technical aspects of enterprises, on engineering and integrating different functional components and interfaces of organizations.

This research confirms that enterprise architects acknowledge that social, cultural and temporal aspects of organizations are important and should be considered in designs. However, it does not follow from this that the enterprise architecture discipline acknowledges that social, cultural and technical aspects of organizations should be given equal consideration in design processes. The research shows that social and cultural aspects of organizations get hardly any attention in designs. Social and culture aspects of organizations are rarely incorporated by enterprise architects, they do not regard the influence of their designs on social and cultural meaning of the organization as very important, and they seldom consider the alignment between designs and social aspects of organizations or designs and cultural aspects of organizations. The social and cultural aspects of organizations that are included in the research framework (Table 3) of this thesis are indeed valued as aspects of the nature of organizations, but they are not regarded as design parameters in enterprise architecture designs. These aspects are generally not considered by enterprise architects, because they are in general not regarded as important in the integration efforts in enterprise engineering.

This research demonstrates that the intention of design professionals to pay due attention to the social and cultural aspects of organizations is not reflected in their enterprise architecture designs. The emphasis in designs is on the attainment of some goal or purpose of enterprises. The difference between the intention to incorporate social and cultural aspects of organizations and actual incorporation in designs suggests that enterprise architects are constrained in the incorporation of them in designs. Reasons for this can be found in the ten factors previously described, such as the education and experience of enterprise architects. The education and experience of enterprise architecture practitioners in technical disciplines such as ICT also seem to restrict the possibilities that enterprise architects see of addressing social and cultural aspects of organizations in their designs. Another reason is the design constructs, models and methods that they use. However, the research does not indicate that the conceptual models that are applied in enterprise architecture frameworks to model enterprises cannot be applied to the incorporation of the social and cultural aspects of organizations. The literature presented in chapter 2 demonstrates that social and cultural aspects can be described through natural language in the form of requirements or by means of metaphors. For example, in traditional architecture Viollet-le-Duc in 1875

introduced metaphors of the machine, the organism and the crystal for architectural designs in order to free architects from restrictive formal prescriptions of the past. Mumford (1983) used natural language in the ETHICS method. Morgan (2006) cited metaphors for organizational designs, such as the machine, the organism, the brain, the culture, the political system, the psychic prison, the flux and the instrument of domination. In enterprise architecture designs, such metaphors can be of value in emphasizing the underlying principle of a design. Current enterprise architecture practice is to describe a design in terms of the technology used, such as a 'service oriented' architecture or a 'best-of-breed' architecture, or a 'rule based' architecture. Instead of these descriptions enterprise architects could adopt metaphors from Morgan or Viollet-le-Duc, or modern metaphors such as the 'participative professional' or the 'social network' to highlight the basic principle of an enterprise architecture design and its relation to the social and cultural aspects of the organization for which the design is made. The ten factor model suggests another cause for the difference between the intention to incorporate social and cultural aspects of organizations and actual incorporation of them in designs: the set-up of design processes. From user-participatory design approaches that were described in the literature review, such as ETHICS (Mumford 1983) and CSCW (Schmidt and Bannon 1992), it is known that user participation increases design quality. In e-government the design is divided into technical and organizational designs. This separation of designs can lead to omission of social and cultural aspects of organizations in designs and reaffirms the importance of user participation in enterprise architecture design processes. The case studies and the expert panel reaffirm that the separation of design professionals and users leads to alignment and coordination problems with the consideration of the social and cultural aspects of organizations that cannot be fixed easily once an enterprise architecture design has been finalized. Another reason for the difference between the intended incorporation of social and cultural aspects of organizations and the actual incorporation of them in designs is that business people assume that enterprise architects are not focussed on the consideration of the aspects in their designs and therefore management does not grant enterprise architects opportunities to incorporate them. Again this is related to the unclear role and position of enterprise architects in organizations and the absence of a clear definition what enterprise architecture is.

The survey conducted for this thesis suggests that if enterprise architects were to consider and incorporate social aspects of organizations, then, they would incorporate roles of employees, decisions employees can call their own and possibilities for self determination into their designs. The findings also suggest that enterprise architects are more likely to incorporate social aspects of organizations into designs when they are more convinced that a design can represent intuition, informality and disorder, and when they do address the alignment of a design with the social side of organizations in design processes. Enterprise architects seem to be less likely to incorporate social aspects of organizations into designs when they see it as unimportant to incorporate decisions employees can call their own or possibilities for self regulation in their designs. The research findings suggest that enterprise architects are somewhat confused about taking account of feelings of employees of achievement and recognition in their designs.

With regard to the cultural aspects of organizations, this research demonstrates that enterprise architects do not regard an enterprise architecture as an instrument for enforcing cultural values of organizations. When enterprise architects consider the cultural aspects that are presented in the research framework (Table 3), they are likely to incorporate cultural elements such as norms and values into designs. Symbolism and the shared identity of members of an organization get hardly any attention in a design. Furthermore, enterprise architects are less likely to incorporate cultural elements of organizations into designs when they see incorporating symbols in their designs as unimportant. As a result, symbolic cultural elements are generally disregarded in enterprise architecture designs. Consequently, the rationalist designs that are created by enterprise architects can possibly trigger unwanted bureaucratic symbolism for its users. This was illustrated in the case study of SVB (chapter 5).

The research demonstrates that the dynamics within organizations regarding the social and cultural aspects and enterprise architectures is a complicating factor in designs and that timing aspects can also complicate designs and design processes. The research illustrates that temporal aspects of organizations are usually simplified in enterprise architecture designs. An example is the time-bound phase and focus of organizations. The research findings demonstrate for example that enterprise architects focus on a certain phase or focus of an organization in their enterprise architecture designs.

## 7.5 Conclusions

A number of conclusions seem to be warranted. The first is that the rationalist nature and positivistic philosophical stance of the enterprise architecture discipline is conspicuous in the design constructs, models and methods the discipline uses in the design of e-government. This leads to functionalist design approaches that marginalize social sense-making, the creation of shared understandings and ethical imperatives of work arrangements (Hirschheim and Klein 1994). The research indicates that a functionalist approach leads to an engineering perspective on e-government concepts, governmental organizations and organizational life and that such an approach leads to an emphasis on programmable elements of governmental organizations. This is why, in the context of e-government, the social and cultural aspects of organizations this research is concerned with are seldom attended to. Design research in other disciplines suggests that a pragmatic epistemological stance can overcome this myopia (Romme 2003).

Another conclusion is that, in the context of e-government, a user participation design tradition such as socio-technical design (Mumford 1983), CSCW (Schmidt and Bannon 1992), structurational approaches (Orlikowski 1992), or rapid ethnography (Millen 2000) is still absent or in its infancy, as far as the enterprise architecture is concerned. In those traditions both objective and subjective elements are taken into account in designs. Neo-humanist design principles such as support for self-determination, self-reflection, social justice, due process and human freedom (Hirschheim and Klein 1994) are not in evidence in the enterprise architecture design approaches to e-government. User participation approaches in information systems research aim at a high degree of user control in the design process in requirements

analysis and testing or prototyping (Franz and Robey 1986; Kujala 2003; Markus and Mao 2004). This research confirms what previous research in information systems has found namely that the absence of a participation tradition in a design discipline leads to limited involvement of users in design processes and reduces the quality of a design from a user perspective. In e-government limited user participation in designs can be regarded as a cause why the design process is split into a design process for the business domain and another design process for the ICT domain. This division has contributed to the focus of enterprise architecture designs on technical and traditional organizational structures. This research suggests that users should participate in the design of all layers of enterprise architectures in order to align business requirements, social and cultural aspects of organizations with the business architecture and subsequent layers.

A third conclusion is that as regards to e-government, the enterprise architecture discipline focuses on design constructs, models, construction methods and to a lesser extent on the evaluation of designed artefacts. The evaluation of designs and design processes should include the substance and organization of the artefact, the intended purposes of the artefact and the environment in which the artefact operates (Simon 1996). Design evaluation processes in the context of e-government have not been observed in this research. Information systems research demonstrates that the evaluation of designs can be done by using design approaches such as rapid prototyping and rapid ethnography (Millen 2000). Such approaches are not in evidence in e-government, possibly because of the use of packaged software, European procurement rules and the complexity of the enterprise architecture designs. For example, in the second case study it has been observed that the use of packaged software and European procurement rules limited the possibilities that designers have for frequent evaluation of the created designs with users. This can lead to problems with the implementation of the designs. Leidner and Kayworth (2006) have for example claimed that cultural conflicts are likely to occur in the implementation of packaged software.

A forth conclusion is that in the design methods of the enterprise architecture disciple in e-government there are quality criteria for consistency and integration in the design of 'hard' systems components such as software applications, application interfaces, and technical infrastructures. Such quality criteria support designers in their task and focus attention. This research illustrates that quality criteria for the consideration of social and cultural aspects of organizations are not present in the discipline. Consequently, the possible gap in a design process regarding 'soft' aspects of organizations that emerges when specifications and functional descriptions are transformed into structural representations cannot be assessed. Kroes (2002) argues that because of this inherent gap in designs and the diversity of the human context it is difficult to define quality criteria for artefacts and design processes. However, the research process that was designed and used in this thesis and the social and cultural aspects of organizations that were of central concern in it demonstrate that an evaluation of 'soft' aspects in enterprise architecture designs can be performed.

In the design of information systems it is important to analyse how individuals in organizations create and re-create meaning through the use of information technology, how information systems influence the social, cultural, political and economic relations and how cultural systems and information systems influence each other (Robey and Azevedo 1994; Avison and Myers 1995; Gallivana and Sriteb 2005;

Leidner and Kayworth 2006; Kappas and Rivard 2008). Efficiency, customer service and rationality are examples of values that can be communicated through technical artefacts. There is a number of different perspectives on the relation between culture and information systems in information systems research (Gallivana and Sriteb 2005). The fifth conclusion of this research is that there is no tradition in the enterprise architecture discipline of considering culture in relation to enterprise architecture designs. Consequently, there is no design framework that can be used to analyse and evaluate the relationship between an enterprise architecture design and the culture of the organization it is designed for.

A final comment is that the results of the expert panel and the survey suggest that these five conclusions are not likely to be restricted to the public sector.

# 8 CONCLUSION
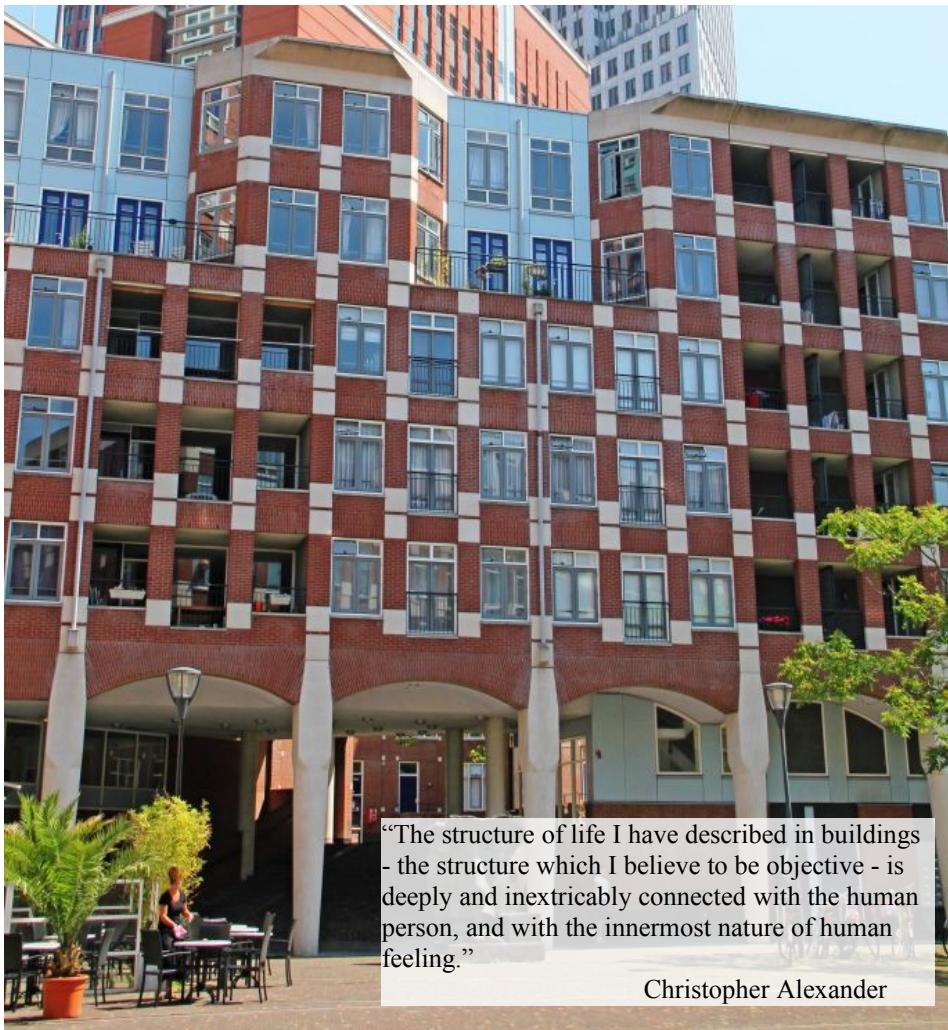
"The structure of life I have described in buildings - the structure which I believe to be objective - is deeply and inextricably connected with the human person, and with the innermost nature of human feeling."

Christopher Alexander

# 8.1  Introduction

In chapter 1 the research objective, research questions and expected contributions of the research to science and society were described. This chapter concludes the research by reviewing how well the research objective has been met by the research, by evaluating how well each research question is answered by the research findings, and by determining the potential contributions of this research to science and society. The chapter concludes by discussing the limitations of the research, issues left open and suggestions for further research.

# 8.2  Reviewing the research objective

The objective of this research was to explore how and to what extend the social and cultural aspects of organizations that were presented in Table 3 in chapter 2 are given consideration and incorporated in the design constructs, models and methods of the enterprise architecture discipline. The aim was to develop knowledge that can be applied to evaluate how those aspects were taken into account in the design of enterprise architectures in e-government and to enhance the significance of those aspects in designs and design processes when the design context such as the integrated business model that was discussed in chapter 5 requires it.

The motivation for this research was a number of reports from the scientific community (Clegg 2000; Appleton 2005; Bieberstein, Bose et al. 2005; Baxter and Sommerville 2011) and practice (Postma and Wallage 2007; Algemene Rekenkamer 2008; Donner 2011) which contended that enterprise architects put too much emphasis on the technical side of organizations and did not incorporate social and cultural aspects of organizations into their design artefacts and methods. Another motivation was the widespread use of enterprise architectures to design and implement e-government (Van den Dool, Keller et al. 2002; Docters van Leeuwen 2009). To enhance the implementation of e-government Postma and Wallage advised to increase the use of reference architectures. But they made no reference to reflection about or including social and cultural aspects of public organizations in enterprise architecture designs. From a scientific and practical perspective what contribution can be made by the design constructs, models and methods of the enterprise architecture discipline to the consideration and incorporation of social and cultural aspects of public organizations in the transformation of public organizations towards e-government remained unanswered. It was unclear how the discipline could be applied, so that social and cultural aspects of organizations are considered and incorporated into designs and how enterprise architectures could be evaluated with regard to these aspects.

The literature review that was presented in chapter 2 illustrated the relevance of social and cultural aspects of organizations to designs. For example, critical organization studies have asserted that the inexorable focus on functional rationality in organizational design can repress the critically rational individual in the interest of a machine-like system of organizational functionality (James and Jones 1976; Dalton, Todor et al. 1980; Trist 1981; Cooper and Burrell 1988; Cooper 1989; Mumford 2006). Critique of purely rationalist designs also appeared in traditional architecture

(Alexander 1965; Jacobs 1993; Choi 2007) in information systems science (Clancey 1993; Herrmann, Hoffmann et al. 2004; Iivari and Iivari 2011) and software engineering (Robinson, Hall et al. 1998; Noble and Biddle 2006) and in enterprise architecture (Clegg 2000; Appleton 2005). The findings of the first case study that were presented in chapter 4 revealed that aspects of the social and cultural context of the design of e-government could be characterized by individualization, informalization, professionalism, autonomy, self-determination, self-management, self-realization, decentralization (Clegg and Hardy 1996; Bekkers and Zouridis 1999; Schnabel 2000; Schnabel, Keuzenkamp et al. 2004; Vogelaar, Groenland et al. 2007; L. de Ruig, Kemper et al. 2008). The second case study, presented in chapter 5, also demonstrated the relevance of research into the consideration and incorporation of social and cultural aspects of organizations in enterprise architecture designs. In that case aspects of the social and cultural context of the design could be characterized by professionalism, autonomy, self-determination, self-management, self-realization, and decentralization (Wartna 2006; Wartna 2009).

The analysis of the case study findings demonstrated limited consideration given to the incorporation of the social and cultural context of a design in the created enterprise architectures, despite design contexts in which social and cultural aspects where clearly documented. The findings of the practitioner consultations (chapter 6) demonstrated what aspects enterprise architecture practitioners consider and incorporate in their designs. These findings were consistent with the findings in the case-studies. The overall analysis (chapter 7) demonstrated a limited consideration and incorporation of social and cultural aspects in enterprise architecture designs in e-government and led to the discovery of ten factors that influence how social and cultural contexts of designs can be considered and incorporated in enterprise architecture designs. It also revealed characteristics of the enterprise architecture discipline that are related to the consideration and incorporation of social and cultural aspects of organizations in enterprise architectures.

## 8.3   Review of the research questions

Four research questions were formulated in the introduction of this thesis to guide the research in attaining its objective. There now follows a discussion of what the research revealed about each of the research questions.

**1. How are social and cultural aspects considered and incorporated in architecture, organization science, information systems research and software engineering?**

The literature presented in the literature review demonstrates that in rationalist approaches in organization science, the focus in a design is on rationality and the ordered technical part of organizations. In socio-technical design approaches the design focuses on both the social and the technical system of organizations and the design objective is their joint optimization. (Trist 1981). According to the ETHICS method of Mumford (Mumford 1983), quality of socio-technical designs can be measured by reference to five criteria: (1) the knowledge fit of workers, in other words the skills of

employees; (2) the psychological fit, i.e. the personal interests of employees; (3) the efficiency fit, that is financial rewards and control systems and support services; (4) the task-structure fit, i.e. task differentiation; and (5) the ethical fit in terms of personal values. Data in the design process are gathered using interviews and questionnaires. No formal modelling techniques are used. The consideration and understanding of the culture of an organization is also important in the creation of socio-technical designs (Johns 2001; Johns 2006).

The research findings in the literature review (chapter 2) have been used to answer this research question. The literature demonstrated that the consideration and incorporation of social and cultural aspects of organizations are attended to in user-participatory design traditions in information science. These design methods consider both objective and subjective elements in designs, such as support for self-determination, self-reflection, social justice, and due process and human freedom (Hirschheim and Klein 1994). Participation approaches in information systems research aim at a high degree of user control in a design process, in requirements analysis, testing, and prototyping (Franz and Robey 1986; Kujala 2003; Markus and Mao 2004). Information systems science showed that the absence of a participation design tradition in a design discipline leads to limited user participation in the setting up of design processes and insufficient consideration of working life in designs. In information systems design it is important to analyse how individuals in organizations create and re-create meaning by means of information technology, how information systems influence social, cultural, political and economic relations, and how cultural systems and information systems influence each other (Robey and Azevedo 1994; Avison and Myers 1995; Gallivana and Sriteb 2005; Leidner and Kayworth 2006; Kappas and Rivard 2008). Efficiency, customer service and rationality are among the values that can be communicated through technical artefacts. In information systems research there are several different perspectives on the relationship between culture and information systems (Gallivana and Sriteb 2005). The evaluation of designs can be done using design approaches such as rapid prototyping and rapid ethnography (Millen 2000). The literature presented in chapter 2 demonstrates that giving consideration to social aspects of organizations in designs and implementing them in technical solutions is cumbersome, in view of the fluid and nuanced nature of social activity and conflicting goals between organization members (Ackerman 2000). The literature also demonstrates that it is difficult to define quality criteria for design artefacts and design processes that take account of social and cultural aspects of organizations (Kroes 2002). Quality criteria can be the usability, elegance and desirability of a design (Sharples, Jeffery et al. 2002). General human values and ethics can also be quality criteria (Friedman and Kahn 2002; Friedman, Kahn et al. 2006; Van den Hoven 2007).

The literature presented suggests that socio-technical design methods are not widely used and where they were applied, the technical systems still got the most attention (Eason 2001; Mumford 2006). The literature shows moreover that despite the developments in socio-technical design, computer supported cooperative work and other user participative design approaches developed in the last decades in order to foster user centred design, a design question remains how working life can be conceptualized (Iivari and Iivari 2011). Baxter and Sommerville (2011) questioned whether common constructs and models in information systems design and software

engineering are rich enough to capture and reflect the elements and characteristics of the organization's social system.

The literature review states also that social and cultural aspects of organizations are seldom taken into consideration in software engineering research (Ramesh, Glass et al. 2004). A rationalist top-down functional design method is in use since the 1970s (Elfatatry 2007). Since the 1990s the software engineering discipline has been searching for other design approaches (Robinson, Hall et al. 1998), and the need for socio-technical software development approaches has been recognized (Coyne 1997; Remenyi, White et al. 1997; Truex, Baskerville et al. 2000). New design approaches imply that efficiency, correctness are no longer an effective or useful guide to practice. Noble and Biddle (2006) asserted that a design should be a negotiation between many small stories. They refer to Wiki and Google as successful designs that are based on socio-technical assumptions.

## 2. How are social and cultural aspects of organizations considered and incorporated in enterprise architecture designs?

This research question was answered in chapter 7 using the enterprise architecture literature, the findings from the case studies, the expert panel, and the survey.

The overall conclusion is that enterprise architectures are rationalist representations of e-government characterized in the main by technical and traditional bureaucratic perspectives and a focus on operational efficiency. The designs are created by design professionals using a rationalist design approach. User participation in designs is absent, or in its infancy in the discipline in relation to e-government. The quality of working life is not considered to be a design parameter by enterprise architects. The challenge that the enterprise architecture discipline faces is to analyse and design the co-existence and interaction of complex, deterministic, and complicated, non-deterministic, systems (Wegmann 2003).

The research has also demonstrated that in the design methods of the enterprise architecture disciple quality criteria for designs are consistency and integration of 'hard' systems components such as applications, application interfaces and technical infrastructures. There are however no quality criteria for enterprise architecture designs relating to the quality of working life. Consequently, the quality of the translation of the quality of working life in structural representations of enterprise architectures can not be judged by the employees of the organization.

It has also been found that there is no tradition in the enterprise architecture discipline of considering the relationship between cultural values of organizations and enterprise architecture designs. Consequently, there is no framework that can be used to analyse and evaluate the relationship and the dependencies between an enterprise architecture design for e-government and social and cultural aspects of governmental organizations.

**3. How can the consideration and incorporation of social and cultural aspects in enterprise architecture designs in e-government be evaluated?**

The research demonstrates that the enterprise architecture discipline focuses on design constructs, models and construction methods. There is much less attention to the evaluation of designed artefacts. According to the design literature presented in paragraph 1.2 an evaluation of an artefact should be part of a design process. According to Simon (1996), such an evaluation can include the substance and organization of the artefact, the intended purposes of the artefact and the environment in which the artefact operates. No references were found in enterprise architecture literature to the evaluation processes of designs. No evaluation process for assessing whether the quality of working life has been considered and incorporated in designs was observed in the case studies either. An evaluation of designs can be carried out with design approaches such as rapid prototyping and rapid ethnography (Millen 2000). These kind of approaches have not been found in use with e-government. An evaluation process and assessment tools for enterprise architecture designs can be derived based on the research methodology and the research findings. The evaluation process is as follows:

1. The first step is to select the social and cultural aspects of the organization that need to be considered and incorporated in a design. The social and cultural aspects that were regarded as relevant to this research were presented in the research framework (Table 3) that was presented in the literature review (i.e. chapter 2), paragraph 2.4;
2. The second step is the determination of the value of these aspects in the context of the design. This has been carried out for both case studies and was presented in paragraphs 4.3 and 5.3;
3. The next step is to assess the enterprise architecture design, using the results of the previous step. This has been done in paragraphs 4.5 and 5.5 and presented in the diagram format in paragraph 7.2;
4. The next step is to consult the professionals that created the design. Therefore, an expert panel can be organized that consists of a representation of the designers to conduct a group interview regarding the consideration and incorporation of the social and cultural aspects in their design. The setting up and results of such an expert session were presented in paragraph 6.2. The results of such an expert meeting can be supplemented with results of a survey that has been sent to all, or a representative group of, design professionals who were involved in the design. The setting up, results and analysis of such a survey were presented in paragraph 6.3;
5. The next step is the analysis of the overall design, using the data gathered in the previous steps. The ten factors presented in paragraph 7.3 can be used to structure that analysis. In this research they were used for the analysis of the first case study. The results of that analysis were presented in paragraph 7.3;
6. The final step of an design artefact evaluation process is to analyse all the data, draw conclusions, review the conclusions and finalize them, as was done in chapter 7.

**4. What factors influence the consideration and incorporation of social and culture aspects of organizations in enterprise architecture designs?**

Based on the findings of this research ten factors have been identified that influence how enterprise architects consider and incorporate social and cultural aspects of organizations into their designs. Five factors are related to the enterprise architecture discipline and five factors to the organizational context of a design. These factors, their proposed interdependencies and an example of those factors in the design of e-government are presented in paragraph 7.3.

## 8.4   Contributions

The introduction of this thesis (chapter 1, paragraph 1.5) set out what contributions the thesis might take. The actual contributions can now be evaluated. They are divided into contributions to science, to practice, and to society.

### Contribution to science

In the literature presented in this research it was said that that design science traditionally focuses primarily on design methodology and not on the designed artefact (Kroes 2002). This thesis focuses primarily on designed enterprise architecture designs (the artefact). The research can claim, it is hoped, to contribute some insights into the nature of the enterprise architecture discipline, enterprise architecture artefacts and aspects of design methods regarding the consideration and incorporation of social and cultural aspects of organizations in enterprise architecture designs. There are also insights into factors that influence how these aspects are considered and incorporated, and how a design evaluation process can be designed and performed on enterprise architecture designs and design processes.

### Contribution to practice

The results of this research, especially the suggested evaluation process and evaluation tools, may enable enterprise architects to assess which social and cultural aspects of organizations should be considered and incorporated in an enterprise architecture design regarding the quality of working life, and to evaluate how they have been considered and incorporated in enterprise architecture designs. The ten factor model may be usable by practitioners to assess how likely it is that social and cultural aspects regarding the quality of working life are considered and incorporated in enterprise architecture designs.

The application of the theory of Lefebvre in the SVB case study in paragraph 5.5 demonstrates that it is be possible to apply some design knowledge from traditional architecture for the evaluation of enterprise architecture designs because both disciplines design and build spaces and can reflect on the effective production of that space and both physical structures and enterprise architectures are designed and built for

people. Lefebvre (1991 p. 33-46) reasoned about physical architecture on an abstract manner. As paragraph 5.5 shows, this kind of reasoning can be applied to the evaluation of enterprise architectures. An example to illustrate the reasoning on an abstract level about the production of space is the design and construction of a library. In a library both physical and abstract spaces exist together. The physical space is the building that houses the library and consists of several physical spaces for gatherings and reading. The enterprise architecture of a library is a representation of its abstract space and consists of its processes such as knowledge creation and knowledge consumption, and its applications such as Google, the Internet, Wiki, Facebook, and mobile applications that are used for finding, sharing and delivering knowledge. Because of this combination of physical and abstract spaces Brown (2006) regards libraries as an example of a combined future of architecture, information science, education and technology. It means also that the physical and abstract architecture of a library can be designed jointly by reasoning about its spaces on an abstract level. On that level the physical structure is the public space of gathering, learning and interacting with people and the enterprise architecture is the timeless abstract place of knowledge.

### Contribution to society

An issue reported in the design and implementation of e-government is to overcome the dominant focus on technology and traditional organization models in the design and implementation programmes and supporting organizations. These issues were described in paragraph 1.2. An insight of this research is that the evaluation process and tools can be used in the design phase of e-government reference architectures and enterprise architectures to evaluate how the quality of working life is considered and incorporated in the designs. In addition to that, the ten factor model can be used to assess how likely it is that social and cultural aspects of public organizations are is considered and incorporated in designs.

In 2008 the High Council of State in the Netherlands, a central government body established to ensure the proper functioning of the democratic system, concludes that business and ICT are separate domains in the implementation of e-government (Algemene Rekenkamer 2008). This thesis confirms that the application of user participated design methods and other design methods from the socio-technical design tradition is not widespread in the enterprise architecture discipline. It also demonstrates that these methods may be useful in the consideration and incorporation of the quality of working life in designs. This thesis also illustrates that information science research can be used to find out how socio-technical design methodologies could be applied in the context of e-government.

## 8.5  Limitations

This research took place in the context of e-government in the Netherlands. The literature presented demonstrates that the enterprise architecture discipline is not restricted to governmental environments, e-government or the Netherlands. It is a discipline that is used in public and private organizations, national and international.

The literature presented suggests that the enterprise architecture frameworks that are used in e-government do not differ fundamentally from frameworks that are used in other environments. The results of the expert panel and the survey suggest also that the results and conclusions in this research are not likely to be restricted to the public sector. However, more data are needed to support a generalization of the research findings beyond the context of e-government.

Another limitation is the non-probabilistic sampling approach that was used for the survey. In paragraph 3.5 it was described that the used availability sampling technique has the drawback that representativeness of the responses is limited to that portion of the population that has the same characteristics as the respondents. As paragraph 3.5 shows, such a sampling method is allowed for a survey that is used to assess the generalizability of case study findings.

Another limitation is the validation of the evaluation process, tools and the ten factor model. These results emerged from serious inquiry. However, they have been derived from two related case studies. More evidence is needed to prove the proper functioning of the evaluation process and tools. More evidence is also needed to prove that the ten factors and proposed relationships are good indicators of whether the social and cultural aspects of an organization have been given due consideration and incorporation into an enterprise architecture design.

## 8.6   Open issues

An contribution expected from this research was that it would add knowledge regarding the richness of enterprise architectural design constructs and models, enabling them to capture and reflect the social and cultural aspects of organizations. The proposition that embodies this expectation is the proposition that the conceptual models used in enterprise architecture frameworks in e-government do not support the incorporation of social and cultural aspects of organizations that can not be described formally. The research concluded that design constructs, models and methods cannot include all social and cultural aspects of organizations selected for enquiry here such as symbolism, shared identity and feelings of achievement. These aspects can be described in natural language, for example in the form of non-functional requirements. This has for example been proposed in the ETHICS method of Mumford (Mumford 1983). These requirements can be tested in acceptance processes of designs. However, how can these subjective aspects be objectively accepted since they have different meanings to different people? This question remains open.

## 8.7   Future research

Future research is needed to enhance the richness of enterprise architectural design constructs, models and methods, and to allow them to capture and reflect the quality of working life in all layers of enterprise architecture designs.

The ten factor model presented here assumes relationships between enterprise architecture factors and organizational factors and the incorporation of social and cultural aspects of organizations in designs. Further research and more empirical data are needed to assess how the ten factors influence each other.

The evaluation process presented in this research has been tested on the cases in this research. More empirical data are needed to demonstrate the usefulness of this evaluation process to other designs.

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# A   List of abbreviations

| Abbreviation | Meaning |
| --- | --- |
| BPMN | Business process modelling notation |
| CAOP | A knowledge centre in the Netherlands with regard to labour market and labour relations in the public domain |
| CSCW | Computer Supported Cooperative Work |
| EA | Enterprise Architecture |
| EAM | A Dutch Enterprise Architecture conference |
| ERP | Enterprise resource planning |
| ETHICS | Effective Technical and Human Implementation of Computer-based systems |
| FRISCO | Framework for Information System Concepts |
| GERAM | Generalized Enterprise Reference Architecture and Methodology |
| GST | General systems thinking |
| iBVM | The new integrated business model of the SVB |
| ICT | Information and communication technology |
| ICTU | The Dutch ICT implementation organization |
| IEEE | Institute of Electrical and Electronics Engineers |
| IFAC | International Federation of Automatic Control |
| IFIP | International Federation for Information Processing |
| IOR | Integral Organization Renewal |
| IS | Information system |
| IT | Information technology |
| IWI | The Work and Income Inspectorate |
| MRP | Materials requirements planning |
| MRP II | Manufacturing resources planning |
| NAF | The Dutch Architecture Forum |
| NORA | The Dutch general reference architecture |
| PORGI | Planning Tools for the Organizational Implementation of Computer-based Information Systems |
| SEAM | Systematic Enterprise Architecture Methodology |
| STD | Socio technical design |
| SVB | Sociale Verzekeringsbank |
| TOGAF | The Open Group Architecture Framework |
| UML | Unified modelling language |
| WRR | The scientific counsel for government policy in the Netherlands |

# B   List of figures

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# D Publication

During this research an article has been published regarding modelling experience in the SVB case. This article is:

Coenen, A., B. van Gils, C. Bouvy, R. Kerkhofs & S. Meijer (2010, 9-10 November). Business modelling experience for a state pension voluntary insurance case. paper presented at the 'The Practice of Enterprise Modelling', Delft.

Abstract:
The Dutch governmental Sociale Verzekeringsbank (SVB) recently completed a project on business modelling. The aim was to develop business models that express the strategic goals of customer event orientation, integrated customer services, as well as improved agility. An approach was chosen to combine event definition, dynamic process modelling and business rules. In this paper the findings are presented. Main conclusion is that, although we used some best practices and common techniques, we had to invent our own ways to combine event definitions, dynamic processes, object models and business rules.

# E    Summary

E-government has been defined as government in which interaction between government and citizens takes place as much as possible through electronic means. Its aim is to enhance service delivery, law-enforcement, and citizen participation. A major service delivery concept in e-government is 'OneStopShop government'. This is an approach to integrating public service delivery from a citizen's, or public services customer's, point of view. One of the issues that has been much commented on with respect to e-government is how to overcome the dominant focus on technology and on traditional organization models in the design and implementation programmes. Workers involved in e-government experience their work as essentially the execution of highly prescribed protocols that have been implemented in information systems, and as governed by information technology (ICT), and that close supervision by management continues. As a result, they regard information systems and information technology as a burden and a straight-jacket. The introduction of e-government has been treated by government as largely a technical operation and the design and implementation of e-government focus almost solely on ICT and on the technical aspects of government transformation. But e-government is, or should be, about business processes, organization, and people as well. The management of an implementing organization that was in the process of implementing e-government and a new business model in which employees were treated as professionals also expressed their concerns about the dominant focus on ICT and technology, and the role of employees in e-government designs. The question they raised was how workforce preferences, such as professionalism and individualism are taken into consideration by designers and incorporated by them in their designs.

The enterprise architecture discipline is frequently used to design and implement e-government. 'Enterprise architectures', which have been in use in e-government since the 1990s, describe enterprises in terms of organizational structure, business processes, information systems, software, and technical infrastructures. They describe both actual and optimal organization and information systems, and attempt to facilitate the transition from the former to the latter by providing insights in the consistency and dependence between the different parts of enterprises. This holistic, integrated view of enterprises also defines the scope of enterprise architecture as a discipline, which works at the level of the complete enterprise. A definition widely used amongst enterprise architects is based on the definition of ISO/IEC 42010:2007, the Standard for Architectural Description of Software-Intensive Systems: "*Architecture is the fundamental organization of a system embodied in its components, their relationships to each other and to the environment and the principles guiding its design and evolution*". The enterprise architecture discipline originates from software engineering and information systems development and emerged in response to the increasing complexity and size of information systems, and the problems of managing and integrating all the information system components of organizations. The original focus was on defining and controlling the interfaces and integration of all components of information systems. The enterprise architecture discipline applies design knowledge

from a number of disciplines such as software engineering, information systems research and organization science.

Design can be regarded as a problem solving activity comprising both a process and a processed artefact. A design ideally aims at the creation of artefacts that are encapsulated in rich contexts of organizations, such as structures, routines, norms and values. The challenge of design is to create artefacts that fit into their context and deliver a solution to a stated problem. Design research seeks to enhance human and organizational possibilities, in order to create new and innovative artefacts. It stimulates critical thinking and focuses on the development and justification of theories that explain or predict phenomena related to the analysis, implementation and use of artefacts. It addresses important issues left unresolved in enterprise architecture designs, notably how to give due consideration to the social and cultural aspects of organizations and incorporate them in designs. It includes investigation of new ways to make designs more efficient or effective. Design theory deals with the creation of artefacts that support the achievement of goals, given the context in which the achievement takes place. It can be regarded as a prescriptive and normative theory that states how a design process should be carried out in a certain context to reach a predetermined goal. Design research focuses on utilization, and the epistemological stance of design science is pragmatism. Key products of design research are constructs, models, and methods. Key questions in design science are whether the artefacts so produced are viable, and whether there is a fit between them, the problem they are intended to solve, and the context in which they are positioned. Artefacts must be not only created but also evaluated, since artefacts are designed to solve problems, and whether they have indeed done so is a matter that demands evaluation.

The metaphor of architecture is used in the discipline to symbolize the complexity and size of information systems. There are many parallels between architecture in the traditional sense of the art and technique of designing and building edifices and enterprise architecture. Both disciplines, for example, concern the production of space. Architecture produces physical space and enterprise architecture produces abstract space. In architectural practice the building environment is a social, political and cultural construction in which the design professional plays a central role. Marcus Vitruvius Pollio stated that the end of architecture is a physical building that has the qualities of durability, usefulness and beauty. In this sense the product of architecture is more than just a building: it expresses some feeling, and its meaningfulness will reflect and depend upon the way and order in which its parts are combined and fit into its social and cultural context. Rationalist design approaches are widely used in the enterprise architecture discipline. They are used too in organization science. These approaches were based on the belief that the world is composed of rationalist design problems that can be solved in terms of requirements, constructs, models, principles and implementations. Concepts from general systems theory (such as import, conversion and export processes) are applied in rationalists design approaches to support organizational phenomena. The socio-technical approach to design defines organizations by their sets of social activities, social groupings, social relations and their deliberately established purpose or goal. An organization is here regarded as the combination of a social system and a technical system that need to be jointly optimized and in which culture plays an important role. The socio-technical systems design

approach was developed in order to create designs that are able both to perform according to requirements and satisfy their users. In the socio-technical design method of organizations and information systems the technical system is the processes, tasks and technologies that transform inputs into outputs and the social system is concerned with attitudes, skills, beliefs and values. Social phenomena include both subjective and objective elements. Because a social system consists of objective structures and conditions together with subjective human actions and perceptions, socio-technical design approaches need to incorporate both an objectivist and a subjectivist approach. A socio-technical design approach can also be used to evaluate how a design system influences the social and technical systems of the organization (and presumably vice versa**)**. Such an approach can provide a framework for analysing the quality of designs and explaining why designs are sometimes accepted only reluctantly.

In their emphasis on technical systems, enterprise architects seem to neglect human aspects of organizations. Organizational change initiatives predicated on the introduction of IT can fail or stall because they do not address social aspects such as distinctively individual behaviour, or the culture of the organization. Enterprise architectures of this sort are often criticised as deterministic, neglecting the autonomy of humans, and lowering organizational flexibility. These criticisms parallel the much-commented on technological myopia of e-government. However, when official reports recommend that the dominance of technology should be reduced, they do not concentrate on either the design process itself or the designed artefacts. The question they leave unanswered is whether it is the design constructs, models and methods that the enterprise architecture discipline uses in the context of e-government that perhaps themselves contribute to this technical focus. The objective of this study is to explore, in the context of e-government, whether social and cultural aspects of public organizations should be taken into consideration in the design methods and incorporated into the design constructs, models, and principles of the enterprise architecture discipline. The study aims to develop knowledge that can enhance the evaluation of the enterprise architecture designs of e-government in terms of their ability to accommodate social and cultural considerations, when the problem statement, or the context, of design tasks requires it. Of the various design approaches, it is the socio-technical design tradition that is used here. Organizations are defined in this study by their sets of social activities, social groupings, social relations and their deliberately established purpose or goal. Of all possible social and cultural aspects of organizations, only those related to the quality of working life are taken into consideration here. This piece of research can be characterized as exploratory; it contains two case studies supplemented by an expert panel and a survey and can therefore be classed as a 'sequential mixed method study'. A literature review is used to explore which social and cultural aspects of organizations are attended to in the socio-technical design tradition. The findings of the literature were used to create a research framework composed of the social, cultural and temporal aspects of organizations that are important in the socio-technical design tradition. This framework has then been used to evaluate enterprise architecture designs. One case study of the design of Dutch reference architectures and another dealing with an enterprise architecture design in a governmental organization are used to explore how public bodies have incorporated social and cultural considerations in their enterprise architecture designs, and what factors were at work here. An expert panel and a survey

have been included in order to assess the level of transferability of the case study findings.

The findings demonstrate that designs can deal with the elements of the framework in three possible ways: (1) no consideration, or consideration but no incorporation; (2) consideration and incorporation but no alignment between the elements of the framework and those of the enterprise architecture design; (3) consideration, incorporation, and alignment between elements of the framework and those of the design. The first possibility, no consideration in the design process, can be the result of deliberate choice, for example when the management of an organization decides that their enterprise architects should ignore these aspects, or unintentional, for example because the aspect is overlooked by the designers. Alternatively some aspect of the framework is given some consideration, but is not incorporated in the design at all, with no evidence of any such consideration in the design documents themselves. The second possibility, namely consideration in a design process and incorporation in a design, but with no alignment with one or more elements of the enterprise architecture, can for example occur when self-regulation for employees (a social element) is specified formally as a business requirement, but remains unimplemented. Both consideration and alignment, the third possibility, means that an element of the framework has been given consideration in a design process, and is included and aligned with design elements. Research findings indicate varying degrees of incorporation of the elements of the research framework in enterprise architectures designs. The degree of incorporation can be: (1) descriptive, which means that the element is specified in general and possibly ambiguous terms, for instance as 'requirements'; (2) normative in principles where the element is described in verifiable rules using unambiguous natural language; (3) normative in business logic, when formal constructs and models of the business architecture layer are used to represent the element; (4) normative in application logic: formal constructs and models of the application architecture layer are used to represent the element; and (5) normative in technical terms, which means that formal constructs and models of the technical architecture are used to represent the element. An element of the framework is fully incorporated in a design if it is included in all five levels.

The research data show that almost all social aspects included in the research framework were given some consideration in e-government designs, but only at the descriptive level. The social aspects of organizations were less aligned with the normative levels of the architecture and there was no consideration of these aspects in the application and technical layers of the designs. There the focus was not on the quality of working life but on the efficiency of business processes in delivering products and services. The cultural aspects of organizations were neither considered nor included in the designs of e-government examined in this thesis. The same applies to the temporal aspects of public organizations.

A number of factors seem to influence how enterprise architects incorporate social and cultural aspects of organizations into enterprise architecture designs. They are: (1) *the definition of what an enterprise architecture is*; (2) *the role and position of enterprise architects within an organization*; (3) *the design tools enterprise architects use, such as frameworks, methods and languages*; (4) *the training and experience of enterprise architects*; and (5) *the personality of enterprise architects*. But apart from the

factors related to the enterprise architecture discipline itself, there are also organization and management factors that appear to influence how enterprise architects deal with social and cultural aspects of enterprises in their designs. These factors are: (1) *how business management reacts upon social and cultural aspects*; (2) *the management's view of the nature of social and cultural aspects*; (3) *the separation of an organization, or change program, into a business part and an ICT part*; (4) *the composition of the design team*; and (5) *management perceptions of the enterprise architecture discipline and its practitioners*. These ten factors, moreover, do not stand in isolation. There are interactions between them. For instance, if enterprise architecture is understood to *include* social and cultural aspects of organizations, that presumably has a positive effect on the incorporation of those aspects in a design. On the other hand, their *exclusion* probably has a negative influence on the whether and how they are considered and incorporated in designs. Such interactions were not explicitly studied in the research.

In sum: the definition of what an enterprise architecture is, the role and position of enterprise architects in organizations, and management's perception of enterprise architects and their discipline all have considerable impact on the manner and extent to which social and cultural aspects of organizations are accommodated in enterprise architectures. Information systems research for its part also itemizes factors that influence the design quality of information systems and acceptance of a design by users. Almost all the factors this study identifies also appear in information systems research. Only what pertains specifically to the definition of enterprise architecture, the role and position of enterprise architects and business management perceptions of the enterprise architecture discipline and its practitioners are distinctive. Another new aspect is that in this research all these aspects are considered in relation to each other.

The thesis formulates and tests a number of propositions. Evaluation of these propositions allows the conclusion that enterprise architects regard organizations as rational, ordered, programmable systems that are goal-driven and have interacting elements that can be 'engineered'. Enterprise architects emphasize that their designs demand a holistic, integrated view of all aspects of enterprises. However, these designs focus exclusively on the functional and technical aspects of enterprises, on engineering and integrating different organizational components and interfaces. The research undertaken for this thesis confirms that enterprise architects acknowledge the importance of social, cultural and temporal aspects of organizations, and of giving them due weight in designs. In fact, however, the discipline does not assign *equal* importance to social, cultural and technical aspects of organizations in design processes. The social and cultural aspects of organizations that the research framework of this thesis includes get hardly any attention: they are valued as aspects of the nature of organizations, but they are not regarded as design parameters. The good intentions of design professionals about paying due attention to the social and cultural aspects of organizations are not reflected in their designs, which are preoccupied with the attainment of some goal or purpose of enterprises. Enterprise architects appear to be constrained in giving social and cultural concerns due weight by the ten factors described earlier. However, the work presented here does not indicate that the conceptual design models of enterprise architecture frameworks *exclude* the incorporation of the social and cultural aspects of organizations. These aspects can be described in natural language terms as (for

example) requirements, design principles or by means of metaphors. The research findings show that if enterprise architects were to consider and incorporate social aspects of organizations into their designs, they would *pari passu* incorporate employee roles, decisions employees can call their own and possibilities for self determination. The findings also suggest that enterprise architects are more likely to incorporate social aspects of organizations into designs when they are more convinced that a design can allow for intuition, informality and disorder, and when they address the alignment of a design with the social aspects of organizations in design processes. This is less likely when they regard incorporating decisions employees can call their own or possibilities for self regulation as unimportant. Furthermore, the research findings suggest that enterprise architects are somewhat confused about whether feelings of employees of achievement and recognition should be taken into account.

As regards the cultural aspects of organizations, the research demonstrates that enterprise architects do not regard an enterprise architecture as an instrument for enforcing the cultural values of organizations. If they were to consider the cultural aspects of organizations, they would be likely to incorporate cultural elements such as norms and values into their designs. Their designs generally disregard symbolic cultural elements. Consequently, the rationalist designs that enterprise architects create may provoke unwanted bureaucratic symbolism for its users. Organizational dynamics are another complicating factor in such designs, and so are timing aspects. As a result, the temporal aspects of organizations are usually simplified in enterprise architecture designs.

The first conclusion of this study is that the rationalist nature and positivistic philosophical stance of the enterprise architecture discipline is conspicuous in the design constructs, models and methods the discipline uses in e-government. This leads to functionalist approaches that marginalize social sense-making, the creation of shared understandings and ethical imperatives of work arrangements. It also conduces to an engineering perspective on e-government concepts, governmental organizations and organizational life, and promotes an emphasis on what is programmable. This is why the social and cultural aspects of organizations this research is concerned with are seldom attended to in designs. Another conclusion is that as far as the enterprise architecture is concerned, a user participation design tradition such as socio-technical design is still absent or in its infancy. This research confirms previous research findings in information systems that the absence of a participation tradition in a design discipline reduces the quality of designs from a user perspective. A third conclusion is that as regards e-government, the discipline focuses on design constructs, models, construction methods and to a lesser extent on the evaluation of designed artefacts. This research has not found any design evaluation. A forth conclusion is that in the design methods of the discipline, as far as e-government is concerned there are indeed quality criteria for consistency and integration in the design of 'hard' systems components, such as software applications, application interfaces, and technical infrastructures, but no such criteria for the consideration of social and cultural aspects of organizations. Consequently, the possible gap between social and cultural aspects of organizations and those incorporated in designs cannot be assessed. The research process that was designed and used in this thesis and the social and cultural aspects of organizations that were of central concern demonstrate that an evaluation of the consideration and incorporation of social and

cultural aspects of organizations in enterprise architecture designs is indeed feasible. The fifth conclusion of this research is that there is no tradition in the enterprise architecture discipline of considering culture in relation to designs. Consequently, there was no design framework that can be used to analyse and evaluate the relationship between an enterprise architecture design and the culture of the organization it is designed for. The research framework (Table 3), the research process that was designed and used to analyse and evaluate enterprise architecture designs, and the ten factor model in this thesis can all be used for that purpose. A final comment is that the results of this study give cause to assume that the results and conclusions of this thesis are not likely to be restricted to the investigated cases.

# F    Samenvatting (Summary in Dutch)

E-overheid, of elektronische overheid, is gedefinieerd als een overheid waarin de interactie tussen overheid en burgers zoveel mogelijk plaatsvindt met behulp van elektronische hulpmiddelen en heeft als doel om dienstverlening, handhaving en participatie te verbeteren. Een belangrijk concept daarin is een dienstverlening waarbij burgers en ondernemers zich slechts tot één loket hoeven te wenden om de publieke diensten te verkrijgen die zij in een bepaalde situatie, zoals een huwelijk of de oprichting van een onderneming, nodig hebben. Deze dienstverleningsvorm wordt ook wel omschreven als OneStopShop-overheid. Een probleem dat in diverse publicaties over het ontwerp en de implementatie van e-overheid naar voren komt, is dat zij een dominante focus hebben op technologie en dat traditionele organisatiemodellen ontworpen en geïmplementeerd worden. Ook is gerapporteerd dat medewerkers zich belemmerd voelen in hun handelen vanwege de ICT-toepassingen die nodig zijn in e-overheid, en dat de bedrijfsvoering en ICT in het ontwerp gescheiden werelden zijn. Een vraag van het management van een uitvoeringsorganisatie die direct betrokken was bij de implementatie van e-overheid en die een bedrijfsvoeringsmodel wilde implementeren waarbij medewerkers veel professionele zelfstandigheid kregen was bijvoorbeeld op welke wijze trends zoals professionalisering en individualisering van medewerkers beschouwd worden door ontwerpers en opgenomen worden in nieuwe ontwerpen.

      Om e-overheid te kunnen realiseren wordt in de ontwerp- en implementatiefase veelvuldig gebruik gemaakt van de enterprise-architectuurdiscipline. 'Enterprise-architecturen' beschrijven organisaties in abstracte termen en kunnen een organisatietransitie ondersteunen door het leveren van inzicht in de afhankelijkheden en samenhang tussen verschillende organisatieonderdelen gedurende een organisatieverandering. De holistische blik van de discipline op organisaties bepaalt tevens de scope van de discipline: de gehele onderneming. Een enterprise-architectuur is benodigd om integratie van en consistentie tussen alle verschillende onderdelen waaruit een organisatie is opgebouwd te bewerkstelligen. Enterprise-architecturen bevatten daarom de componenten van een organisatie zoals de organisatiestructuur, bedrijfsprocessen, informatiesystemen, technische infrastructuur en de interfaces tussen die componenten. De discipline is relatief jong. Een veelgebruikte definitie van enterprise-architectuur beschrijft dat architectuur de fundamentele organisatie is van een systeem, opgebouwd uit componenten, relaties tussen componenten en met de omgeving, en principes die het ontwerp en de doorontwikkeling ervan begeleiden. Een kernpunt in enterprise-architectuur is dat verschillende perspectieven tegelijkertijd beschouwd kunnen worden. Elk perspectief behoort tot een belanghebbende van de enterprise-architectuur en beschrijft de definitie, betekenis en noodzaak van de architectuur vanuit het gezichtspunt van die belanghebbende.

      Het maken van passende ontwerpen is een centraal element in een aantal disciplines die gerelateerd zijn aan enterprise-architectuur, zoals 'traditionele' architectuur, organisatiekunde, informatiesystemen en softwareontwikkeling. Het ontwerpen kan gezien worden als een probleemoplossende activiteit die zowel een ontwerpproces, 'het ontwerpen', alsook een ontwerpproduct, het ontworpen artefact,

omvat. Een ontwerpopdracht richt zich op het creëren van een artefact dat past in de context van het ontwerp, zoals normen en waarden van een organisatie. Daarbij moet het een oplossing leveren voor een bepaald ontwerpprobleem, zoals elektronische dienstverlening aan burgers. Een artefact kan fysiek, elektronisch, of abstract zijn en is toepasbaar als er een fit bestaat tussen het ontwerp, de oplossing en de context waarin deze geplaatst wordt. Wetenschappelijk onderzoek dat gericht is op het maken van enterprise architectuurontwerpen adresseert belangrijke issues zoals het beschouwen en opnemen van sociale en culturele aspecten van organisaties in gecreëerde ontwerpen. De epistemologische grondhouding in ontwerponderzoek is het pragmatisme. Constructen, modellen, en ontwerpmethoden zijn basisproducten van ontwerponderzoek. Het levert over het algemeen geen generaliseerbare bevindingen op omdat het vrijwel altijd plaatsvindt binnen een specifieke context. Ontwerponderzoek heeft tot doel om menselijke mogelijkheden, en het functioneren van organisaties te verbeteren door middel van het creëren van nieuwe en innovatieve artefacten. Het stimuleert een kritische beschouwing van ontwerpen, zoals de wijze waarop sociale en culturele aspecten van organisaties worden meegenomen in ontwerpen. Het houdt zich bezig met het creëren van wetenschappelijke, en daarvan afgeleide praktische kennis omtrent het maken en evalueren van artefacten.

De metafoor van architectuur wordt gebruikt in de enterprise-architectuurdiscipline om de complexiteit en omvang van organisatiebrede informatiesystemen te symboliseren. Een belangrijke overeenkomst tussen enterprise-architectuur en 'traditionele' architectuur is dat beide disciplines bijvoorbeeld gericht zijn op het produceren van ruimten. Enterprise-architectuur creëert abstracte ruimtes en traditionele architectuur levert fysieke ruimtes op. In traditionele architectuur bestaat de ontwerpcontext uit sociale, politieke en culturele aspecten. Marcus Vitruvius Pollio was de eerste architect die ook schoonheid beschreven heeft als wezenlijk onderdeel van het resultaat van architectuur. Volgens hem levert architectuur gebouwen op die degelijk, bruikbaar, en mooi zijn. In die zin levert architectuur meer op dan alleen een fysiek gebouw. Rationalistische ontwerpmethoden zijn, net zoals in de organisatiekunde, wijdverbreid in architectuur. In organisatiekunde is de rationalistische ontwerpaanpak gebaseerd op de systeemtheorie van Bertalanffy waarin uitgegaan wordt van een geordende en objectieve werkelijkheid. In informatiesystemen en softwarebouw gaat de rationalistische ontwerpaanpak ervan uit dat er een formeel conceptueel schema bestaat dat de objectief waarneembare essentie van organisaties kan weergeven. Een andere ontwerpschool beschouwt organisaties als een stelsel van sociale activiteiten, sociale groepen en sociale relaties die kiezen voor de realisatie van onderling bepaalde doelstellingen. In deze 'sociaaltechnische' ontwerpschool is een organisatie een combinatie van een sociaal en een technisch systeem die beide geoptimaliseerd zouden moeten worden en waarin organisatiecultuur een belangrijke rol speelt. De sociaaltechnische ontwerpschool pleit ervoor om ook de sociale processen van organisaties te beschouwen en te incorporeren in het ontwerp van (informatie)systemen. Sociaaltechnische ontwerpmethoden zijn ontwikkeld om ontwerpen te maken die zowel functionaliteiten bevatten, als ook voldoening geven aan de gebruikers ervan. In sociaaltechnisch ontwerp wordt daarom gezocht naar een evenwicht tussen technische en sociale aspecten zoals gedrag, vaardigheden en waarden van medewerkers.

Zoals aangegeven zijn er officiële rapporten waaruit blijkt dat het ontwerp en de implementatie van e-overheid een dominante technologische focus heeft. Dit is consistent met de wetenschappelijke literatuur waaruit een beeld naar voren komt dat enterprise-architecten veel aandacht besteden aan de technische aspecten van organisaties, met als gevolg dat het sociale systeem van organisaties om het gerealiseerde technische systeem heen ontworpen lijkt te worden. Aanbevelingen in de officiële rapporten uit de publieke sector om de implementatie van e-overheid minder technologisch te maken richten zich bijvoorbeeld op de besturing van het implementatieproces, maar niet op het ontwerpproces en zijn artefacten. Om die reden is de vraag onbeantwoord wat de bijdrage aan de technologische focus is van de constructen, modellen en methoden die enterprise-architecten hanteren in e-overheid. De doelstelling van dit onderzoek is daarom om in de context van e-overheid te ontdekken hoe sociale en culturele aspecten van publieke organisaties beschouwd en meegenomen worden in enterprise-architectuurontwerpen en welke factoren daarbij een rol spelen. Het streven van dit onderzoek is om kennis te vergaren die toegepast kan worden om te evalueren hoe bepaalde sociale en culturele aspecten van publieke organisaties vanuit een sociaaltechnisch ontwerpperspectief in enterprise-architectuurontwerpen worden meegenomen. Dit onderzoek past daarom bij de sociaaltechnische ontwerpschool en beschouwt organisaties als het samenstel van een technisch en een sociaal systeem. Het uitgevoerde onderzoek is verkennend van aard en is in essentie een casestudieonderzoek waarin twee casestudies zijn uitgevoerd, een expertpanel is georganiseerd en een enquête is afgenomen. Het expertpanel en de enquête zijn toegevoegd aan het onderzoek om de mate van generaliseerbaarheid van de casestudieresultaten te bepalen. De eerste casestudie betrof het ontwerp van de Nederlandse referentiearchitectuur genaamd NORA en de daaruit afgeleide referentiearchitecturen. De tweede casestudie betrof de uitwerking van NORA in de omgeving van de Sociale Verzekeringsbank. Op basis van een literatuuronderzoek is een raamwerk opgebouwd met daarin bepaalde sociale en culturele organisatieaspecten en daaraan gerelateerde tijdsgebonden aspecten die een rol spelen in een ontwerp, uitgaande van een sociaaltechnische ontwerptraditie. Dit raamwerk is gebruikt om te analyseren en te evalueren hoe die aspecten beschouwd en meegenomen zijn in de ontwerpen en welke factoren daarbij van invloed waren. Ook is onderzocht op welke wijze enterprise-architecten zelf met die aspecten omgaan in hun ontwerpactiviteiten.

De onderzoeksdata wijzen uit dat er drie typen beschouwingen voorkomen van de geselecteerde sociale en culturele aspecten in ontwerpactiviteiten: (1) geen beschouwing, en dus ook geen incorporatie van de aspecten in een ontwerp; (2) wel een beschouwing en incorporatie van de aspecten in het ontwerp, maar geen uitlijning tussen de aspecten en architectuurelementen; (3) wel een beschouwing en ook een uitlijning tussen de aspecten en de architectuurelementen. Uitlijning kan plaatsvinden op de verschillende lagen van een enterprise-architectuur. Een aspect kan bijvoorbeeld alleen op het niveau van bedrijfseisen ('requirements') beschouwd en afgestemd zijn en verder niet. Ook kan een aspect volledig in lijn zijn met alle algemeen gangbare architectuurlagen, zoals de bedrijfsarchitectuurlaag, applicatiearchitectuurlaag en technische architectuurlaag. In meer abstracte termen betekent dit dat de aspecten in beschrijvende en in normatieve zin kunnen zijn meegenomen in een ontwerp. Beschrijvend betekent dat daarmee niet de norm gesteld wordt voor de inhoud van de

bedrijfsarchitectuur, applicatiearchitectuur en technische architectuur. Het kan bijvoorbeeld in de bedrijfsarchitectuur beschreven zijn dat medewerkers de mogelijkheid hebben om hun eigen werk te plannen en te organiseren. Deze beschrijving kan echter door ontwerpers niet als norm gehanteerd worden voor het ontwerp van de applicatielaag. Met als mogelijk gevolg dat de beschreven ruimte voor medewerkers door enterprise-architecten ingeperkt wordt in de applicatielaag door bijvoorbeeld applicaties te ontwerpen waarmee de werkallocatie volledig geautomatiseerd wordt. De onderzoeksdata geven ook aan dat er vijf niveaus van incorporatie bestaan van de sociale, culturele en tijdsgebonden aspecten van organisaties in enterprise-architecturen: (1) beschrijvend, dit betekent dat een aspect is beschreven in requirements met behulp van algemene termen in natuurlijke taal; (2) normatief in principes, dit betekent dat een aspect ondubbelzinnig beschreven is in algemene en controleerbare regels met behulp van natuurlijke taal; (3) normatief in bedrijfslogica, dit betekent dat een aspect in de bedrijfsarchitectuurlaag is weergegeven met behulp van formele, en dus toetsbare, constructen en modellen; (4) normatief in applicatielogica, dit niveau van incorporatie betekent dat een aspect is weergegeven met behulp van formele constructen en modellen in het applicatieontwerp; en (5) normatief in de technische infrastructuur, dit betekent dat formele constructen en modellen zijn gebruikt om het aspect weer te geven op technisch niveau. Een element uit het raamwerk is volledig geïncorporeerd in een ontwerp als het is beschouwd en opgenomen in alle vijf de niveaus.

De onderzoeksdata geven aan dat van alle sociale, culturele en tijdsgebonden aspecten uit het raamwerk alleen de *sociale* aspecten beschouwd worden in e-overheid, en dan vrijwel alleen op een beschrijvend niveau voorkomen in ontwerpen. De sociale aspecten van overheidsorganisaties zijn niet beschouwd op de applicatielaag en technische laag van de enterprise-architectuur. Op normatief niveau zijn in alle onderzochte enterprise-architecturen inconsistenties naar voren gekomen tussen de sociale aspecten van overheidsorganisaties en de vertaling daarvan in architectuurelementen, met name in de applicatiearchitectuurlaag en de technische infrastructuurlaag. Het ontwerp van die lagen was gericht op het zo efficiënt mogelijk leveren van producten en diensten aan burgers zonder dat daarbij aandacht besteed werd aan de eisen en wensen van medewerkers ten aanzien van hun werkomgeving. De onderzoeksdata wijzen verder uit dat *culturele* en *tijdsgebonden* aspecten uit het framework niet beschouwd zijn in de ontwerpen en dus ook niet zijn opgenomen in de onderzochte enterprise-architecturen.

Naast deze constateringen zijn tien factoren in het onderzoek geïdentificeerd die een rol kunnen spelen bij het beschouwen en incorporeren van de sociale en culturele aspecten van overheidsorganisaties. Vijf van deze factoren zijn toe te wijzen aan de enterprise-architectuurdiscipline en vijf factoren zijn organisatiekundig van aard. De vijf enterprise-architectuur factoren zijn: (1) *De definitie van wat een enterprise-architectuur is*. Uit het literatuuronderzoek is naar voren gekomen dat er veel definities van enterprise-architectuur zijn. Uit de onderzoeksresultaten is gebleken dat het daardoor moeilijk is om te bepalen wat de inhoud van een enterprise-architectuur is en wat de waarde daarvan is voor een organisatie waarbinnen enterprise-architectuur wordt toegepast; (2) *De rol en positie van de enterprise-architect*. Deze factor is gerelateerd aan de onduidelijke definitie van wat een enterprise-architectuur is. De onderzoeksdata

wijzen uit dat die onduidelijke definitie leidt tot een onduidelijke positie en rol van de enterprise-architect binnen organisaties; (3) *De constructen, modellen, methoden en raamwerken die gebruikt worden door enterprise-architecten.* Uit de resultaten van het onderzoek blijkt dat die instrumenten weinig houvast bieden om de geselecteerde sociale en culturele aspecten van organisaties te beschouwen en op te nemen in enterprise-architectuurontwerpen; (4) *Training en ervaring van enterprise-architecten.* De onderzoeksresultaten laten zien dat er weinig aandacht is voor de gekozen sociale en culturele aspecten van organisaties in de opleiding en ervaring van enterprise-architecten, en dat enterprise-architecten vaak geschoold en ervaren zijn in het technische domein en weinig tot geen kennis van en ervaring met ontwerpaspecten van het sociale en culturele domein van organisaties hebben; en (5) *De persoonlijkheid van enterprise-architecten.* De resultaten van het onderzoek geven ook aan dat deze factor een rol speelt in het beschouwen en incorporeren van de sociale en culturele aspecten van organisaties in enterprise-architectuurontwerpen, en verder dat enterprise-architecten een ontwerpopdracht benaderen met een positivistische grondhouding en organisaties benaderen vanuit een ingenieursperspectief. De vijf organisatiegebonden factoren zijn: (1) *de benadering van de sociale en culturele aspecten van organisaties door het management van de organisatie.* Een puur rationalistische managementbenadering benadrukt de technische en ordelijke kant van de organisatie, met als waarschijnlijk gevolg een technische benadering van de enterprise-architectuur; (2) *de grondhouding van management ten aanzien van de aard van de sociale en culturele aspecten van een organisatie.* Een grondhouding kan zijn dat de sociale aspecten per definitie subjectief en dynamisch van aard zijn en daarom niet te beschouwen zijn in enterprise-architectuurontwerpen. Ook de culturele aspecten kunnen zodanig beschouwd worden. Daarbij kan een grondhouding zijn dat er niet één cultuur is, maar diverse, bijvoorbeeld per subgroep binnen een organisatie één cultuur. Daarbij kan de aanname zijn dat medewerkers behoren tot meerdere subgroepen en daardoor beïnvloed worden door meerdere culturen. Een ander basishouding kan zijn dat er één (dominante) cultuur is waarbij die culturele waarden met behulp van een enterprise-architectuur ondersteund kunnen worden; (3) *de wijze waarop een ontwerpactiviteit al dan niet is gescheiden wordt in een organisatie- en een ICT-werkdomein.* De data in dit onderzoek wijzen uit dat een scheiding tussen organisatie- en ICT-aspecten het beschouwen en incorporeren van sociale en culturele aspecten door enterprise-architecten bemoeilijkt; (4) *de samenstelling van het ontwerpteam.* De onderzoeksresultaten laten zien dat de teamsamenstelling mede bepalend is voor de mate waarin sociale en culturele aspecten worden beschouwd en geïncorporeerd in een enterprise-architectuurontwerp; en (5) *de perceptie van het management met betrekking tot de enterprise-architectuurdiscipline en enterprise-architecten.* De onderzoeksdata illustreren dat het businessmanagement de neiging heeft om enterprise-architecten te beschouwen als technische experts die weinig afweten van sociale en culturele aspecten van organisaties. Daarbij komt dat het beschouwen van sociale en culturele aspecten toegewezen kan zijn aan functionele specialisten, zoals medewerkers die belast zijn met personeelszaken. Deze specialisten worden door het management benaderd als het gaat om het beschouwen van sociale en culturele aspecten.

Deze factoren staan niet op zichzelf, zij zijn aan elkaar gerelateerd en beïnvloeden elkaar. Als de definitie van enterprise architectuur bijvoorbeeld ook de

sociale en culturele aspecten van een organisatie omvat, dan heeft dat waarschijnlijk een positief effect op het beschouwen en opnemen van deze aspecten in ontwerpen. Het niet opnemen van deze aspecten in de definitie heeft dan waarschijnlijk een negatieve invloed op het beschouwen van deze aspecten in een ontwerpproces. Deze onderlinge relaties zijn niet expliciet bestudeerd in dit onderzoek, maar worden verondersteld te bestaan. Uit de onderzoeksdata is af te leiden dat in een ontwerpopdracht de volgende drie factoren de meeste invloed uitoefenen op het beschouwen en opnemen van sociale en culturele aspecten van organisaties in een ontwerp: (1) de definitie van wat een enterprise-architectuur is; (2) de rol en positie van enterprise-architecten in de organisatie; en (3) de percepties van het management ten aanzien van enterprise-architecten en hun ontwerpen. In informatiesysteemonderzoek zijn ook factoren benoemd die de kwaliteit en gebruikersacceptatie van systeemontwerpen beïnvloeden. Vrijwel alle factoren die in dit onderzoek geïdentificeerd zijn komen ook in dat onderzoek naar voren. De factoren die direct gerelateerd zijn aan enterprise-architectuur, zoals de definitie van wat een enterprise-architectuur is, zijn aanvullingen op die factoren. Verder heeft dit onderzoek deze tien factoren met elkaar in verband gebracht, inclusief hun verwachte onderlinge afhankelijkheden. Dat is een aanvulling op eerder uitgevoerd onderzoek.

Er zijn ook een aantal proposities geformuleerd en getest in dit onderzoek. De analyse van die proposities heeft bevestigd dat enterprise-architecten organisaties beschouwen als rationele en programmeerbare systemen die gericht zijn op het bereiken van een bepaalde doelstelling en die bestaan uit samenwerkende onderdelen die uitgevonden, gedefinieerd, ontworpen en gebouwd kunnen worden. Enterprise-architecten benadrukken het belang van een holistische ontwerpbenadering van organisaties. Echter, in ontwerpopdrachten richten zij zich vrijwel geheel op de samenhang en integratie van functionele en technische aspecten van organisaties. Dit onderzoek bevestigt dat enterprise-architecten erkennen dat het beschouwen van de sociale en culturele aspecten van organisaties in enterprise-architectuurontwerpen waardevol is en dat deze geïncorporeerd zouden moeten worden in hun ontwerpen. Echter, onderzoeksdata wijzen ook uit dat de sociale en culturele aspecten van organisaties nauwelijks aandacht krijgen in hun ontwerptrajecten. Enterprise-architecten erkennen niet dat sociale en culturele aspecten van organisaties net zoveel aandacht zouden moeten krijgen in een ontwerpopdracht als de technische aspecten van organisaties. De sociale en culturele aspecten van organisaties worden door hen kennelijk niet beschouwd als ontwerpparameters. Ook worden enterprise-architecturen niet beschouwd als instrumenten om bepaalde culturele waarden van organisaties te benadrukken. Verder blijkt uit de data dat de intentie van enterprise-architecten om de sociale en culturele aspecten van organisaties te beschouwen en te incorporeren in hun ontwerpen niet terug te vinden is in de daadwerkelijke ontworpen artefacten. Het accent in hun ontwerpen ligt op het realiseren van organisatiedoelen. De onderzoeksdata illustreren dat enterprise-architecten op een of andere manier beperkt worden om hun intentie om sociale en culturele aspecten van organisaties te beschouwen en op te nemen in ontwerpen om te zetten in actie. De hierboven beschreven tien factoren leveren hier mogelijke verklaringen voor. Het onderzoek heeft niet uitgewezen dat de constructen, modellen en methoden die enterprise-architecten kunnen gebruiken in het maken van enterprise-architecturen onvoldoende rijk zijn om sociale en culturele aspecten van

organisaties weer te geven. Sociale en culturele aspecten van organisaties kunnen bijvoorbeeld beschreven worden in de vorm van requirements, principes of door middel van metaforen. De onderzoeksresultaten geven verder aan dat als enterprise-architecten sociale aspecten van organisaties zouden beschouwen en opnemen in hun ontwerpen, dat zij zich dan richten op rollen van medewerkers in bedrijfsprocessen, de beslissingsbevoegdheid van medewerkers, en de mogelijkheid van medewerkers op het maken van keuzen en hun zelfstandigheid. Enterprise-architecten zijn meer genegen om sociale aspecten van organisaties op te nemen in hun ontwerpen als zij ervan overtuigd zijn dat een ontwerp ook intuïtie, informele structuren en wanorde kan weergeven, en als zij bereid zijn om in een ontwerpproces het ontwerp af te stemmen op de sociale aspecten van een organisatie. Enterprise-architecten lijken minder geneigd te zijn om sociale aspecten van een organisatie op te nemen in hun ontwerpen als zij het onbelangrijk vinden om de beslissingsbevoegdheid van medewerkers, en de mogelijkheid van medewerkers op het maken van keuzen en de zelfstandigheid van medewerkers te beschouwen. Het onderzoek wijst verder uit dat enterprise-architecten niet goed weten hoe zij kunnen omgaan in hun ontwerp met de behoefte van medewerkers aan erkenning en het gevoel dat medewerkers krijgen wanneer zij goed presteren. Ook komt uit het onderzoek naar voren dat een enterprise-architectuur niet gezien wordt door enterprise-architecten als een instrument om bepaalde culturele waarden van organisaties te versterken. Wanneer enterprise-architecten culturele waarden van organisaties beschouwen, dan zijn dat meest waarschijnlijk de normen en waarden van een organisatie. Er wordt door hen geen rekening gehouden met de symbolische waarde die een enterprise-architectuur kan hebben voor medewerkers. Als gevolg daarvan kan een enterprise-architectuur die met behulp van een rationalistische ontwerpbenadering tot stand is gebracht onbedoeld bij medewerkers de indruk wekken dat de organisatie traditionele bureaucratische waarden nastreeft. Tenslotte wijst de analyse van de proposities uit dat de dynamiek van organisaties met betrekking tot de sociale en culturele aspecten door enterprise-architecten gezien wordt als een complicerende factor in het ontwerpproces en het ontwerp. Als gevolg daarvan worden deze tijdsgebonden aspecten gewoonlijk versimpeld weergegeven in ontwerpen.

Het onderzoek heeft geleid tot een aantal conclusies. Als eerste kan geconcludeerd worden dat in de context van e-overheid het ingenieursperspectief op organisaties en de positivistische natuur van de enterprise-architectuurdiscipline aanwezig is in de constructen, modellen en ontwerpmethoden van de discipline. Dit leidt tot een pure rationalistische ontwerpbenadering van e-overheid. Deze benadering richt zich niet op betekenisgeving en kwaliteit van de werkomgeving van medewerkers. Het marginaliseert sociale betekenisgeving, de totstandkoming van gedeelde overtuigingen, en ethische vereisten op de werkvloer. Het levert ook tot een bouwkundige benadering van e-overheid, overheidsorganisaties en het organisatieleven, en leidt tot een nadruk op de programmeerbare onderdelen van publieke organisaties. Dit is waarom sociale en culturele aspecten van organisaties zelden onderwerp zijn van een ontwerpopdracht. Alternatieve benaderingen, zoals de sociaaltechnische benaderingen met veel gebruikersparticipatie, zijn in de context van e-overheid niet gevonden in de discipline of staan nog in kinderschoenen. Dit onderzoek bevestigt eerdere resultaten van ontwerponderzoek die aangeven dat het afwezig zijn van een participatieve ontwerpaanpak leidt tot een lagere kwaliteit van

informatiesysteemontwerpen, gezien vanuit een medewerkersperspectief. Ook is er in dit onderzoek geen traditie gevonden in de enterprise-architectuurdiscipline die de culturele waarden van enterprise-architecturen voor organisaties beschouwen. Verder kan geconcludeerd worden dat de enterprise-architectuurdiscipline zich wel richt op constructen, modellen en methoden, maar geen aandacht lijkt te hebben voor de evaluatie van de afstemming tussen de sociale en culturele aspecten van organisaties en de aspecten die opgenomen zijn in de ontworpen artefacten. Er zijn dan ook geen kwaliteitscriteria gevonden waarmee de beschouwing en incorporatie van sociale en culturele aspecten van organisaties in ontwerpen geëvalueerd kunnen worden. Het gehanteerde evaluatieproces en de sociale en culturele aspecten van organisaties die gebruikt zijn in het raamwerk van dit onderzoek kunnen hiervoor wel ingezet worden. Een andere conclusie is dat er kwaliteitscriteria bestaan in de ontwerpmethoden van de enterprise-architectuurdiscipline in de context van e-overheid. Die zijn gericht op het waarborgen van de consistentie, samenhang en integratie van de verschillende technische organisatiecomponenten zoals softwareapplicaties, applicatie-interfaces, en technische infrastructuren. Kwaliteitscriteria met betrekking tot sociale en culturele organisatieaspecten zijn niet gevonden. Het gevolg daarvan is dat de mogelijke afwijkingen tussen sociale en culturele aspecten van een organisatie en de aspecten die geïncorporeerd zijn in een ontwerp die ontstaan wanneer organisatieaspecten vertaald worden in enterprise-architectuurontwerpen niet beoordeeld kunnen worden. Dit onderzoek heeft aangetoond dat het raamwerk dat gehanteerd is in dit onderzoek (tabel 3), het onderzoeksproces dat opgezet is in dit onderzoek om enterprise-architecturen te analyseren en te evalueren (hoofdstuk 3), het rapportagemodel (7.2) en het model met de tien factoren (paragraaf 7.3) allemaal gebruikt kunnen worden om die mogelijke hiaten op te sporen in ontwerpen. Een afsluitende opmerking van dit onderzoek is dat geconstateerd is dat de resultaten van dit onderzoek aanleiding geven om te veronderstellen dat de resultaten en conclusies van dit onderzoek waarschijnlijk ook geldigheid hebben buiten de context van de onderzochte casussen.

Society and organizational life are strongly influenced by modern technologies like Facebook, Google, internet and mobile devices. Those technologies support trends in society like professionalization and individualization. They also enable modern forms of electronic service delivery which rest heavily on modern technologies. The application of those technologies depends not only on the functionalities that are offered, but also on the social and cultural contexts in which they are applied. New technologies also influence social and cultural aspects of organizations in which they are implemented. Not all implementations of modern service delivery go as planned. Especially in electronic government there are serious issues due to a dominant technical focus of the designs. Solutions to these issues are generally in the area of project governance and management. The questions this thesis answers are how social and cultural aspects of organizations are considered and incorporated in enterprise architectures in the context of e-government, which factors are of influence in this, and how enterprise architecture designs can be evaluated on these aspects.

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