Aalto University School of Science Degree Programme in Computer Science and Engineering

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# User-Centered Aspects in Enterprise Architecture Practices: Exploratory Study on the Perceptions of Finnish Enterprise Architecture Practitioners

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Abstract

Enterprise architecture (EA) provides tools for understanding complex systems; however, the understanding the benefits of enterprise architecture practices is lacking among stakeholders. This thesis suggests the user-centered design (UCD) approach for EA practices to improve the benefit realization and evaluation of EA practices for stakeholders. It is not known that linkages between EA and UCD would have been researched before. The goal of the thesis was to discover possible linkage.

The thesis examined the current status of user-centered aspects within EA practices and the perceptions of EA practitioners about applying user-centered principles within EA work. The user-centered principles are based on the principles of ISO 9241-210:2010(E) "Human-centred design for interactive systems" standard. Research data consisted of 16 thematic interviews with enterprise architecture practitioners. The qualitative analysis of the data applied the grounded theory approach.

The findings show that considering user-centered aspects happens mostly in the business-driven EA work. However, enterprise architecture work seemed usually still IT-centric in practice. Considering user-centered aspects within enterprise architecture practices could support the transformation from IT-centric EA work to business-driven EA work. Most of the practitioners perceived applying user-centered principles possible in EA practices. However, applying UCD principles and collaboration between fields require defining the context of application and clarifying certain concepts, such as user, for all the parties. The research and its findings provide a solid basis for further studies.

**Keywords** enterprise architecture, enterprise architecture practices, user-centered design, human-centred design principles, use context



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#### Tiivistelmä

Kokonaisarkkitehtuuri (enterprise architecture, EA) tarjoaa työkaluja kompleksisten järjestelmien ymmärtämiseen, mutta kokonaisarkkitehtuurityön hyötyjen ymmärrys on kuitenkin vähäistä sidosryhmien joukossa. Tämä diplomityö ehdottaa käyttäjäkeskeisen suunnittelun (user-centered design, UCD) lähestymistavan liittämistä kokonaisarkkitehtuurikäytäntöihin tehostamaan kokonaisarkkitehtuurityön hyötyjen aikaansaamista ja todentamista sidosryhmien välillä. Linkkiä käyttäjäkeskeisen suunnittelun ja kokonaisarkkitehtuurin välillä ei ole tiettävästi tutkittu aiemmin. Työn tavoitteena oli löytää mahdollinen linkki.

Työssä tutkittiin käyttäjäkeskeisten aspektien huomioimista nykyisessä kokonaisarkkitehtuurityössä sekä kokonaisarkkitehtuuriammattilaisten näkemyksiä käyttäjäkeskeisten periaatteiden soveltamisesta kokonaisarkkitehtuurityöhönsä. Käyttäjäkeskeisten periaatteiden pohjaksi otettiin ihmiskeskeisen suunnittelun periaatteet ISO 9241-210:2010(E)-standardin mukaisesti. Tutkimusaineisto koostui 16 teemahaastattelusta. Laadullinen analyysi sovelsi aineistolähtöistä (grounded theory) lähestymistapaa.

Löydökset osoittavat, että käyttäjäkeskeisten aspektien huomioimista ilmenee lähinnä toimintalähtöisessä kokonaisarkkitehtuurityössä. Käytännössä kokonaisarkkitehtuurityö näyttäytyy kuitenkin useimmiten vielä IT-keskeisenä. Käyttäjäkeskeisten aspektien huomioiminen kokonaisarkkitehtuurikäytännöissä voisi IT-keskeisestä tvöstä toimintalähtöiseen. Käyttäjäkeskeisten tukea muutosta periaatteiden soveltaminen kokonaisarkkitehtuurityössä on lähes kaikkien haastateltujen ammattilaisten mukaan mahdollista. Periaatteiden soveltaminen ja vhteistyö näiden alojen välillä vaatii kuitenkin soveltamiskontekstin määritystä ja tiettyjen käsitteiden, kuten käyttäjä, selventämistä kaikille osapuolille. Tutkimus ja sen löydökset tarjoavat vakaan pohjan jatkotutkimuksille.

Avainsanat kokonaisarkkitehtuuri, kokonaisarkkitehtuurikäytännöt, käyttäjäkeskeinen suunnittelu, ihmiskeskeisen suunnittelun periaatteet, käyttökonteksti

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# TABLE OF CONTENTS

L	ist of H	igures	vii
L	ist of 7	ables	vii
D	efiniti	ons	viii
1	Int	roduction	1
	1.1	Research Motivation	1
	1.2	Research Questions, Goal and Scope	4
	1.3	Research Methods and Data	5
	1.4	Outline of the Thesis	5
2	En	terprise architecture	7
	2.1	Enterprise Architecture Structures the Whole	7
	2.2	Enterprise Architecture Practices	9
3	Us	er-Centered Aspects	15
	3.1	User-Centered Concepts	
	3.2	User-Centered Design Principles	19
4	Re	search Design	25
	4.1	Initial Research and Pilot Interviews	25
	4.2	Interview Themes and Conducting Interviews	25
	4.3	Research Data and Interviewees Categorized	
	4.4	Conducting Data Analysis and Synthesis	
	4.5	Evaluation and Limitations of the Research	32
5	Fin	dings and Analysis	35
	5.1	Enterprise Architecture Work in Finland	
	5.2	Principle A: Understanding Users, Tasks and Environments	48
	5.3	Principle B: Involving Users	61
	5.4	Principle C: Evaluation from User's Perspective	68
	5.5	Principle D: Iterative Process	
	5.6	Principle E: Addressing the Whole User Experience	
	5.7	Principle F: Multidisciplinary Team	85
	5.8	Overall Perceptions on User-Centered Aspects	

6	Discussion and Conclusions10		100
	6.1	Main Findings and Answers to Research Questions	100
	6.2	Contribution and Implications	104
	6.3	Future Research Suggestions	106
	6.4	Conclusion	107
Re	eferenc	es	111

# LIST OF FIGURES

Figure 1: Updated D&M IS Success Model (DeLone and McLean, 2003, p. 24)2	2
Figure 2: Enterprise Architecture Abstraction Levels According to Decision Scope	2
Figure 3: Abstraction Levels of Enterprise Architecture, adapted from IAF (van't Wout et al., 2010)	3

# LIST OF TABLES

Table 1: Interviewees	. 30
Table 2: Division of Answers Regarding the Applicability of Principles	. 93

# **DEFINITIONS**

Architecture "(system) fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution" (ISO/IEC/IEEE 42010:2011(E), 2011, p. 2).

- Business users The term is used within research findings referring to those stakeholders which are neither enterprise architects nor direct application end-users, but are directly influenced by the enterprise architecture practices, or to whom enterprise architecture provides direct value (cf. end-users).
- Client Clients purchase, for example, consulting services from consultant firms, a client is not a user of those service as such. In Finnish, a client and customer are referred to with the same word (asiakas).
- Customer Customers purchase or consume products and services in order to use them. The words "customer" and "user" are considered synonyms in some contexts in this thesis, although semantic differences exist. In Finnish, a client and customer are referred to with the same word (asiakas).
- Customer see *User Experience* Experience User experience and customer experience are considered synonyms although semantic differences exist.
- Design Design includes different definitions with semantic differences. In enterprise architecture, the concept of design focuses on system specific requirements and design decisions have more limited impact than decisions on the architecture level (Greefhorst and Proper, 2011, pp. 16–17). In user-centered design, the concept of design includes both planning and implementation at a higher level than in enterprise architecture.
- End-users The term is used in Findings to refer to those stakeholders who use the applications and systems but are not direct users of enterprise architecture practices (cf. Business users).
- Enterprise An interactive system, complex whole of people, processes and technologies, which may consist of one organization or multiple organizations with a common goal.

Enterprise architecture (EA)	<i>EA</i> refers to "a set of concepts and practices based on holistic systems thinking, principles of shared language, and the long-standing disciplines of engineering and architecture" (Kappelman and Zachman, 2013, p. 87). This thesis considers the concept enterprise architecture from the widest perspective, including the architecture and its representations, the organizational unit, practices, and the discipline.
Enterprise level work	Work considers the whole organization or division or business unit and all enterprise architecture domains may be involved. The term is used to categorize interviewees.
Solution architecture	Limited to specific stakeholders, requirements and system functionalities and thus similar to the concept of software architecture or capability architecture (Greefhorst and Proper, 2011, p. 25).
Solution level work	Work considers a limited area of the whole organization or division or business unit; nevertheless, all domains may be involved, e.g., a large information systems program.
User	A person who interacts with products or services or systems.
User-centered aspects	In this thesis, the concepts of user, usability, and user experience as well as user-centered principles, i.e. understanding users and use contexts, user involvement, user-centered evaluation, and iterative processes, addressing the whole user experience and the multidisciplinary team.
User-centered design (UCD)	User-centered design is "an iterative process whose goal is the development of usable systems, achieved through involvement of potential users of a system in system design" (Karat, 1996, p. 20). User-centered design is considered an umbrella concept that provides tools for designing any kind of interactive system with the focus on the humans interacting with systems. Although user-centered design includes the word "centered", it does not imply that users and user-centered design experts should control the whole process; however, they should be equally important for the process (Karat, 1997, p. 37).
User experience	"person's perceptions and responses resulting from the use and/or anticipated use of a product, system or service" (ISO 9241-210)
Usability	The concept of usability (i.e. also usefulness, utility, and acceptance) can be considered from different viewspoints: universal, situational, perceived, hedonic, organizational and cultural usability (Hertzum 2010).

## **1** INTRODUCTION

#### 1.1 Research Motivation

An enterprise is an interactive system. Definition of a system includes "[a] group, set, or aggregate of things, natural or artificial, forming a connected or complex whole" (OED - Oxford English Dictionary, n.d.). An enterprise portrays an organization, or multiple organizations, with a common denominator, such as mission and function. Enterprises today embody complex systems of elements, such as people, processes, information, and technology, and their relationships. In other words, an enterprise denotes a complex whole of organized groups of things that interact with each others.

Managing complex, interactive systems such as enterprises requires a holistic approach that considers all the elements and their relationships. Enterprises aim for the realization of their mission by the means of the business. Business today is dependent on information systems and effective infrastructure. Thus, managing an enterprise towards mission realization requires viewing the relationships between business and IT elements. For this viewing, using enterprise architecture (EA) is suggested (Ross et al., 2006). Enterprise architecture practices aim for the strategic transformation of an enterprise (Ross et al., 2006), bridging strategy to operational implementations of enterprise architecture provides holistic perspectives on the complex enterprise elements and their relationships, and thus it is a tool for decision making.

However, recent studies have shown that the usage of EA for decision making is lower than expected and the benefits of EA have not been realized the way they were expected. It is mentioned that enterprise architecture practitioners could require more understanding and suitable approaches for integrating business and IT and measuring the activities (Lange and Mendling, 2011). Understanding the real use of EA has been requested (Hiekkanen et al., 2013). The quality of the used enterprise architecture practice depends on the usage of that practice. For realization of the benefits provided by enterprise architecture, applying the information systems success model (IS Success Model) by DeLone and McLean (2003) has been suggested (Lange et al., 2012; Niemi and Pekkola, 2009). In the Updated D&M IS Success Model (Figure 1) quality has three dimensions, namely *information quality, systems quality* and *service quality*, which "*will affect subsequent 'use' and 'user satisfaction'*". Causal relationships exist between use and user satisfaction and intention to use, so that positive use experiences will increase user satisfaction. Causal net benefits will finally determine whether a system or service should continue. (DeLone and McLean, 2003)





Quality in use refers to the broad view on usability including attributes effectiveness, efficiency and satisfaction (Bevan, 1999). "Achieving quality in use requires a user-centered approach" (Bevan, 1999, p. 92). Thus, enterprise architecture aiming for benefit realization through quality in use would require a user-centered approach to achieving quality.

User-centered design (UCD) includes several methods that support evaluating and improving use related quality. User-centered design approaches aim for "*an iterative process whose goal is the development of usable systems, achieved through involvement of potential users of a system in system design*" (Karat, 1996, p. 20). Although, user-centered design includes the word "centered", it does not imply that users and user-centered design experts should control the whole

process; however they should be equally important for the process (Karat, 1997, p. 37).

This thesis suggests a user-centered approach for the enterprise architecture practices. It is not known that the linkage between enterprise architecture and user-centered design would have been examined before. User-centered design could also benefit from a systematic enterprise architecture approach. It has been suggested that user-centered design practitioners require a strategic approach (Bevan, 1999; Venturi et al., 2006) and suitable constructs for addressing different levels of usability, such as organizational and environmental levels (Hertzum and Clemmensen, 2012). Applying an enterprise architecture approach could provide benefits for user-centered design aiming for organizational usability.

Quality in enterprise architecture context is defined as the extent of meeting stakeholder needs (Niemi and Pekkola, 2013). Existing research includes studies regarding the benefits of enterprise architecture and their realization (Niemi, 2006; Tamm et al., 2011), success factors (van der Raadt et al., 2004; Ylimäki, 2006) and non-functional, quality attributes (Niemi and Pekkola, 2013). In addition, enterprise architecture stakeholders have been researched (Isomäki and Liimatainen, 2008; Niemi, 2007; van der Raadt et al., 2010, 2008); however, these studies do not focus on the actual use perspective of enterprise architecture functions. From the perspective of an outsider, such as a stakeholder, enterprise architecture practices are difficult to understand (Lemmetti and Pekkola, 2012).

The above implies that users and their needs are not really understood in enterprise architecture practices. Enterprise architecture benefit realization efforts with the adaptation of DeLone and McLean IS Success Model (Figure 1) do not consider the context of use and the users although user satisfaction is an important part of the model. The efficient usage of enterprise architecture as a tool for decision making requires that architects and other decision makers understand the actual use and utility of it (Hiekkanen et al., 2013). Understanding the actual use and utility refers to understanding the concept of use. The concept of use indicates someone using it (i.e. user), in a certain context (i.e. environment and situation) for a certain purpose (i.e. goal, which can be also fun).

User-centered design takes these into consideration and thus increases the user satisfaction and quality in use. However, enterprises usually have limited understanding of user-centered design (Venturi et al., 2006), and difficulties addressing usability, i.e. quality in use, in contracts (Jokela et al., 2013). Incorporating the user-centered view into enterprise architecture practices could enrich the emphasis on users and use contexts, and thus the quality of enterprise architecture practices.

# 1.2 Research Questions, Goal and Scope

As stated earlier in this chapter, enterprise architecture practices could benefit from the understanding of users and use contexts. Understanding users and use contexts are addressed in user-centered design practices which are guided with user-centered principles. Understanding the concepts and principles of usercentered design are referred to as user-centered aspects. Incorporating enterprise architecture and user-centered aspects could be advantageous for the whole enterprise.

The initial assumption in this thesis is that current enterprise architecture practices do not consider user-centered aspects. Understanding the current status and support from key personnel, i.e. enterprise architects, would be essential for the future. Therefore, the research questions are:

*RQ1:* How are user-centered aspects considered in current enterprise architecture work?

*RQ2:* How do the practitioners of enterprise architecture perceive the value of incorporating user-centered principles in the enterprise architecture work?

The goal of this study is to determine if user-centered aspects are considered in current enterprise architecture practices, and how. In addition, the perceptions of enterprise architecture practitioners are examined regarding the possibility of linking user-centered principles into enterprise architecture work. Perceptions include both affirmative and challenging aspects. The high-level goal is to discover a possible linkage between the disciplines for future collaboration and mutual benefit.

Due to the undiscovered nature of this topic, this thesis is a high-level exploratory study. The study focuses on the concepts of user and user-centered aspects within enterprise architecture practices, in the way enterprise architecture practitioners understand enterprise architecture. The actual processes and methods of user-centered design and enterprise architecture are out of scope.

This thesis considers enterprise architecture as an umbrella concept that covers all different types and domains and angles of enterprise architecture. Similarly, usercentered design is considered an umbrella concept that provides tools for designing any kind of interactive system with focus on the humans interacting with systems. The broad, but high-level, view on disciplines is taken for the better coverage of possible linkage.

# 1.3 Research Methods and Data

Research data is based on 16 thematic interviews with enterprise architecture practitioners, mostly enterprise or solution architects or consultants. The interviews were conducted at 12 different organizations in Finland, Helsinki metropolitan area during the weeks 6-10/2014. The interviewees had working experiences from both the private sector and the public sector regarding enterprise architecture. A qualitative, grounded theory approach was applied for the data analysis. The findings are structured based on the principles of ISO 9241-210:2010(E) "Human-centred design for interactive systems" standard.

# 1.4 Outline of the Thesis

The report of this study is structured as follows.

*Chapter two* introduces enterprise architecture and enterprise architecture practices as presented in the literature, for the reader to understand the multifaceted nature of enterprise architecture.

*Chapter three* presents user-centered design and elaborates on the user-centered aspects considered in this thesis and used in the analysis. The user-centered aspects that were examined from the research data are summarized in this chapter.

*Chapter four* explains the research design including pilot interviews, interview themes and interviewees. In addition, chapter four evaluates the whole research and discusses the limitations.

*Chapter five* presents the research findings and analysis, and provides the main contribution of this thesis. The subchapters include current status and perceptions on user-centered aspects.

Finally, *chapter six* discusses the answers to the research questions with practical implications and further study suggestions. In addition, the conclusions of the whole research are drawn at the end of chapter six.

## **2** ENTERPRISE ARCHITECTURE

This chapter elaborates those aspects of enterprise architecture that are needed for understanding the interview themes, research and discussion. Here is to note that enterprise architecture is still rather young discipline that lacks commonly defined terms although these have been discussed and reviewed widely in the literature (e.g. Greefhorst and Proper, 2011; Kappelman and Zachman, 2013; Lankhorst, 2009; Op 't Land et al., 2009; Pulkkinen, 2006; Ross et al., 2006; Schöenherr, 2009).

# 2.1 Enterprise Architecture Structures the Whole

Standard definition for architecture is "(system) fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution" ((ISO/IEC/IEEE 42010:2011(E), 2011, p. 2). Enterprise architecture refers to "a set of concepts and practices based on holistic systems thinking, principles of shared language, and the long-standing disciplines of engineering and architecture"(Kappelman and Zachman, 2013, p. 87). Enterprise architecture as a product considers the coherent whole of principles, methods, models, as well as stakeholders and their concerns (Op 't Land et al., 2009, pp. 36–39).

#### 2.1.1 Domains of Enterprise Architecture

Enterprise architecture as a structure forms basis for all other architectures. Enterprise architecture can be seen as the highest level *"logic for business processes and IT capabilities"* (Ross et al., 2006, p. 48) or it can comprise all views of an enterprise, such as business, work, information, function, infrastructure views as well as the information systems and their relationships (Armour et al., 1999). Thus, domains of enterprise architecture can be categorized in many ways. Typically, domains include business architecture and IT architectures, such as, information systems architecture, information architecture and infrastructure architecture.

Business architecture refers to the business view of the enterprise. It focuses to align business strategy with business models (Osterwalder et al., 2005), business processes (The Open Group, 2011) and business domains (Versteeg and Bouwman, 2006). Connecting architecture with the strategy and operating model of the company is important for the successful architecture that also business understands (Ross et al., 2006). Business architecture includes strategy, governance, organization and key business processes (The Open Group, 2011). Versteeg and Bouwman (2006) differentiate business architecture from concept of enterprise architecture and refer with business architecture to architecture that structures economic activities into domains or areas of accountability. Nevertheless, this thesis comprehends business architecture belonging to the concept of enterprise architecture. Business architecture represents the business operations of an enterprise holistically.

IT architecture domains include information systems, information, and infrastructure. Information systems architecture dimensions the information systems, the applications of the enterprise, and is thus also referred as application architecture (Pulkkinen, 2006). Application architecture comprises blueprint of individual applications, interactions of applications, and relationships between applications and key business processes (The Open Group, 2011).

Information architecture considers the structure and relationships of the information used within organization (Armour et al., 1999). Information architecture can be referred also as data architecture (Pulkkinen, 2006). Data architecture consists of logical and physical data assets as well as data management resources (The Open Group, 2011).

Infrastructure architecture refers to technology architecture (Winter and Fischer, 2006). Technology architecture includes logical software and hardware capabilities that support services in other levels such as IT infrastructure, middleware, networks, communications, processing and standards (The Open Group, 2011).

#### 2.1.2 Enterprise Architecture Principles

Principles are mentioned to be essential elements of enterprise architecture. Principles present the fundamental understanding of what is essential for the enterprise (Op 't Land et al., 2009, p. 36) and guide, govern and affect the enterprise architecture process, including development, maintenance and use (Greefhorst and Proper, 2011; Richardson et al., 1990). However, architecture principle development is a young discipline, in which there are large diversity in approaches and specifications (Greefhorst and Proper, 2011, p. 111). Principles in enterprise architecture have different structures, maturities, usage, roles, types, and domains.

Architecture principles have or should have certain syntax that contains usually rationale and practical implications (Lindstrom, 2006; Richardson et al., 1990; Stelzer, 2010). Principles express or should express the concerns of the key stakeholders (van Bommel et al., 2006). Principles offer rationales and guidelines for plans (Richardson et al., 1990). Principles can be formalized as declarative rules in which the analysis process provides better understanding of concerns of key stakeholders; however, relevant stakeholders should validate the outcome of analysis process (van Bommel et al., 2006). Enterprise architecture principles are one way to connect strategy to architecture and thus ensure architecture compliance with business goals (Ross et al., 2006).

Although principles may be defined, they are not used in many organizations (Aier, 2012; Hiekkanen et al., 2013). Reasons for not using principles include that principles are defined in a small groups of architects or by a single architects and the definition process is a one-time effort (Aier, 2012).

# 2.2 Enterprise Architecture Practices

Enterprise architecture as a process includes design and realization of complex structures of an enterprise (Lankhorst, 2009). The architecting process is holistic and team-oriented with architects as "*mentors and midwives of their architecture*" (Armour and Kaisler, 2001, p. 31). It is important to notice that architecting is not

executed only at one stage but throughout life cycle of system (ISO/IEC/IEEE 42010:2011(E), 2011, p. 8).

#### 2.2.1 Enterprise Architecture Processes and Outcomes

Enterprise architecture practices include knowledge transfer by means of modeling and communication. Enterprise architecture modeling provides abstract representations of certain aspects of enterprise such as business processes, applications, and IT-infrastructure with specific goal and purpose (Lankhorst, 2009, p. 123). Thus, enterprise architecture serves as a language that aims for common understanding of the system (Smolander, 2002). Descriptions of the architecture need to be communicated "*either to the people reading the model or between people making the model*" (Lankhorst, 2009, p. 123). Therefore, the enterprise architecture practices, for example descriptions, should be suited for the purposes of stakeholder groups and support the understanding of those groups (Smolander, 2002).

Outcomes of enterprise architecture process include enterprise architecture products, such as principles or policies, models and views regarding current and target state, and roadmaps (Lankhorst, 2009; Op 't Land et al., 2009; van der Raadt and van Vliet, 2008). Enterprise architecture products are created for different phases and in different domains (Pulkkinen, 2006). In addition, enterprise architecture process provides intermediate results for development and enterprise architecture implementations, such as operational changes that aim for transformation and new processes and systems (Op 't Land et al., 2009; van der Raadt and van Vliet, 2008). Outputs include also intangible results, such as understanding, agreements and commitment (Op 't Land et al., 2009, p. 49).

Enterprise architecture practices should include also planning, not only documenting (Niemi and Pekkola, 2013). Enterprise architecture process includes analyzing existing situation, target situation, gaps, and alternatives, and thus it is strategic, tactical and operational tool for planning (Op 't Land et al., 2009, pp. 31–33; The Open Group, 2011). Planning includes decision making. Planning and decision making include using enterprise architecture artifacts, such as models, views and analyses, to introduce knowledge, upon which stakeholders can agree

and commit (Lankhorst, 2009, p. 123). These architecture artifacts should be useful and have purpose and thus architecture team should be aligned with the other users of the enterprise architecture products (Niemi and Pekkola, 2013).

The goals of enterprise architecture function vary from fulfilling the regulatory requirements to aligning business and IT (Lange and Mendling, 2011; Schöenherr, 2009). With respect to the organizational transformation, the roles of enterprise architecture include the regulative role, which is prescriptive governing of design with focus on principles, rules, guidelines and standards (Op 't Land et al., 2009, p. 34). Strategic transformation requires adjusting management and development of systems and processes (Lankhorst, 2009).

#### 2.2.2 Enterprise Architecture Frameworks, Methods and Ontology

Architectural frameworks provide tools and best practices and thus enable communication and bring structure to the enterprise architecture practices with views (Greefhorst and Proper, 2011, p. 24; Lankhorst, 2009, p. 22; Op 't Land et al., 2009, p. 39). Architectural methods include structured process steps and techniques for architecting in different life cycle phases (Lankhorst, 2009, p. 22).

Typical enterprise architecture frameworks and methods include

- the Open Group Architecture Framework (TOGAF) and its Architecture Development Model (ADM) (The Open Group, 2011)
- the Integrated Architecture Framework (IAF) of Gapgemini (van't Wout et al., 2010).

The classification scheme for descriptive representations, *Zachman Framework for Enterprise Architecture (ZEF), The Enterprise Ontology* (Zachman, 2011) provides also understanding of the complicated structure of an organization (Kappelman and Zachman, 2013). The ontology bases on the original Framework for Information Systems (Zachman, 1987).

In Finland, public sector utilizes additional models. Public administration, both governmental and municipal, uses the JHS-179 recommendation of the Public

Administration Recommendations (JHS recommendations) (JUHTA, 2012). JHS-179 recommendation includes method and framework for enterprise architecture planning with descriptions of the different dimensions and is part of the "*Developing the ICT services -series*" (JUHTA, 2012). Kartturi architecture model has been developed especially to address the needs of higher education institutions with customer-driven approach regarding management and development of services and information systems (Korkeakoulujen KA-pilottiryhmä, 2013).

#### 2.2.3 Enterprise Architecture Abstraction Levels

Architecture processes are performed in different levels from enterprise level to operational level (Pulkkinen, 2006; van der Raadt and van Vliet, 2008). An approach for abstraction levels of enterprise architecture is to divide them according to decision scope (Figure 2).





These decision making levels include enterprise level, solution level and operational level. The middle level can also be referred as domain level with system level below it (Pulkkinen, 2006), or system level may also refer to the project level (van der Raadt and van Vliet, 2008). In this thesis, domain, project and system levels form together the solution level referred in subchapter 4.3. The

solution level decisions refer to decisions regarding solution architecture. Solution architecture includes different domains and describes fundamental decisions and high-level design of specific solution (Greefhorst and Proper, 2011, p. 25; Op 't Land et al., 2009, p. 33). Solution architecture is limited to specific stakeholders, requirements and system functionalities and thus similar to concept of software architecture or capability architecture (Greefhorst and Proper, 2011, p. 25). Operational level is for the feedback loop (van der Raadt and van Vliet, 2008).

Another perspective for abstraction levels is elaborated in Integrated Architecture Framework (IAF) by Capgemini (van't Wout et al., 2010). This framework includes abstraction levels which are contextual, conceptual, logical and physical. These abstraction levels (Figure 3) answer the interrogatives why, what, how and with what, respectively (van't Wout et al., 2010).



Figure 3: Abstraction Levels of Enterprise Architecture, adapted from IAF (van't Wout et al., 2010)

*Contextual level* focuses understanding the reason for architecture, i.e. it focuses on vision, including business drivers, mission, and strategy, architectural scope and objectives, and constraints and principles. *Conceptual level* analyses and defines the functional and non-functional requirements based on vision, scope, objectives and constraints. *Logical level* creates the logical structure of ideal solution for the requirement fulfillment; however, the solution is independent from implementation. *Physical level* allocates the logical elements into implementation-specific structure of real-life, physical things.(van't Wout et al., 2010)

#### 2.2.4 Stakeholders within Enterprise Architecture Practices

The purpose and scope of the enterprise architecture defines stakeholders. Stakeholders and their roles can be divided according to which enterprise architecture functions and levels they serve (van der Raadt and van Vliet, 2008). Stakeholders usually include management in different levels (senior, program, project) and architects in different levels (enterprise, solution, software) (van der Raadt and van Vliet, 2008; van der Raadt et al., 2010).

The roles of enterprise architecture stakeholders can be classified based on stakeholder descriptions and concerns into three classes, namely producers who carry out enterprise architecture planning and development, facilitators who govern, manage, maintain and support enterprise architecture work, and users who do not perform direct enterprise architecture work but utilize it and its products (Niemi, 2007).

The quality of the architecture is depended on stakeholders. Architect decides the internal quality of architecture artifact whereas stakeholders discover the external quality (Lankhorst, 2009, p. 132). Quality assessments depend on goals. Architect should understand individual goals of stakeholders and consider how to impact those positively (van der Raadt et al., 2010). For example, for the understandable architecture artifacts, architect should analyze stakeholders and construct artifacts using the language, terms and concepts of stakeholders (Lankhorst, 2009, p. 141). In addition, the users of enterprise architecture elements, such as frameworks, models and principles, may perceive enterprise architecture and enterprise architecture practices with contradictions (Lemmetti and Pekkola, 2012). Quality of use within enterprise architecture depends on user satisfaction.

#### **3** USER-CENTERED ASPECTS

In this thesis, the user-centered aspects relevant for enterprise architecture include understanding concepts such as *user*, *usability* and *user experience*, as well as *applying user-centered principles* in current practices or future practices. First subchapter within this chapter presents the concepts and their background. The second subchapter presents the contents of the principles, which applicability was examined within the research.

# 3.1 User-Centered Concepts

#### 3.1.1 Concepts of User and User-Centered Design

Definition of *user* in ISO-standard is "*person who interacts with the product*" (ISO 9241-11:1998 as cited in ISO 9241-210:2010(E), 2010, p.3). Primary users operate products and services, whereas secondary users are influenced by or involved in the use of products and services (Keinonen, 2008, p. 215). Several different products and services are used within the concept of enterprise architecture (see 2.2) depending on the context of use.

The original concept of *user-centered system design* (Draper and Norman, 1986, p. 2) regards the design of computers from user's point of view. It has emphasis on people: it focuses on the nature of interaction among people and the interaction between people, system and society (Draper and Norman, 1986, p. 2). Although user-centered design practices benefit organizations, organizations do not often support and understand the importance of putting these practices into contracts (Venturi et al., 2006).

User-centered design practices could be supported for example with compliance to the International Organization for Standardization (ISO) standards. ISO uses the term "human-centred design" (HCD) instead of "user-centered design" (UCD) to emphasize that systems are impacted by other stakeholders who are not always considered as users (Earthy et al., 2012). However, in the scope of this thesis, the term user-centered is used for distinguishing the actual usage of enterprise architecture from other stakeholder related activities. Adapting user-centered design supports reducing risks and increases the possibility for *big usability* (Earthy et al., 2012, pp. 274–275), which equals with quality in use (Bevan, 1999). Big usability is impacted by the decisions at architectural level.

#### 3.1.2 Concepts of Usability and User Experience

Today, the typical concepts of user-centered design include usability and user experience. Practitioners and academics have different perceptions regarding the concepts. Both of these concepts have multiple definitions depending on professional and practitioner, and thus it should be cleared from which point-of-view is taken (Hertzum and Clemmensen, 2012). Nielsen (1993) locates usability and related concepts as a part of system acceptability and combines to system acceptability both social and practical acceptability. "Usability applies to all aspects of a system with which a human might interact" (Nielsen, 1993, p. 25). During the years, the concept of usability has evolved.

The six images of usability (Hertzum, 2010) include *universal* usability, *situational* usability, *perceived* usability, *hedonic* usability, *organizational* usability and *cultural* usability. Each of them has different focus and requires different mindset and scope; however, working with them and the different sets of methods each image has, enriches the understanding of the overall usability. It is important to understand from which angle usability is addressed in order to take the strengths and weaknesses of each image into account. Usability images can be thought as pairs: both universal and cultural usability focus on "*system use by disparate user groups in heterogeneous settings*", whereas situational and organizational usability involve specific context of use and the usefulness of the system within that, and perceived and hedonic usability include experiences of an individual user (Hertzum, 2010).

These concepts are not new; considering how people interact with systems traces back to the early decades of last century and the problem solving methods of industrial designer Henry Dreyfuss. For example, utility and safety were included in his problem solving method "the five-point formula" (Dreyfuss, 1955). These essential points should be applied to every design problem (Dreyfuss, 1955, pp. 178–185):

- *Utility and safety* include aspects such as is the designed system easy, comfortable and safe to use.
- *Maintenance* includes aspects such as easiness and accessibility of the system maintenance related things.
- *Costs* include manufacturing costs, such as tool and production costs, and distribution costs.
- Sales appeal is psychological value, "silent selling" that "proclaims the excellence"
- Appearance is explained as the "application of the first four points [...] give the [...] nine tenths of the appearance factor" and the rest 10 percent occur from "form, proportion, line, and color". (Dreyfuss, 1955, pp. 178–185)

Both concepts, usability and user experience, include aspects from "five-pointformula"; in usability especially the utility, safety and maintenance aspects are present whereas sales appeal and appearance could be easily linked to contemporary view of user experience. In addition, these all are relevant in the enterprise architecture context, since enterprise architecture aims for the holistic picture in the fulfilling of stakeholder needs.

The usability attributes of Nielsen (1993) include learnability, efficiency, memorability, errors and satisfaction. These usability factors could be applied to an enterprise architecture product, such as target state description, in the following way:

- *Learnability* of target state description: the contents of target state, the essence of target state should be easily learned, so that "*user can rapidly start getting some work done with the system*" (Nielsen, 1993, p. 26).
- *Efficiency* of target state description: the target state description should be efficient to use for "*a high level of productivity is possible*" (Nielsen, 1993, p. 26)

- *Memorability* of target state description: casual users, such as representatives of process users, are able after a while to continue working towards goal "*without having to learn everything all over again*" (Nielsen, 1993, p. 26).
- *Errors* of target state description: the contents of the description should be presented so that they are interpreted correctly. "*[C]atastrophic errors must not occur*" (Nielsen, 1993, p. 26) during the use. With target state description, false interpretations could be considered as errors.
- *Satisfaction* of target state description: people involved to use target state should be "*subjectively satisfied when using it*", in other words these people "like" the use of target state description (Nielsen, 1993, p. 26).

User experience (UX) includes especially the perceived and hedonic usability User experience has plethora of definitions aspects. (see e.g. http://www.allaboutux.org/ux-definitions). ISO-standard defines user experience as "person's perceptions and responses resulting from the use and/or anticipated use of a product, system or service" (ISO 9241-210:2010(E), 2010, p. 3). Common attributes for user experience include usually subjectivity, dynamic and contextdependent (Law et al., 2009). "The main UX constructs are a user's perceived hedonic quality (pleasure-producing product qualities), pragmatic quality (userperceived usability), beauty (aesthetics) and goodness (overall product quality)" (Law and van Schaik, 2010, p. 313).

Temporally, usability is usually limited to occur during the certain use situation, whereas user experience may arise already before interaction as well as after interaction (Bargas-Avila and Hornbæk, 2012). Nevertheless, all of the images and image pairs of usability can be applied to enterprise architecture depending on the point-of-view. Additionally, dynamic nature of user experience should be considered within enterprise architecture.

# 3.1.3 User-Centered Concepts Summarized

User-centered aspects include understanding the user-centered concepts within enterprise architecture. These concepts include user, usability and user experience.

- *User* is defined by the usage of the product or service in certain context of use. Thus users within enterprise architecture depend on the context of use.
- *Usability* (i.e. also usefulness, utility, and acceptance) can be considered from different views: universal, situational, perceived, hedonic, organizational and cultural usability.
- *User experience* has many definitions, however, essential for user experience are context of use as well as anticipated use, experienced use, and hedonic and pragmatic aspects.

Important is to note, that usability and user experience more than nice user interface, and that wrong architectural decisions at higher level limit quality of use.

# 3.2 User-Centered Design Principles

User-centered design principles trace back to early 1980s when Gould and Lewis (1983) drafted their three key principles for designing for usability. These three principles for design are *early focus on users and tasks*, *empirical measurement*, and *iterative design* (Gould and Lewis, 1985).

The user-centered principles selected for this thesis base on the ISO Standard *Ergonomics of human–system interaction — Part 210: Human-centred design for interactive systems* (ISO 9241-210:2010(E), 2010) standard. The standard is later referred as ISO 9241-210:2010(E). The standard defines also the human-centered design process. ISO standards in human-centered design are collection of best practices compatible with frameworks such as Control Objectives for Information and Related Technologies (COBIT) and mentioned to be "*quality manager friendly*" (Earthy et al., 2012, p. 277). According to Earthy et al. (2012, p. 277)

ISO standards for human-centered design are suitable for complex large scale usability improvements and they cover many areas in organizations. The humancentered design equals with user-centered design in the scope of this thesis. With direct reference to the standard, the term human-centered is used.

# 3.2.1 Principles of ISO 9241-210:2010(E) Human-centred design for interactive systems Standard

Principles for human-centered design are:

*a) the design is based upon an explicit understanding of users, tasks and environments;* 

b) users are involved throughout design and development;

c) the design is driven and refined by user-centred evaluation;

d) the process is iterative;

- e) the design addresses the whole user experience;
- f) the design team includes multidisciplinary skills and perspectives.

These principles are partly interrelated. The word design is referred here with broader meaning than in enterprise architecture.

#### Principle A: Understanding users, tasks and environments

Understanding users, tasks and environments includes indentifying all the relevant user and stakeholder groups as well as the contexts of use. Understanding users refers to familiarizing with the different user groups and their different characteristics instead of just stereotyping them (Gould and Lewis, 1985). Direct contact with potential users provides useful information. This direct contact can occur in forms of interviews, discussions and actual observations, if possible in correct use context, especially prior to system design (Gould and Lewis, 1985; Gulliksen et al., 2003). Contextual inquiries (Beyer and Holtzblatt, 1998) and other field researches provide plenty of information regarding the users and their use environments. Understanding the use context including social, temporal, physical, information, and technical context of use, is important not only in usability related studies but also essential in user experience endeavors (Roto et al., 2011). Information received from user researches is useful in other projects as well and cannot always be stored as simple requirements, but instead works as a common shared repository of knowledge for everyone in the development team (Sutcliffe and Gulliksen, 2012, p. 296). Descriptions of users, tasks and scenarios basing on real world information may provide understanding without actual meeting with users (Gulliksen et al., 2003). Typically major failures in large systems result from lack of understanding user needs and use contexts. Context of use depends on the enterprise architecture product and function.

#### **Principle B: Involving users**

Involving users enhances the understanding of users and use contexts. Users are the experts in their own work and tasks; however, they are usually unable to express their needs as requirements (Sutcliffe and Gulliksen, 2012). Involving users in the process provides opportunity to reflect the future use. Suitable way to involve users depends on the context and definition of users. Different types of user involvement include participating, giving information, and evaluating. Involving users enhances commitment and acceptance. In order to benefit most from the user involvement, it should be active and the representatives should have the characteristics and skills required.

#### Principle C: Evaluation from user's perspective

User-centered evaluation contains evaluations from the perspective of the users. Evaluation should start already from the early stage and be continuous throughout the lifecycle. Evaluation includes simulating, testing and measuring real world scenarios on demonstrations such as prototypes and mock-ups. The evaluation of this kind includes real potential users testing out prototypes preferably in real contexts (Gould and Lewis, 1985; Gulliksen et al., 2003; Nielsen, 1993). Prototypes support requirement elicitation and idea visualization and enhance communication among developers and users (Gulliksen et al., 2003). The feedback resulted from evaluation refines the solutions and minimizes risk of not addressing the user needs, especially hidden needs. User-centered evaluation

needs no actual user involvement: evaluations made by experts are also usercentered evaluations, if they base on real-world understanding and not on stereotypical thinking. Moreover, many different approaches for user-centered evaluation exist; the suitable method depends on which image of usability is being targeted (see 3.1.1 page 16) or what user experience measurements have been chosen (Law and van Schaik, 2010).

#### **Principle D: Iterative process**

Iterative process refers cyclic process in which sequence of steps are repeated until the outcome is desired. Iterative process implies that problems found during evaluation need to be fixed and further evaluated (Gould and Lewis, 1985). The middle outcomes are revised and refined based on evaluation results. Iterations can be informal, but they should contain all relevant steps including analysis of needs and contexts, design, evaluation and re-design (Gulliksen et al., 2003). Iteration cycles may occur as mini-cycles or be at macro-level.

#### **Principle E: Addressing whole user experience**

Addressing whole user experience considers all aspects influencing the usability and user experience, usually regarding the future use situation. User experience is multidimensional and refers to holistic view on the interaction with focus on the positive aspects (Bargas-Avila and Hornbæk, 2011). The situational and dynamic aspects during the use in certain context should be considered (Bargas-Avila and Hornbæk, 2011). Addressing the whole user experience includes aspects such as considering the previous experiences on current or other products or processes, and users' skills, beliefs, behaviors, and preferences towards the use. Additionally, the other functions of the product or service such as branding, system performance, and functionality are also related to the whole user experience. The whole lifecycle of the product or service should be considered. User experience involves besides current use also both anticipated and past uses. Different parts of organization are involved in the whole user experience. Human activities should be considered although processes are automated. When considering automating the processes, the users should still also be involved in decisions relating the allocation of function. In addition, their characteristics should be considered just in case some manual parts are left within the whole endto-end process.

#### Principle F: Multidisciplinary team

Multidisciplinary skills and perspectives in teams refer to the appropriate level of knowledge for considering compromise and collaboration with relevant stakeholders. Multidisciplinary teams increase awareness of the boundaries in other disciplines. From the user-centered point, especially interesting is whether architecture teams include usability or user experience experts, or user representatives.

#### 3.2.2 User-Centered Principles Summarized

The main ideas behind these interrelated principles are summarized here:

- Understanding users, tasks and environments refers to indentifying relevant user and stakeholder groups and their needs within the specific use contexts. Understanding should base on real-world information derived from meeting real user representatives. Focus on understanding should be early and continuous.
- *Involving users* refers to active and direct user involvement as with user as a participant, informant, or evaluator.
- *Evaluating from user's perspective* includes early and continuous evaluation basing on real-world scenarios.
- *Iterative process* includes repeating cyclic process until the outcome is desired, levels for iteration vary from mini-cycles to macro-level iteration.
- *Addressing whole user experience* considers all aspects influencing future use such as user's prior experiences, anticipation, attitudes and skills as well as organization, practices and roles, other products and services, and brand image.

• *Multidisciplinary teams* include sufficient knowledge base for considering trade-offs and collaborating.

Here is to note that the concept of design is not strictly defined; more important is the understanding of user groups, use contexts, involving users in the practices, evaluating from the user's perspective and focusing on the whole user experience.

# **4 RESEARCH DESIGN**

This chapter elaborates research and analysis approaches, presents interview themes and interviewees, and evaluates the research.

## 4.1 Initial Research and Pilot Interviews

The initial aims of the study included finding a linkage between user-centered principles and enterprise architecture principles. Thus, research began with initial literature review with focus on enterprise architecture principles and user-centered design principles. Preliminary literature review was conducted by searching with keywords in scientific databases. In addition, citations backwards and forwards were taken into account with relevant literature, in both enterprise architecture as well as user-centered design disciplines. In both disciplines, the scope was at the general, principal level instead of the deep, methodological level. The initial literature review was the basis for the interview themes.

Two pilot interviews were conducted prior to the official research data interviews. Pilot interviewees were two researchers in the enterprise architecture field that have used enterprise architecture in practice. First interviewee was more representative to an in-house enterprise architecture role and the second one to a consult role. Thus, both interviewee roles were tested prior the real interviews.

These pilot interviews were not considered as research material. Instead, pilot interviews were used to rehearse the interview structure and determine relevant themes. Interview themes and preliminary question setting were refined iteratively with pilot interviews. Discussions with pilot interviewees after the interviews supported focusing on the essential. In addition, pilot tests included testing voice recording and informed consent form.

# 4.2 Interview Themes and Conducting Interviews

The qualitative approach with thematic interviews (Hirsjärvi and Hurme, 2008), which are similar to interview guide approach (Patton, 2002, pp. 343–344), was

chosen for the interviews. Approach of this kind explores the interviewees' own terminology, judgments, and perceptions (Patton, 2002, p. 348).

#### 4.2.1 Formulating Interview Themes

Interview themes were formulated by the researcher alone although they were tested and discussed in the pilot interviews. The interview themes were based on the findings of the initial literature research on enterprise architecture principles and practices. The wording of possible interview questions was mainly openended, and question types included the questions of experience and behavior as well as opinions and values (Patton, 2002, pp. 348–351).

Each interview theme was informally assessed based on reflection against the research questions and preliminary literature research findings. Sub research questions were formulated during the process to determine which aspects should be covered during the interview for the analysis of the actual research questions. Purpose of the interviews was to examine user consideration within enterprise architecture from the perspective of enterprise architecture practitioners. The interviews aimed to determine the ways in which user-centered aspects are considered in enterprise architecture practices. Moreover, interviews aimed probing the perceptions of enterprise architecture practitioners regarding user perspective in enterprise architecture. At the end of the interview, the reactions to user centered design principles were tested. Follow-up questions and clarification probing (Patton, 2002, pp. 372–374) were used especially for the attitudes towards meeting with the users and the concepts of usability and user experience.

Understanding of the way in which the practitioners comprehend enterprise architecture and related concepts was essential for the analysis of the data. Additionally, interviews aimed to determine whether enterprise architecture principles are used, i.e. would the applying user-centered principles to the enterprise architecture principles benefit the whole. Interviews aimed to determine how the particular interview theme is seen by the enterprise architects, what are their experiences, knowledge, perceptions, and in some extend opinions in the matters "without predetermining those points of view through prior selection of questionnaire categories" (Patton, 2002, p. 21).

### 4.2.2 Interviews included following themes

The interview guide included following themes due to following reasons:

- *Background information* of the interviewee and the organization-to position the answers and analysis (Table 1: Interviewees, page 30)
- Concepts in enterprise architecture: interviewee's own understanding of concepts such as enterprise, architecture and enterprise architecture, as well as of contents and practices of enterprise architecture (cf. Chapter 2)– to warm up and position the level of architectural thinking
- *Enterprise architecture principles*: interviewees own understanding and perception towards architectural principles-to find out whether they are really used in practice. The initial focus was to incorporate the principles together; however, initial literature review (cf. 2.1.2) implied that enterprise architecture principles might not be used.
- *Concrete examples of enterprise architecture work* such as last or current projects or programs which used or applied enterprise architecture practices-to detect whether current practices realize user-centered principles (3.2) and consider users.
- Use of enterprise architecture in general to determine how interviewee comprehend the context of use within enterprise architecture, including aspects such as enterprise architecture products, services, outcome and implementations (Chapter 2).
- Perceptions on *applicability of the principles in ISO 9241-210 standard* (3.2.1) – to probe idea of incorporating user perspective with user centered principles into enterprise architecture practices

The language of the interviews was Finnish since all the interviewees were Finnish speaking. Each interview was adjusted according to type of organization and role of interviewee. All themes were not discussed with everyone if the time limit was to exceed.
# 4.2.3 Preparing and Conducting the Interviews

Suitable interviewees were sampled with mixture of convenience and snowball sampling using knowledge, contacts and past experiences of the researcher to contact interviewees. This kind of sampling was chosen due to the tight schedule as well as due to the accessibility and availability of the suitable interviewees. Every interviewee was contacted individually per e-mail and suitable interview time was agreed. E-mails explained in Finnish and in English the purpose of the interview.

At the beginning of the interview, the researcher introduced herself and her fields of study and explained ethical matters. Informed consent forms were signed in each actual interview. Consent form stated that all the information was going to be handled with confidence and reported anonymously so that particular interviewee and organization cannot be identified, unless otherwise agreed with the interviewee. Only researcher had access to the data, unless otherwise agreed with the interviewee. Interviewees were notified that interviews were audio recorded for the analysis.

In addition to the voice recordings, notes were written per hand to support formulating follow up questions and for stimulating early insights and for back up. After the interviews, immediate interpretations and insights were noted. Voice records were transcribed for data analysis.

Observations were not possible, because enterprise architecture is a long process and longer participation in an enterprise architecture process was not available for this master's thesis. However, for possible further studies observations will be recommended.

# 4.3 Research Data and Interviewees Categorized

Total of 16 interviews were conducted with enterprise architecture practitioners during the weeks 6-10 in 2014. The interviewees were employed in 12 different organizations. Interviewees included in-company architects from private and public sector and consultants working for the private or public or both sectors. The researcher interviewed practitioners in their work places in Helsinki Metropolitan area. Lengths of the actual interviews were between 1 hour and 2 hours (with average 1 hour 36 min).

Interviewees were categorized based on their role, the sector they work in, the level of architectural work they participate in and overall experience in enterprise architecture or organizational development. Here is to note that classification of the interviewees was conducted during the analysis phase, not before interviews. Thus, categories were not discussed with interviewees.

Table 1 (p. 30) shows the distribution of the interviewee categories. In order to preserve the promised confidentiality, researcher decided that identity and organizations of the interviewees were not revealed.

The *roles* included an architect, i.e. an in-company architect, or a consultant, or management, or a role that comprises both in-company activities and consultancy. Latter included those who expressed experience working both as a consultant and as an in-company architect or management. Otherwise the current work status was counted.

*Experience* within architecture and business development was categorized with intervals of less than 5 years, 5 to 10 years and more than 10 years of experience in architecture or business management. The 10 years limit was taken from the comment of an experienced practitioner.

Level of architecture work was limited to work at either enterprise architecture level or at solution architecture level (Figure 2, p.12). Enterprise level work was considered more strategic with organizational transformation emphasis. Enterprise level indicated decisions in programs with impact to the whole enterprise. As enterprise was considered also divisions or business units, if the size with reference to amount of personnel of that division or business unit was sizeable. Work at solution level considered narrower view than enterprise. Nevertheless, solution level work might have involved work in all the domains starting from the strategic level. At the solution level, the decision scope was domain or system. Consultants were mainly at this level, since they lacked the possibility to really decide at the enterprise level although they may have influence on decisions. Titles were irrelevant in this categorization regarding level of architecture work. This considers more how broad view on the enterprise the interviewee has.

The *industry sector* includes working in the private or in the public sector enterprises or in both sectors. For consultants, the sector indicates the client cases discussed instead of the sector of their own employer. Those who had experience working in the public sector and in the private sector the sector status was taken from the cases discussed, if they involved both, then both was taken

		Architectur			ecture	Industry sector					
		Experience		work level				Work position			
Role	Organization area	0-5 years	5-10 years	More than 10 years	Enterprise	Solution	Public	Private	In-company architect	Architecture consultant	Length of interview
Consultant	Consulting	х				х		х		х	1:02:37
Enterprise architect	Financial sector		x		x			x	x		1:18:17
Consultant	Consulting		х			х	х	х		х	1:55:13
Consultant	Consulting		х			х	х	х		х	1:33:43
Solution architect	ICT services		x			х		x	x		1:39:47
Solution architect / Consultant	Financial sector		x			х		x	x	x	1:47:21
Consultant	Consulting		х			х		х		х	1:42:44
Management	ICT services			х	х		х	х	х	х	1:41:52
Enterprise architect	University			x	х		x		x		2:01:12
Enterprise architect	Machinery			x	х			x	x		1:44:10
Enterprise architect	Financial sector			x	x			x	x		1:44:21
Management / Consultant	ICT services / Consulting			x		х	x	x	x	x	1:26:30
Consultant	Consulting			х		х	х			x	1:34:32
Solution architect / Consultant	ICT services / Consulting			x		x	x		x	x	1:13:36
Consultant	Consulting			x		х	х			x	1:33:26
Consultant	Consulting			х		х	х			x	1:37:58
	1	6	9	5	11	9	11	9 Avera	11 ge length:	25:37:19 1:36:05	

## Table 1: Interviewees

# 4.4 Conducting Data Analysis and Synthesis

The research data consisted of the transcribed voice records of 16 interviews and personal notes. Some interviewees offered by request also additional material which was helpful for the understanding. These additional materials were not used directly for the data analysis; however, they served as a validation for sub-hypotheses during the research and analysis.

Making sense of the massive amount of data began already during the interviews with ideas about the possible direction of analysis. Transcribing nearly verbatim the interviews raised emergent insights. These ideas and insights were recorded in separate documents to keep the actual data clear. Overlapping analysis and data collection with separate field notes and analysis improves the quality of research (Patton, 2002, p. 437).

After all the interviews were transcribed, ATLAS.TI used to assist analysis. The first round of ATLAS.TI analysis was case analysis. Case analysis included invivo coding, in which actual words of the interviewees are coded instead of prepared codes (Corbin and Strauss, 2008, p. 65). "*What people actually say and the descriptions of events observed remain the essence of qualitative inquiry*" (Patton, 2002, p. 457). The reporting of findings was in English; therefore, these in-vivo codes were in English instead of Finnish codes. They actually were sort of in-vivo. In addition the shorter code names were used than the actual quotation snippet in Finnish.

Additionally, the first round included the rough categorizing of codes in families based on the interview themes (cf. 4.2), such as enterprise architecture practices, enterprise architecture principles, user-centered principles and definitions. Representative quotations were translated as comments. After conducting the first round of coding for all the interviews, six categories of the human-centered design principles and other user-centered aspects were used to structure findings in the cross case analysis. Code listings with quotations were examined to find the current state and perceptions towards user-centered view within enterprise architecture.

For each user-centered principle (3.2.2), positive and negative examples were collected regarding the current state. Additionally, pros and contras toward applying the certain principle were collected. In addition, the reasons for applicability were investigated. Most of the analysis was conducted manually in researches' mind and in paper notes and memos.

The grounded theory approach (Corbin and Strauss, 2008) was applied for the analysis of these data. The researcher discovered that the data were too heterogeneous to really emerge a theory from it; none of the concepts emerging from the data showed applicability to all cases (Corbin and Strauss, 2008, p. 103). Nevertheless, indications for future research (6.3) were found. Moreover, the analysis was guided by the purpose (Patton, 2002, p. 435), i.e. the applicability of the findings was the most important criteria. Thus, the principles of user-centered design were considered as a frame for analysis. The substantive significance is going to be determined based on following factors: the extent to which findings will deepen the understanding, the extent findings will be consistent or inconsistent with other knowledge, and the extent to which findings are useful for purpose (Patton, 2002, p. 467).

# 4.5 Evaluation and Limitations of the Research

Evaluation of the research includes overall evaluation, the evaluation of the interviews, and the evaluation of the data analysis.

The overall limitations include the language and terminology. Interviews were held in Finnish; however, reported in English. Some terms have multiple meanings in both languages, and thus might have different connotations. Additionally, the same words in Finnish language might be interpreted differently. The researcher translated findings aiming at word-by-word translation, if possible. Interpretations were not validated by the interviewees. Concepts used were broad; thus defining every time the point-of-view used is impossible. This might have influenced inaccurate interpretations, especially during the interviews where thorough analysis was not possible. Each interview was slightly different than another; however, this belongs to the qualitative interview where "the specific interview situation, the needs of the interviewee, and the personal style of the interviewer all come together to create a unique situation for each interview" (Patton, 2002, p. 379). Some interviews were shorter than others due to the timetable of the interviewee. In addition, since interviews were thematic, no exact question set for everyone was followed. Thus, the wording of the questions was slightly different for various interviewees. On the other hand, the themes were really generic. Therefore, the interviewees had the opportunity to express everything they related to that specific theme, during the interview. Additionally, the breadth of themes discussed depended on the interests and experiences of the interviewees.

Some interview questions might have sounded simplistic for the practitioners; however the purpose was probing practitioners to reflect and explain issues behind those simplistic questions without revealing the actual terms before the interviewees had expressed the words for the concepts themselves. The wording of the questions may have influenced that some interviewees generalized answers instead of relating and describing actual occurrences. However, those reveal the perceptions of the interviewees.

Regarding the applicability of the ISO 9241-210:2010(E) principles within enterprise architecture work, the practitioners were given only the statements, i.e. they were not offered the rationale behind the statements. This may have influenced on the answers, because they did not know the backgrounds. On the other hand, in practice, people usually do not have time to read long explanations, but they rely on their own interpretations.

The time schedule was tight. In some days, two interviews were conducted during the same day. Additionally, the transcribing of an interview was more demanding process than anticipated.

Limitations in data analysis focus on language and interpretation differences, which limit the overall research. Possible misinterpretations might have influenced the whole analysis.

Software was used to assist analysis. However, challenges with the use of the program led to use manual categorizing due to time limits. Nevertheless, "*the human being, not the software, must decide how to frame a case study, how much and what to include, and how to tell the story*" (Patton, 2002, p. 442).

For qualitative analysis, no statistical test exists. Therefore, the qualitative analyst "must rely on their own intelligence, experience, and judgment" (Patton, 2002, p. 467). The substantive significance of this result is not validated until the participants and reviewers have familiarized and agreed with the conclusions of this result (Patton, 2002, p. 467)

# **5** FINDINGS AND ANALYSIS

This chapter presents and analyses the main findings of the research. These findings are the main contribution of this thesis. The contents of this chapter are organized as follows: first notions on enterprise architecture work in Finland and then observations regarding the six user-centered principles and their overall applicability within enterprise architecture. In addition, findings regarding usercentered concepts are presented within the subchapters.

At first, subchapter 5.1 presents the main observations regarding the characteristics of the enterprise architecture work in Finland. These characteristics influence the consideration of user-centered aspects. The subchapter begins by introducing the way practitioners understand the real purpose of enterprise architecture work. The following section present challenges for achieving this purpose, as noted by the practitioners. These challenges relate to the IT-centricity of enterprise architecture. Thereafter, characteristics of business-driven architecture work are elaborated. These characteristics are noted as solutions for business-driven architecture. The subheadings describe analyzed categories. The subchapter ends with presenting how the practitioners perceive the concept of user within enterprise architecture.

Then following subchapters present the main findings regarding the consideration of user-centered aspects. These findings are presented in the order of usercentered principles. Here is to note that the contents of user-centered principles are interrelated; that is, some of the findings could suit under more than one principle. Main findings include examples of current practices and attitudes that support or challenge practicing according to principles as well as perceptions relating to applicability of the principles. Similarly to first subchapter, the subheadings describe categories of the notions. Current practices and perceptions regarding respective principle are presented in this order:

• Principle A: Understanding users, tasks and environments in subchapter 5.2

- Principle B: Involving users in subchapter 5.3
- Principle C: Evaluation from user's perspective in subchapter 5.4
- Principle D: Iterative process in subchapter 5.5
- Principle E: Addressing whole user experience in subchapter 5.6
- Principle F: Multidisciplinary team in subchapter 5.7

The chapter concludes with subchapter 5.8, which includes concepts of usability and user experience as understood by practitioners as well as overall notions mentioned by practitioners toward user-perspective and user-centered principles within enterprise architecture.

# 5.1 Enterprise Architecture Work in Finland

This subchapter presents findings and analysis regarding the enterprise architecture practices. It includes the reason, challenges and solutions for the current enterprise architecture work. In addition, this subchapter presents how practitioners perceived the concept of user within enterprise architecture.

# 5.1.1 Reason for Enterprise Architecture: Business Goals

All practitioners implied that enterprise architecture should be practiced for a reason, and this reason for enterprise architecture should be business-driven. According to the most experienced enterprise architecture practitioner, the purpose of enterprise architecture work is enterprise transformation from the as-is state to the to-be state.

"What is the reason for enterprise architecture practices? Well, it is practiced, because the enterprise wants to change something and then there are two viewpoints. We want to know what the current state is, so that the area we want to change can be made visible "mitä varten yritysarkkitehtuuria tehdään? No, sitä tehdään sen takia, että yritys haluaa muuttaa jotain ja silloin siinä on kaksi näkökulmaa. Halutaan tietää, että mikä on nykytila, jotta se alue, mitä ollaan muuttamassa, saadaan näkyviin ja ymmärretään, että mitä pitäis muuttaa. Sitte se toinen näkökulma on se, että mikä se tavoitetila pitäisi olla sille alueelle. No näitä alueitahan voi rajata eri tavoilla and we understand what needs to be changed. Then the other viewpoint is what the target state should be for that area. *Well, these areas can be defined* in different ways then, it can be small patch from some somewhere or it can be a very large area that we want to touch, there the governance model particularly provides the controllability so that this enterprise architecture will be divided like "tag'em and bag'em" into separate subareas and those are given owners and they plan the development of their own areas."

sitten, voi olla joku pieni läntti jostain tai se voi olla tosi iso alue mitä halutaan koskea, siinä se hallintomalli tuo nimenomaan sen ohjattavuuden, että se jaetaan niinku halki-poikki-japinoon erilaisiin osa-alueisiin tää yritysarkkitehtuuri ja niille annetaan omistajat, ja ne suunnittelee niiden oman alueensa kehityksen"

(Management-role, working at enterprise level, both in-company architecture and consulting, over ten years of experience)

The contents of enterprise architecture include different instruments. These instruments include different perspectives and approaches to enterprise.

"This is roughly the enterprise architecture "tool set": different viewpoints, such as strategic analysis, target state, short term goals and capability requirements, then breaking them down as changes there, into enterprise architecture, into processes and information systems, into organization, and then these projects, which in carry practice out those changes, portfolio management and risk management. This is enterprise architecture"

"Tässä on nyt suurin piirtein se kokonaistyökalupaketti: erilaiset näkökulmat, eli se strategia-analyysi ja tahtotila ja lähiajan tavoitteet ja kyvykkyysvaatimukset, sitten niiden purkaminen sinne muutoksiksi kokonaisarkkitehtuuriin, sinne prosesseihin ja informaatiojärjestelmiin, organisaatioon, ja sitten nää projektit, jotka käytännössä tekee ne muutokset, portfolion hallinta ja riskienhallinta. Tätä on kokonaisarkkitehtuuri"

(Management-role, working at enterprise level, both in company architecture and consulting, over ten years of experience)

Other practitioners had similar thoughts regarding the contents of enterprise architecture.

# 5.1.2 Challenges in Enterprise Architecture Work

Many interviewed practitioners implied that ideal, business-driven enterprise architecture seems in many organizations as an endeavor; i.e., the current enterprise architecture practices appear still IT-centric in Finland. This ITcentricity of enterprise architecture was remarked especially by those practitioners with less than ten years of experience. Most of them worked in solution architecture cases. The challenges for business-driven enterprise architecture include issues such as others understanding enterprise architecture as technical "IT-dabbling", enterprise architecture principles including only IT principles, practitioners lacking management support and interest, and focusing on formal modeling.

## Challenge: Enterprise architecture is seen only as IT-practice

Practitioners mentioned that outside enterprise architecture teams, enterprise architecture is mostly understood as "IT dabbling" instead of understanding it as a tool for strategic development. Outsiders of enterprise architecture team are said to link the word 'architecture', after linking it first to buildings, with IT-related, technical "stuff".

"Usually when people talk about architecture [...] it is these IT-tools, servers etc." "yleensä ku jengi puhuu arkkitehtuurista [...] niin kyllä se on nää IT kilkkeet, serverit ja nää tämmöset"

(Solution level architect & Consultant, private sector, experience 5-10 years)

The IT-centricity, i.e. others associating enterprise architecture practices as ITpractices, may be due to the location of enterprise architecture functions. Enterprise architecture functions locate within information management departments, inside the ICT-organization. "In practice within an enterprise it is pretty often some IT-organization architect, who alone draws architectures and feels like doing meaningful work, but no-one will ever use those architectures, or if uses, well good..." "Todellisuudessa aika useasti se on yrityksessä joku IT-organisaation arkkitehti, joka yksikseen piirtää arkkitehtuureja ja kokee tekevänsä tärkeää työtä, mutta kukaan ei koskaan käytä niitä arkkitehtuureja, tai jos käyttää niin tota, hyvä niin.."

(Consultant working at solution level, private sector, experience 5-10 years)

IT-department is, in addition, usually the location of direct customers who enterprise architecture consultants work for.

"Direct customers are those who pay the consultancy projects. Pretty often it is the chief information officer [or information manager] of some client organization." "Suorat asiakkaat ovat niitä, jotka maksavat konsulttiprojekteja. Aika usein se on jonkun asiakasorganisaation tietohallintajohtaja."

(Consultant working at solution level, private sector, experience 5-10 years)

The chief information officer might be the direct customer; however, as one interviewee pointed out, the top management is not always interested in the results of enterprise architecture. The participants within enterprise architecture case may contain only "lower level" IT-management.

"from the solution architecture viewpoint, kind it is of interesting that you usually cannot get the top management IT-organization of [to *participate*], like chief and information officer especially not someone like chief of business development, or chief executive officer level persons, so that usually they are management level architects or

"jos lähtee ratkaisuarkkitehtuurin näkökulmasta, niin se on silleen jännää, että siellä ei yleensä saa ITorganisaation ylintä johtoa, tyyliin tietohallintojohtajaa, eikä varsinkaan saa mitään kehitystoiminnanjohtoa, saatikka sitten toimitusjohtajan tasoisia ihmisiä, että yleensä ne on jotain esimiestasolla olevia arkkitehteja, tai tämmösiä päällikkötason ihmisiä, ei ylintä johtoa, mutta kuitenkin johtoa, ja nimenomaan IT-organisaatiosta." heads of [something], not executive level, but still some kind of management, and particularly from the ITorganization."

(Consultant working at solution level, in both public and private sector, experience 5-10 years)

Here is to note that consultancy firms provide traditional IT architecture services with enterprise architecture services, and this might influence client organizations to consider enterprise architecture only as an IT-related concept. On the other hand, some consultants considered that it can be easier to do business-driven architecture as a consultant than as an in-house architect, since consultants usually do not have the burden of organizational legacy and hierarchy.

# Challenge: EA principles are only IT principles, if any at all

Overall interpretation from the interviewed practitioners is that although enterprise architecture principles might be defined, they are not really used for guiding the transformation. Mostly, enterprise architecture practices were guided by IT principles or by no principles. Some practitioners actually mentioned that architectural principles were unwritten rules which are not explicitly defined nor communicated.

"Pretty often they are unwritten rules, and different people in same organization may have their own principles, pretty often they do... quite seldom they like are very explicitly defined and published" "Aika useasti ne on kirjoittamattomia sääntöjä, ja niitä saattaa olla samassa organisaatiossa eri ihmisillä omat periaatteensa, aika useasti onkin, ...aika harvoin niitä niinku hirveän eksplisiittisesti määritellään ja julkaistaan."

(Consultant working at solution level, private sector, experience 5-10 years)

In contrast, a few enterprise level architects mentioned and showed that their organizations had enterprise architecture principles which based on the business

strategy. These principles were communicated openly to the whole organization and they acted as a rationale for decisions of all kinds.

#### **Challenge: Lack of Business Management Support and Interest**

Several practitioners, regardless of whether they worked at enterprise or at solution level, mentioned the importance of management support and business interest for enterprise architecture practices. Lack of management support was seen as challenge for successful enterprise architecture practices, especially by the solution level architects. Some of the interviewees mentioned that business management lacks the interest in enterprise architecture practices because they do not understand the benefits of enterprise architecture. In addition, the name 'enterprise architecture' was mentioned being curse word for some management.

Those organizations lacking the business management support and interest seemed to relate the term enterprise architecture only to IT-architecture. Additionally, in those organizations, the enterprise architecture seemed to refer only to solving predefined problems with technical descriptions and solutions. Those organizations had separated strategy and customer understanding to the business development, and low collaboration or no collaboration existed.

#### Challenge: Focus on Formal Modeling instead of the Real Purpose

The real purpose of enterprise architecture practices may be distracted due to extensive modeling. Especially among the solution-level practitioners, the enterprise architecture practices seemed to focus on descriptions and models of the current and target states. Nevertheless, practitioners have mixed impressions whether the current state should be described or not. Many practitioners consider that focusing extensively on current state descriptions is waste of time and resources. Practitioners mentioned that especially in the public sector enterprise architecture practices include extensive modeling, without clear reason.

"many [organizations], especially in the public sector, have these kinds of modeling drills, where the current state is slavishly described with formal modeling languages and everybody wonders why" "monessa on silleen, etenkin julkisella puolella, että pidetään sellaisia mallennussulkeisharjoituksia, jossa sitten kuvataan orjallisesti nykytilaa formaaleilla kuvauskielillä, kaikki ihmettelee minkä [...] takia"

(Management/Consultant-role, working at solution level, in both public and private sector, with over ten years of experience)

One practitioner referred with these kinds of time wasting enterprise architecture practices to the extensive framework following.

"take TOGAF and start to carry out enterprise architecture work accordingly" "otetaan TOGAF, ja aletaan suorittaa yritysarkkitehtuurityötä sen mukaan"

Consultant, working at solution architecture level, in private sector, experience 0-5 years

The business people may not understand the models focusing too much on certain notation language. Therefore, the reason for practices should be clear before practices.

# 5.1.3 Solutions for Business-Driven Enterprise Architecture Work

Practitioners revealed methods for ideal, business-driven enterprise architecture work. These methods include understanding the management and their objectives, enterprise architecture mindset, and customer experience as internal value.

#### **Solution: Understand Management**

One experienced enterprise architecture practitioner advised that actually architect should be responsible for understanding the executives and their objectives. Enterprise architects should understand the strategic aims of the enterprise and commit to them. Thus, enterprise architects support management to implement business models through processes and information systems. Another experienced practitioner demonstrated understanding of management. This consultant prepared a presentation to the top management of the client organization, in the public sector. This presentation explained the benefits of enterprise architecture and other issues management needs to know about enterprise architecture. The presentation and approach demonstrated efforts to really understand management. This practitioner managed to convince management of the client organization to commit into enterprise architecture work by showing benefits of enterprise architecture. Here is to note that this practitioner was not in-company architect working in IT department; that is, the practitioner did not possess the hierarchical legacy which may hinder contact with top management.

## **Solution: Architectural Mindset**

The architectural mental model or mindset was emphasized by practitioners. Enterprise architecture mindset refers to the systematic approach to understanding the whole structure instead of focusing only on narrow parts. The important part of mindset is to understand the essential processes with respect to the whole. Mindset can be applied although work would be only at system level. Mindset was mentioned being more important than the correct tools and notations for architecture descriptions. Important is to note that the enterprise architecture mindset is possible, regardless whether the activities are called as enterprise architecture practices.

"...at the moment the best approach is that we don't make it into a big deal, no flag waving that 'let's start making enterprise architecture now' but instead we join the program and see to that the processes and information systems will be developed well and we derive the requirements from those business models" "tällä hetkellä se paras lähestymistapa on se, että ei tehdä siitä hirveen isoa numeroa, ei heilutella sitä lippua, että 'nyt ruvetaan tekemään kokonaisarkkitehtuuria', vaan mennään sinne hankkeeseen mukaan ja katotaan että prosessit ja informaatiojärjestelmät tulee hyvin rakennettua, että me johdetaan ne vaatimukset sieltä businessmalleista"

(Management-role, working at enterprise level, both in company architecture and consulting, over ten years of experience)

Enterprise architecture mindset was especially applied by experienced practitioners at solution architecture level.

## Solution: Customer Experience as Internal Value Leads to Business-Driven Enterprise Architecture

As mentioned earlier, a business-driven enterprise architect commits to the strategic aims of the enterprise. Strategic aims or internal values today seem to have a common theme: customer experience. Within the scope of this thesis, customer experience equals with the concept of user experience. Customer experience is considered as user experience especially in cases where the customer refers to the user of products or services provided by the enterprise.

Due to this strategic aim of customer experience, the committed enterprise architect considers what is important to the end customer, i.e. the user of the services or products provided by the enterprise. Customer experience as organizational value seems to drive for business-driven architecture. Thus, customer experience as internal value drives for enterprise architecture functions that contain user-centered aspects.

"I see it so that the customer experience is exactly this business-driven architecture work, and with this we will get some concreteness, and that our customers will realize that it is like useful to collaborate with us." "Mä nään, että tää asiakaskokemus on just tätä liiketoimintalähtöistä arkkitehtuuriduunia, ja tätä kautta taas me saadaan konkretiaa, ja se että nää meidän asiakkaat oivaltaa, että meidän kanssa on niinku hyödyllistä tehdä vhteistyötä,"

(In-company architect working at enterprise level, in private sector, with over ten years of experience)

Research showed that business-driven enterprise architecture aims at detecting possible risks instead of just solving problems. Combining this thinking with the user perspective enhances value creation, as one interviewee demonstrated with a case. This practitioner had discovered possible risk with parallel projects that aimed at "traditional" user experience without "wow-effect". The target of the enterprise had been to differentiate by providing targeted services to different

customer segments. This enterprise architect had noted that these projects should have a uniform way of producing user experience. Thus this architect had suggested to key stakeholders in the business unit using an external consultancy firm focusing user research and usability. User and customer research results were used in collaboration with communications and branding. Thus, a new enterprise wide electronic procurement system and related processes were developed with enterprise architecture thinking incorporated into understanding of the users and their use contexts.

"There was a huge difference in the starting point, [...] that the customer did not in practice make external, or was unable to place an order with us with the electronical [system], but had to phone some kind of sales person, with whom the order was placed, and it was really complicated, internal process, how it was done [...] we managed to simplify it very much [with the user-centered perspective]" "Siinä oli hirveä ero siinä lähtötilanteessa, [...] että asiakas ei käytännössä tehnyt ulkoisia, tai ei voinut tehdä meille suoraan tilausta sähköisellä vaan piti soittaa jollekin tämmöselle myyntihenkilölle, jonka kanssa sitten tehtiin, ja se oli hyvin monimutkainen, sisäinen prosessi, miten se tehtiin. [...] saatiin yksinkertaistettua hyvin paljon,..."

(In-company architect working at enterprise level, in private sector, with over ten years of experience)

To conclude, business-driven enterprise architecture seems to understand what really matters for the organization. It realizes that organization benefits from the understanding the customer and how the customer operates with the organization. Business-driven enterprise architecture practices begin from the contextual level where the interrogative is why.

# 5.1.4 Concept of User within Enterprise Architecture

The concept of user is not easy in enterprise architecture context. Practitioners' perspectives on the users within enterprise architecture varied from information system end-users to everybody.

Five practitioners mentioned that enterprise architecture is used by "everybody" in some way. The reasoning included that enterprise architecture belongs to everybody because everybody has a role within it, including those to whom it is advantageous, as well as those who produce and those who develop enterprise architecture. Everyone can have interest in, and decide or design something with enterprise architecture. Enterprise architecture relates to an entity, such as enterprise, and thus it involves everybody, including customers, suppliers, and employees.

One practitioner remarked that more directly enterprise architecture was used by CIOs, business managers, process owners and product managers, project managers and steering groups, as well as the architects at the central point as enterprise architecture users. Another practitioner mentioned that enterprise architecture was used by the stakeholders in the business side for the business development. These development programs and their management require the architectural requirements in order to be able to develop business according to enterprise architecture. Inside these programs, the head designers and application architects use enterprise architecture for understanding the larger context. Additionally, the system end-users should participate in enterprise architecture.

"...to some degree also the very end-users of the systems, because architecture should like understand at least a little what the real life there in the trenches eventually is like, so that it would not go to that [kind of] ivory-tower architecture, which you also see every now and again." "...jollain asteella myöskin ne järjestelmien ihan ne loppukäyttäjätkin, arkkitehtuurin on taas hyvä ymmärtää edes vähän sitä mitä se oikea elämä on siellä juoksuhaudoissa lopulta, jotta se ei menisi sellaiseen norsunluutorniarkkitehtuuriin, jota sitäkin näkee aina välillä."

Consultant working at solution level, in both public and private sector, experience 5-10 years

Three of the sixteen practitioners mentioned that 'users' within enterprise architecture are only end customers and employees. The only common thing with

these practitioners was that they all work in consultant organizations. One of these practitioners remarked that the users do not use enterprise architecture; they use the applications and systems developed with the enterprise architecture. Another one stressed that the term of 'user' is irrelevant in context of enterprise architecture.

## Two simple user types identified

To simplify the complex concept of user in the context of enterprise architecture, the findings were analyzed with two types of users, namely system end-users and business users.

- (*System*) *end-users* refer to the traditional user thinking which considers as users the end-users of those systems and applications developed as enterprise architecture implementations with enterprise architecture products.
- Business users refer to those who directly use enterprise architecture products, services, processes. Business users include management, architects and other IT employees, as well as business programs and projects.

Business-driven enterprise architecture requires especially understanding the goals and objectives of business users. The objectives of business users may include understanding the end-users.

# 5.2 Principle A: Understanding Users, Tasks and Environments

This subchapter includes findings and analyses founded on the contents of usercentered Principle A: Understanding users, tasks and environments (p. 20). Regarding the current state of understanding, some examples demonstrating understanding as well as some challenges are presented in subchapter 5.2.1. Then, in the subchapter 5.2.2, the overall perceptions toward this principle are presented. Practitioners considered different issues important to know and significant for enterprise architecture.

# 5.2.1 Current State of Understanding Users, Tasks and Environments

Surprisingly many example cases discussed within the interviews demonstrated considering users, especially end-users. At solution architecture level, architects had interviewed end-user representatives and utilized research reports for creating and supporting understanding. In addition, solution level architects mentioned the need to understand business users and to meet with them to understand their objectives and to guide them for benefits of enterprise architecture. Furthermore, the business-driven enterprise architecture solutions presented in Subchapter 5.1.3 consisted of examples of enterprise level user understanding, such as the experienced practitioner in the consultant role preparing the presentation for the top management of client organization. That presentation demonstrated understanding on the expectations and objectives of the business users.

Practitioners implied that the current state analysis is the part in which user requirements are collected. Collecting user requirements included possible user research or user involvement. Thus, understanding the current state should not be overlooked although some practitioners considered it as a waste of time (see page 41).

"It is sort of that current-state analysis, how each organization operates at the moment, and then we get during the requirement elicitation for the "se on niinku tavallaan sitä nykytilaanalyysia, että miten kussakin organisaatiossa tällä hetkellä toimitaan, ja sitten me saadaan, kun haetaan vaatimuksia sille prosessille, että miten se prosessi tulisi niinku process, [information] how the process should work in the optimal case, so this is the phase where we search for those who daily, use the system on a daily basis." optimitapauksessa toimia, niin silloin haetaan niinku niitä, jotka on päivittäisessä, päivittäin käyttävät sitä järjestelmää."

(Consultant, working at solution architecture level, in public sector, over ten years of experience)

The cases discussed involved examples of understanding end-users which use the systems and applications developed with enterprise architecture. Architects at solution level have for example conducted some user researches to map stakeholder needs. Other architects at solution level have utilized user information from other projects without actually meeting the users. These cases have included benefits and challenges.

#### Examples: Architect met system end-users in person

One solution level architect consultant visited and interviewed representatives of system-level users in a public sector case where customers were governmental authorities. This case counted as users experts and management level representatives. Although they were not considered as the end-users of the future systems, they were considered as user representatives who know what occurs in detail level. The overall task of the consultants related to the conceptual and logical levels of infrastructure architecture program.

"...We went in person during the program to map the stakeholders and, like, their operations, to consider how, what kind of issues there will pop out that we should catch the ball regarding what kind of architecture or actually then already the system development, like infra will be built, so that it would better serve those" "Henkilökohtaisesti me käytiin tossa tota hankkeen aikana kartottamassa sidosryhmiä ja sitä niinku ihan heidän toimintaa, miettimässä sitä miten se, minkälaisia asioita sieltä tulee esiin, joista meidän pitäisi ottaa niinku palloa sen suhteen että miten jotain arkkitehtuuria tai oikeammin sitten jo sitä järjestelmäkehitystä niinku infraa rakennetaan, jotta se palvelisi paremmin noita"

(Consultant working at solution level, in both public and private

sector, experience 5-10 years)

Benefits of that meeting with users, as stated by the architect, included enhanced understanding on the stakeholder needs. Architects received understanding of the detail level issues meaningful to end-users. Although most of those detail level issues might not have been meaningful at the higher level, some architectural issues were found which were critical and not been considered before those interviews. The issues these kinds might for example influence on human lives if not considered. In addition, this practitioner noted as benefit that they were able to "give faces to the program" in order to users to understand things do not appear from the "ivory-tower".

Challenges of this case included lack of support from the program management side regarding this user research. A couple of years passed by before architects were allowed to conduct this user research, because it was not in the program plan.

Another case, which was a limited area solution architecture case, included one architect visiting representative user for an interview of the current state. At the same time, this architect observed the functions of processes. From this case, the architect had learned that also architect can conduct user observation and thus receive valuable information for state descriptions direct from the best source.

"...why not, and you could also say 'who else' because you get the best information from the very source", "... miksipä ei, ja voi sanoa että 'kukapa mukaan' että siinähän sen parhain tiedon saa juuri sieltä tiedon lähteeltä,..."

(In-company architect and consultant, at solution level, mainly in public sector, with more than ten years of experience)

This architect received better understanding about the user's tasks and workflow, how the information goes within the process from system to system. This particular observation case did not reveal any new information to the architect, it just confirmed something. Nevertheless, the architect noted the importance of real life information for example regarding usability issues. "something could have come up [...] we could have been quite blind to something... relating to usability or what really happens and so on..." "siinä nimenomaan voisi juuri tulla jotain sellaista mikä ois ihan [...] mille oltais oltu ihan sokeita jollekin, siis se voi olla joku käytettävyyteen tai siihen mitä tapahtuu todella niin siihen liittyvää, joo."

(In-company architect and consultant, at solution level, mainly in public sector, with more than ten years of experience)

This practitioner noted that human limitations are challenges for using user observation.

"human limitations on knowing, that is, what to ask and how to observe the right way and how to focus on the right things and what the essential things are" "[...tässäkin mennään niiden] inhimillisten ymmärryksen rajoissa, elikkä että osaa kysyä, tarkastella oikealla tavalla ja kiinnittää huomionsa oikeisiin asioihin, nimenomaan mitkä on oleellisia sen mitä ollaan hakemassa."

(In-company architect and consultant, at solution level, mainly in public sector, with more than ten years of experience)

Based on this, the collaboration of user-centered design expert and enterprise architect could be advantageous. Together they could observe users even better, since the user-centered design experts have better knowledge on human related matters whereas architect understands how to abstract complex processes.

#### **Example: Using information from other projects**

Information from other projects provides also some understanding of users and their needs. One consultant mentioned a client case, where client organization had conducted user research which revealed problems in a certain employee related process. The report from this research assisted consultants to discover problems in the technical architecture of the systems relating to the process. In this case, the architect consultants could utilize those problem listings as rationale for architectural problem improvement. Their original task contracted by the client was however only to review the technical architecture. They had to first convince the direct stakeholder in client organization that reviewing the involved processes is also required. In addition, they received information on this user research only later during the process review.

"The information was dropped every now and then... we were told that [end-users] were complaining this and that and there was also a written report [made by someone inside the customer organization] that included some of these problems [...]...from it we got, I don't know how real idea, but an idea that sort of helped us to find the problems in that architecture" "Sitä tiputeltiin siellä sun täällä, kerrottiin [käyttäjät] ovat valittaneet tämmöstä, ja [käyttäjät] ovat valittaneet tämmöstä, ja sit oli niillä yksi raporttikin siitä, mikä oli kirjoitettu, mihin oli kerätty kaikkia näitä ongelmia, mutta aika hyvin siitä sai semmosen niinku, en tiedä miten todellisen kuvan, mutta sen kuvan mitä...tavallaan, joka auttoi meitä sitten löytämään ne ongelmat sieltä arkkitehtuurista."

(Consultant working at solution level, private sector, experience 5-10 years)

The mentioned problems included certain issues, some of which originated from the architectural level.

*"for example in a certain phase"* of the process [the user needs to] change the tool/system, and this weakens the usability, one must learn to use many different tools/systems, some things take too long a time, some things do not work as they should or they do not work at all, and from these we could sort of figure out like so, well, if in this stage of process is this kind of thing that it does not work, so what is the architecture underneath, in which part it is broken or in which part we could make some improvements"

" jotain tiettyjä asioita, esimerkiksi jossain tietyssä vaiheessa prosessia joutuu vaihtamaan työkalua ja tää heikentää sitä käytettävyyttä, joutuu opettelemaan montaa eri työkalua, jotkut asiat kestää liian kauan, jotkut asiat eivät toimi niin kuin ne pitäisi tai eivät toimi ollenkaan, ja tavallaan näistä sitten pystyi miettimään, että no okei, jos tässä vaiheessa prosessia on tämmönen, että se ei toimi, niin mikä se on se arkkitehtuuri siellä alla, että missä kohtaa se on rikki tai missä kohtaa vois tehdä parannuksia."

(Consultant working at solution level, private sector, experience 5-10 years)

In that case the information reached the architects only later; however, they received the report. The fact that information is not available is a challenge.

#### Challenge: Direct contact to users is not possible

Organizational hierarchy hinders actually meeting the end-users or end-customers, especially in the enterprise architecture level. Some practitioners have acknowledged that they should avoid ivory-tower thinking.

"here [we] are [hierarchically] far from [real customers]. The risk is that we are in the ivorytower and nothing, what we do, has like any influence on anything." "...kaukana täällä ollaan [todellisista asiakkaista]. Riskinä on se, että ollaan norsunluutornissa ja ei millään mitä tehdään oo sillain vaikutusta."

(In-company architect working at enterprise level, in private sector, with over ten years of experience)

Some practitioners remarked that the possible user studies regarding end users or end customers are usually made by other departments than enterprise architecture. The hierarchy between enterprise architect and for example the market research department could be large. No formal meetings might occur where this information of customers and users could be shared. In addition, the feedback from customers and other end users might come through centralized organization which filters the information.

"[Explicit understanding of users, tasks and environments is] in practice challenging to reach because we are so far from the end-users, our endusers are [...] customers or if they are internal end-users they work somewhere else [...] we know here only little about their practices [...] work the information comes to us through centralized organization, so the information will be filtered at least on one level."

"[Explicit understanding of users, tasks and environments on] käytännössä vaikea saavuttaa ku me ollaan kaukana niistä loppukäyttäjistä, meidän loppukäyttäjät on [...] asiakkaita tai jos ne on sisäisiä loppukäyttäjiä niin ne työskentelee jossain muualla [..] heidän toimintatapojaan tunnetaan hvvin vähän täällä [...] tieto, mikä meille tulee keskitetyn organisaation kautta, mikä on filtteröitynyt sit vähintäänkin vhdessä tasossa."

(In-company architect working at enterprise level, in private sector, with over ten years of experience)

To avoid ivory-tower, the collaboration with other departments, i.e. with the business users is essential. However, the hierarchical location is not the only challenge. The actual attitudes may also cause problems.

## Challenge: User groups not identified due to attitudes

The attitudes of enterprise architects or others participating enterprise architecture practices may cause limited understanding. Stereotype based attitudes may cause failures at end results. As an example, a consultant at solution architecture level mentioned a case where stakeholders and their needs were not documented nor discussed. The reason was that participants thought no need to consider the users because "everybody knows who they are".

"[stakeholder groups and their needs] came more like implicitly... everybody knows what kind of customers use that system, and who in my client organization operates in support functions etc" "Enemmän ne [sidosryhmät ja niiden tarpeet] tuli silleen implisiittisesti. Että kaikki tietää minkä tyyppiset asiakkaat sitä järjestelmää käyttää ja ketkä siellä mun asiakasorganisaatiossa on niinku tekemisissä tukitoiminnoissa ja niin edelleen."

(Consultant working at solution level, in both public and private sector, experience 5-10 years)

Another solution level consultant explained a case which implicated that understanding users and their tasks would not be necessary at the strategic enterprise level, since the process might get "automated", and "everybody already knows" the problems. Context in this case was consultancy for systems integration at strategic level. In this case, the consultant had interviewed executives, IT people and architects. Users of those existing systems had not been interviewed.

"If one decides to do something to the situation, then... But another option is to choose "Sitten varmaan, jos päätetään tehdä tilanteelle jotain, niin sitten tietysti... varmasti analysoidaan tarkemmin... tai some [X-]system and transfer the data there... necessarily we do not have to go deep with analysis, that everybody already knows the problem, but actions have not been taken." toinen vaihtoehto, että valitaan joku [x-]järjestelmä johon siirrettään sitten ... välttämättä ei tarvitse mennä edes syvälle analysoimaan, että se on hyvin tiedossa kyllä kaikilla se ongelma, mutta ei vain ole ryhdytty toimenpiteisiin."

(Consultant, working at solution architecture level, in private sector, experience 0-5 years)

These challenges should be acknowledged in order to provide benefits. Different user groups have different needs and automated processes involve usually somewhere in the whole chain some kind of human activities.

## 5.2.2 Perceptions on Understanding Users, Tasks and Environments

Practitioners emphasized that understanding the usage is important for decisionmaking. Practitioners also emphasized the understanding for whom something is produced. Latter was especially essential according to in-company enterprise architects. Without understanding, enterprise architects are unable to offer suitable solutions for customers.

*"you can't make decisions, if you don't understand how things are used"* 

"ei voi tehdä päätöksiä jos ei ymmärrä mihin asioita käytetään"

(Consultant working at solution level, in both public and private sector, experience 5-10 years)

"You cannot otherwise make such decision and construct such a whole, and now I don't talk just about the technical, [or the] architect, but you cannot construct a customer serving whole if you don't know who they [i.e. users] are." "Et sä voi muuten tehdä sellaisia päätöksiä ja rakentaa sellaista kokonaisuutta, ja nyt mä en puhu teknisestä pelkästään, arkkitehdista, vaan sä et voi rakentaa sellaista kokonaisuutta joka palvelee sitä käyttäjää, jos et sää tiedä ketä ne [käyttäjät] on."

In-company architect working at enterprise level, in private sector, experience 5-10 years

Fourteen practitioners perceived applying the first principle of ISO 9241-210:2010(E) standard "*the design is based on explicit understanding of users, tasks and environments*" possible in enterprise architecture context. Especially those practitioners with longer overall experience within the field stressed that understanding the processes and the activities is essential. Understanding the operations and processes includes also the users and their roles and activities.

"In enterprise architecture, the starting point is to understand like the operations of the organization, and that relates to users and their tasks." "Ja kokonaisarkkitehtuurissa lähdetään siitä, että ymmärretään se niin kun organisaation toiminta, ja siihen liittyy käyttäjät ja heidän tehtävänsä"

(Consultant working at solution architecture level, in public sector, over ten years of experience)

"...we have to see the process. The process forms the requirements for information systems, and the requirements for information systems cannot be separated from the process because there [inside the process] they [i.e. information systems] are used." "...meidän täytyy nähdä se prosessi. Prosessi muodostaa vaatimukset tietojärjestelmille ja tietojärjestelmien vaatimukset ei voi olla mitenkään irrallisia prosesseista koska siellähän niitä käytetään."

(Management-role, working at enterprise level, both in company architecture and consulting, over ten years of experience)

Furthermore, essential in understanding is not only the processes and user requirements, but also human behavior.

"...mainly that we sort of have to recognize the user's um role, user responsibilities, and how a human acts in that certain situation regarding this system...it is clear and should be based on human actions and human behavior" "..lähinnä se, että meidän pitää tavallaan tunnistaa se käyttäjän tuota roolitus, käyttäjän vastuut, ja miten se niinku ihminen toimii siinä tietyssä tilanteessa tän järjestelmän osalta... ihan on selkeä ja pitää perustua ihmisen toimintaan ja ihmisen käyttäytymiseen...."

(Consultant working at solution architecture level, in public sector, over ten years of experience)

Understanding customers is important already at strategic level; however, more detailed understanding belongs in the middle-level.

"Because enterprise architecture goes all the way from strategy to detail level development, so the A is essential there in the middlelevel development. Sure we need to understand customers already in the strategy, like why, like who our customers are, why, and what we want to offer them." "... ku kokonaisarkkitehtuurihan menee ihan sieltä strategiasta ihan sinne nippelitason tuottamiseen saakka, niin kyllähän tuossa tuo A on ihan oleellinen siinä välikerroksen tuottamisessa... toki pitäähän siinä strategiassakin jo ymmärtää asiakasta, että miksi... mitkä on meidän asiakkaita, miksi, ja mitä me halutaan niille tarjota"

(Consultant working at solution architecture level, in public sector, over ten years of experience)

Understanding customers and users can even be considered as a key topic at enterprise architecture level, even though less detailed manner.

"What we just talked about...to understand who the users are, what they want to do, in which situation and what environment those needs arise, so, in my opinion, this is a key thing in this enterprise architecture work also, but sure when thinking about entireties, these are then at a somewhat coarser level than in an individual service, but absolutely ves" "Mitä mun mielestä tuossa äsken just keskusteltiin, että ymmärretään niitä, että ketä ne käyttäjät on, mitä ne haluaa tehdä, missä tilanteessa, ja missä ympäristöissä niitä tarpeita ilmenee, niin mun mielestä tää on ihan avainasia tässä kokonaisarkkitehtuuriduunissakin, toki kun me ajatellaan kokonaisuuksia niin nää on sitten ehkä vähän karkeammalle tasolle jäsennetty kuin jonkun yksittäisen palvelun osalta, mutta ehdottomasti joo."

(In-company architect working at enterprise level, in private sector, with over ten years of experience)

The end-users should not be the only ones considered. Understanding to whom and why should also cover the "business users" and their objectives.

"Now when Ι that sav understand, [architect] SO, needs to understand the business objectives of the development,... addition in [architect] also can understand other viewpoints, and this understand means that understands but does not necessarily implement things that way, since the architectural boundaries and realities come from the other side, and the architect should check if there is bad conflict. [...] But that cannot happen before the architect has understood the target where we are headed."

"Nyt kun mä puhun että ymmärtää, niin sen täytyy ymmärtää sen liiketoiminnan kehityksen tavoite...sen lisäksi se voi ymmärtää muitakin näkökulmia, ja se ymmärtää tarkoittaa sitä, että ymmärtää, mutta ei välttämättä toteuta sitä sellaisenaan, että sit tulee ne niinku ne arkkitehtuurireunaehdot ia reaaliteetit tulee sieltä toisesta reunasta, ja sit katotaan että ollaanko tässä pahasti konfliktissa, [...], mutta se ei voi tapahtua ennenku arkkitehti on ymmärtänyt sen tavoitteen mihin ollaan menossa."

(Solution level architect & Consultant, private sector, experience 5-10 years)

In addition, another consultant emphasized that architecture team should meet the business users at the early phase. This meeting should involve guiding business users such as management regarding the benefits of enterprise architecture practices.

"...especially, in the beginning of the work, relating to the guiding part, we guide them in how to benefit from the architecture. If you take some traditional business manager, well, they don't understand anvthing about structural planning, so we have to go and present the material but probably also tell, or together walkthrough, how this influences your plans or decisions"

" ... varsinkin sen työn alkuvaiheessa, siihen liittyy just se tukipuoli, että opastetaan heitä, että miten sitä arkkitehtuuria hyödynnetään, että jos ottaa jonkun perinteisen liiketoimintajohtajan niin eihän hän ymmärrä rakenteisesta suunnittelusta yhtään mitään, että pitää ainakin mennä esittelemään se materiaali, mutta todennäköisesti myös kertoa, tai yhdessä käydä läpi, että miten tää vaikuttaa sinun tekemiin suunnitelmiin tai sun tekemiin päätöksiin. "

(Consultant working at solution level, in both public and private sector, experience 5-10 years)

Regarding the applicability of the first principle, the remaining two votes included practitioners stating that "explicit" is such a strong word and applying would be thus too context dependent or not possible at all. One of these practitioners did not consider principles relevant in enterprise architecture at all because the practitioner considered principles relating only to the end-users. The same practitioner considered that understanding users, tasks and environments is not needed, if the process is going to be automated. This one practitioner had least experience which might have influenced the ability to understand larger applicability.

"That first part, we perhaps do not go that deep, or we do not have the possibility to go that deep [...] in enterprise architecture related analysis, so that we would have 'explicit understanding' of anything. [...] It is only one analyzed area, if at all... often, for example automation is so advanced that the users participate in the process at only few points, so that many things happen under the hood, such as, for example, in logistics there are automated warehouses...so, there is not much need for the users at all...

"Tuossa ekassa ei ehkä mennä niin svvälle tai ei mahdollisuutta mennä siinä tarpeeksi syvälle [...] kokonaisarkkitehtuuriin liittyvässä analyysissä, että olisi 'explicit understanding' yhtään mistään. [...] se on kuitenkin vaan yksi tarkasteltavista aihealueista, jos sitäkään ... monestihan, esimerkiksi automatisaatio on saatettu viedä niin pitkälle, että ne käyttäjät osallistuu siihen prosessiin aika harvoissa pisteissä, että hyvin paljon toteutuu siellä konepellin alla juttuja.. vaikka nvt esimerkiksi logistiikkapuolella on automaattivarastoja... ei kauheesti tarvita niitä käyttäjiä ylipäätäänsä."

(Consultant, working at solution architecture level, in private sector, experience 0-5 years)

To conclude, understanding both types of users was acknowledged important by the practitioners. Almost all practitioners perceived that applying this 'understanding' principle is possible, and even required within enterprise architecture practices.

# 5.3 Principle B: Involving Users

Findings and analyses presented in this subchapter are founded on Principle B: Involving users (p. 21). The current state of involvement including examples is presented first. After that the perceptions of the practitioners are presented in 5.3.2.

# 5.3.1 Current State of Involving

The level of user involvement depends on the interpretation of the concept of user. Involving end-users in the enterprise architecture in a regular basis was not common; however, the business users were at some level involved in enterprise architecture practices. The current end-user involvement depends actually on whether development projects at solution architecture level are included as enterprise architecture work Many programs involved representatives of user groups in workshops and seminars.

# Examples: Users involved in enterprise architecture activities

With reference to the extensive modeling with formal notations (page 41), one experienced practitioner explained learning from the history. Previously enterprise architecture practices had involved formal modeling without considering the real usage, whereas today this practitioner includes business users in enterprise architecture practices. This practitioner emphasized that enterprise architecture should be produced together with those to whom value is created with activities. For example, enterprise architecture activities should be practiced together with those activities should be practiced together with decision situations. Otherwise activities do not benefit the whole.

"Well, precisely this way, it is now the way we have started to do things, meaning that we have learned from history, that I used a couple of years to construct this kind of system map, and the end-result was it was not widely used. It emerged that it apparently was too complex, No, kyllä tässä nimenomaan sillä tavalla, se on nyt se tapa millä on lähdetty tekemään, eli tässä on nyt historiasta sillä tavalla opittu, että mä tein pari-kolme vuotta rakensin tälläista järjestelmäkarttaa ja lopputulos oli, että se ei kovin laajasti tullut käyttöön, että kävi ilmi, että se oli tota ilmeisesti liian monimutkainen ja kun niitä prosesseja ei oltu ajateltu niin..kyllä tässä sinänsä on virheistä opittu, että and when the processes were not considered. So, in that sense, I have learned from mistakes, that it is not worth to develop in one's chamber those theoretically fine and beautiful and correctly modeled things, but specifically together with those to whom you try to provide the value... sitä ei kannata kammiossa tehdä ja teoriassa tosi hienoa ja kaunista ja oikein mallinnettua juttua, vaan nimenomaan siellä yhdessä niitten kanssa, joille sitä arvoa yrittää tuottaa, niin kyllä...

(In-company architect working at enterprise level, in private sector, with over ten years of experience)

Example of user involvement at program level includes end-user representatives and business users involved in a large solution level program. This program consisted of parallel projects. These projects utilized enterprise architecture methods. User involvement approaches included multiple workshops, where user representatives participated in, especially for the requirement elicitation project. The challenge with this program was that the users were mainly involved in separate project to the enterprise architects. Due to separate projects, the benefit of user involvement with respect to enterprise architecture could have been lesser than with active involvement.

*"…service* processes and requirements definition projects are those that most involve users, but the requirements definition project had the most emphasis on user involvement. [...] Well, our enterprise architecture group has mostly participated in the parallel projects aka information systems project plus technology architecture project, and in the beginning... now of course these things have grown closer..."

"palveluprosessit-projekti ja vaatimusmäärittely-projekti ovat korostetuimmin ne, missä ne on olleet kävttäjät. mutta vaatimusmäärittelyprojekti oli se, missä kaikkein korostetuimmin käyttäjät on olleet mukana. [...] No, tää meidän kokonaisarkkitehtuurijoukko on ollut lähinnä sitten suurimmassa määrin rinnakkaisprojekteissa näissä eli tietojärjestelmät-projektissa plus sitten teknologia-arkkitehtuuriprojektissa, ja alkuvaiheessa...nyt tietenkin tässä vaiheessa tietysti nää asiat on lähentyneet toisiaan.'

(Consultant working at solution architecture level, in public sector, over ten years of experience)

Users can be involved in many different ways.

#### **Example: Different types of involvement**

One experienced solution level practitioner realized that "designer" is not the only role in which users can be involved. Informant is more probable role for users involving the enterprise architecture practices.

"I say, then actually, if there have been those processes, then there have been also process participating. owners Then business practitioners within the processes, well they are there just like... they aren't like design experts but they are experts like in social services production, or in banking services, knowing the insurance provision or legislation or taxation laws, so they are then the person to be heard, meaning that they do not perform but they are informants."

"kyllä sit tosiaan, jos on noita prosesseja ollut niin, kyllä siellä on ollut sitten myös prosessiomistajia mukana. Sit taas business-toimijat siellä prosesseissa, niin nehän on vaan niinku siellä...eihän ne oo niinku mitää suunniteluasiantuntijoita vaan ne on asiantuntijoita vaikka jossain sosiaalipalveluiden tuottamisessa, tai jonku pankkipalvelun tuottamisessa, vakuutuussäännösten tai lainsäädännön tuntemisessa tai verolain tuntemisessa. että ne on sitten niinku kuultavina henkilöitä tässä, että ne ei oo tekevinä vaan ne on tietolähteinä. "

Management/Consultant-role, working at solution level, in both public and private sector, with over ten years of experience

Involving users might have challenges, such as managerial issues.

## Challenge: Client might prohibit involving users

User researches conducted by others caused that client prohibited involving endusers in the solution architecture project. However, that study had been survey, not actual participation or interview. Thus, the information of the real life was limited.
"Client did not want that they [=end-users] would have been taken into this project or that they would have been bothered with this project...[...] there was this survey earlier, and in a sense, it would have been like again they are asking something" "Asiakkaalta ei haluttu, että heitä nytten otetaan tähän projektiin tai heitä häiritään tällä projektilla tai ... ja ilmeisesti he, siellä oli tehty jo sitä kyselyä aikaisemmin ja tavallaan se oli vähän, että nyt taas tullaan kyselemään"

(Consultant working at solution level, private sector, experience 5-10 years)

### 5.3.2 Perceptions on Involving Users

Similar to the user understanding, also user involvement was associated with the user requirements. According to one experienced practitioner, users belong to the early phases of enterprise architecture practices. This kind of user involvement includes mapping the realistic user needs to the strategy in the form of the requirements.

"Well of course [users] belong [to the describing phase of architecture], because they tell the requirements and we in turn need to know how to map [...] requirement realistic [...] when we are able to map the requirement to our strategy and our target state towards which we aim, because we want that user to be our customer, so this is where the linkage happens why the customer is, sort of, part of that design process."

"No tottakai ne kuuluu, koska nehän kertoo ne vaatimukset, ja meidän taas täytyy ne vaatimukset osata kytkeytyä..[...] vaatimus realistinen [...] me voidaan se vaatimus kytkeä siihen strategiaan meidän ja siihen tavoitetilaan mihin me pyritään, koska me halutaan että juuri tuo käyttäjä on meillä niinku asiakkaana, niin tässä tapahtuu se kytkös siihen miksi se asiakas on tavallaan osa sitä suunnitteluprosessia."

(In-company architect working at enterprise level, in public sector, with over ten years of experience)

Most of the practitioners considered the second ISO 9241-210:2010(E) principle *"users are involved throughout design and development*" applicable in enterprise architecture. Involving users in enterprise architecture in the future depends on who is considered as a user in enterprise architecture practices. Twelve practitioners considered it possible to involve end-users in enterprise architecture; however the level and phase of the involvement depends on the architecture, organization or practitioner. Three practitioners emphasized that especially involving business users in enterprise architecture activities is essential. These three practitioners have in common the experiences from the financial sector. Both users can be involved in many roles.

Many practitioners acknowledged that users, or process practitioners as put by one practitioner, know the best what they actually do. Even though they may lack the whole view.

"Yes, is applicable. Users or process practitioners have, of course, the best knowledge of that what exactly they do, but certainly they do not have the big picture, and it is very often false impression of what others do" " kyllä, voi soveltaa. Käyttäjillä tai prosessin suorittajilla on paras tieto tietenkin siitä mitä juuri he tekevät, mutta ei tietenkään sitä kokonaiskuvaa ja sehän on hyvin usein väärä käsitys siitä mitä muut tekevät."

(Management-role, working at enterprise level, both in company architecture and consulting, over ten years of experience)

According to some practitioners, the applicability of this principle with end-users as users participating on enterprise architecture work depended on factors such as architecture, enterprise architect or organization.

"it depends, if we are in dealing with architecture that touches directly end-users, so then those end-users should be involved in the work" "Riippuu tapauksesta, jos ollaan tekemisissä arkkitehtuurin kanssa joka koskettaa suoraan loppukäyttäjiä, niin silloin niitä, loppukäyttäjiä tulisi ottaa mukaan siihen työhön..."

(Consultant working at solution level, private sector, experience 5-10 years)

"...it isn't valid [...] not by us, we don't even see those endusers..." "...ei oo validi [...] ei meillä, ei me edes nähdä niitä loppukäyttäjiä..."

(Solution level architect & Consultant, private sector, experience 5-10 years)

On the other hand, regarding business users as users, this principle would guide especially enterprise architects. Business users should be involved when creating architecture artifacts or making decisions.

"also, from that business development, or from its perspective we have to draw and discuss those things.. ...users are involved throughout design and development, yes..." "elikkä sen liiketoiminnan kehittämisen, tai sen näkökulmasta täytyy piirtää ja keskustella niistä asioita ...users are involved throughout design and development, kyllä..."

(Solution level architect & Consultant, private sector, experience 5-10 years)

"now, when we talk about enterprise architecture level, so it is sometimes difficult to discuss these things, because most people see the world from their own boxes and silos, so I am not sure...[...] but it could *be applied that way, if we think* about those architectural artifacts and participants in the *architecture workshops* and decision-making situations, so especially in our own work it should guide that 'users are involved', so precisely so that we do together, those target state diagrams, roadmaps et cetera..."

nyt tässä tää, kun puhutaan kokonaisarkkitehtuuritasosta, niin se on hankala välillä näitä asioita keskustella, kun useimmat näkee maailman siitä omasta laatikostaan ja omasta siilostaan lähtien, niin nyt mä en oo ollenkaan varma, [...] mutta kyllä tätä vois sillä tavalla soveltaa, että jos ajatellaan niitä arkkitehtuuriartefakteja arkkitehtuurityöpajoihin ja – ja osallistujia päätöksentekotilanteisiin niin kyllä ehdottomasti tässä meidän omassa työssä tän pitäisi ohjata sitä, että... ja se että' users are involved', niin nimenomaan että niitä yhdessä tehdään, niitä tavoitetilakaavioita, roadmappeja, et cetera,"

(In-company architect working at enterprise level, in private sector, with over ten years of experience)

Many practitioners with project management background referred to agile software methods and best practices when discussing user involvement, evaluation and iterative processes.

"again it is that kind of a best practice, which should be self evident truth – it isn't though, but. Usually users come along at a very late phase." "niin sekin on taas again semmonen best practice, joka pitäisi olla itsestään selvyys – ei tosin ole, mutta. Yleensä käyttäjät tulee mukaan hyvinkin myöhäisessä vaiheessa"

(In-company architect working at enterprise level, in private sector, experience 5-10 years)

"this B-part... it's very clear thing, because especially this kind of scrum or agile development model, that's bases on the idea that we try to get user stakeholders to those sprint evaluations." "tää B)-kohta ...ihan selvä juttu, koska varsinkin tämmönen scrum tai ketterä kehitysmalli niin sehän perustuu siihen ajatukseen, että yritetään saada käyttäjästakeholdereita siihen sprinttien evaluaatioon.."

(Consultant working at solution architecture level, in public sector, over ten years of experience)

To summarize, the most benefit from involving users would arise from involving the business users into enterprise architecture practices.

# 5.4 Principle C: Evaluation from User's Perspective

This subchapter bases the findings and analysis on the contents of Principle C: Evaluation from user's perspective (p. 21). The current state includes examples on the current evaluation practices.

## 5.4.1 Current State of Evaluation from User's Perspective

The current state of user-centered evaluation seemed to be limited to feedback at some level. Enterprise architects received, mostly, only verbal feedback, and that was usually at the end of work. Continuous evaluation which would value also future initiatives at different levels seems to be missing. Those few evaluations from the user's perspective that were not verbal feedback in meetings were usually first inside the projects and focused only on systems and their interfaces. Development programs and projects included informal and formal review sessions, where management and other user representatives might have reviewed documents and thus evaluated them from their perspective. Here is to note that some practitioners did not consider practices at system level as enterprise architecture work.

### Example: Real potential users representatives reviewing the plans

One practitioner explained a case which included user involvement, user evaluation and iterative process. This example case included applying enterprise architecture methods when creating a requirement specification document for a request for proposal (RFP) regarding a large information system with process improvements. This requirement specification document included target state descriptions. The target state descriptions, which were part of the final RFP, were communicated to the end-users through several review sessions. User representatives from those process areas, which were going to be impacted with the new information system, gave improvement ideas. Ideas were discussed in the architecture group. Some of these end user improvement ideas resulted actions, some not. The most end-user ideas that resulted architectural actions were regarding the new processes.

"[in review sessions] there have been of course people responsible for [this particular function] across the [public] sector customer] organization, and also regular people of the *customer*] [public] sector [...participants organization. have given] large set of improvement suggestions and proposals that things should be done differently and those are then handled here in the project group, and some have yielded actions, some of course not [...] there are certain specific process related issues that are after all decided to implement differently than originally thought."

" siellä on ollut tietysti [X funktiosta] vastaavia ympäri [organisaatio]:n organisaatiota, ja myöskin sitten tavallisia [organisaatio]:n organisaation ihmisiä. [...osallistujilta tullut] iso joukko että niitä kehitysehdotuksia ja esityksiä, että asioita pitäisi jollain toisella tapaa, ja niitä on sitten käsitelty täällä projektiryhmässä ja osa on aiheuttanut toimenpiteitä, osa tietenkään ei, että se vaihtelee[...] Siellä on tiettyihin specifeihin prosesseihin liittyviä asioita, jotka on niinku loppujen lopuksi päätetty toteuttaa hieman eri tavalla mitä on alun perin mietitty. "

(Consultant working at solution architecture level, in public sector, over ten years of experience)

That particular case involved only documents and models which were reviewed. Other projects have used prototypes or mock-ups.

### Examples: Expert walkthroughs with use cases and other prototype testing

As user-centered evaluation, prototypes can be tested by experts using real world scenarios. A solution architect consultant implemented use cases and rough functionalities into the system. This proof-of-concept (POC) was tested with the same senior experts who participated in the requirement definition. Another practitioner explained a large enterprise architecture program including baseline project involving a new user interface for external and internal users. To evaluate the new user interface, an HTML mock-up was developed. Only internal user representatives tested this mock-up. Nevertheless, the organization planned testing it also with external end-users.

"We decided, that let's make this kind of proof-of-concept for it, because it was sort of easy, since we knew the use cases [...] then we walked through all the use cases with these same experts" "päätettiin, että tehdään sille tämmönen proof-of-concept, että sehän oli silleen helppo että meillä oli ne käyttötapaukset tiedossa [...]. Sitten käytiin läpi ne kaikki käyttötapaukset näitten samojen asiantuntijoitten kanssa"

(Consultant working at solution level, in both public and private sector, experience 5-10 years)

"That was in general only internally, not with end-user [...] feedback was collected inside [the organization] quite widely. But that what is missing, is, well, that we did not go back to the end-users. We are actually planning that now, we are now in that phase that we are starting the piloting, so it will be the first time when we go with ready outcome to the customer, with the customer's own data so that they can perceive it as their own - that is one thing that demo is lacking"

"Sitä lähinnä sisäisesti. ei loppukäyttäjän kanssa, että sitä näytettiin...ennen ku sitä...feedbackiä kerättiin [organisaation nimi]n sisältä hyvinkin laajasti. Mutta se mikä puuttuu, on hyvinkin se, että ei menty takaisin sinne loppukäyttäjien luokse. Me ollaan itse asiassa tekemässä sitä nyt, että me ollaan siinä vaiheessa että me aloitetaan pilotointi, niin se on niinku se ensimmäinen kerta ku mennään valmiin lopputuloksen kanssa sinne asiakkaalle, jossa on asiakkaan oma data niin se voi mieltää sen enemmän omakseen – se on yksi mikä olisi siitä demosta puuttunut"

(In-company architect working at enterprise level, in private sector, with over ten years of experience)

#### Examples: Evaluation from the business user perspective

According to practitioners, the feedback from management and experts for enterprise architecture descriptions is collected usually in meetings. For example, the strategic planning process includes management as business users. The planning aims to design transformation in many subchapters starting from the current state and target state with the goal of creating the roadmap. "Yeah, the management is part of this [i.e. strategic planning] the whole time; every now and then they comment on our outputs [...] at least once a month with top management" "Joo, siis johto on tässä [strategisessa suunnittelussa] mukana koko ajan, että vähän väliä kommentoivat meidän tuotoksia. [...]mutta ehkä ylimmän johdon kanssa vähintään kerran kuukaudessa...

(Consultant, working at solution architecture level, in private sector, experience 0-5 years)

"Yes, [management] received what they wished, and all the alterations that were asked for were made [...] we collected feedback also from experts [...] showed descriptions in meetings, in which quite lot of people reviewed" "kyllä, [johdon henkilöt] saivat sitä mitä toivoivat, ja kaikki korjaukset mitä pyydettiin saatiin tehtyä [...] kerättiin kyllä myöskin asiantuntijatahoilta [...] näyttämällä kuvauksia palavereissa, joissa oli jonkun verran väkeä sitten katselmoimassa, suhteellisen paljon"

(In-company architect working at solution level, in private sector, experience 5-10 years)

One experienced practitioner mentioned that they enquire the satisfaction of internal customers, i.e. business users, with verbal question. These questions determine whether support provided by the enterprise architecture team has been successful.

"First question is 'when you sat down with us and we discussed this thing, so are you now better informed about what you need to do?' That is the first question. 'Did we save you time and and then as monev?' a background the third 'does this influence you plans?'[...] If the answers are that 'yes, we got what we wanted or got more' then we gain a point. And if we can or they can answer the very thing whether their planning process is now shorter or even though it had got longer but

"Ensimmäinen kysymys se että "ku te istuitte meidän kanssa alas ja me keskusteltiin tästä asiasta, niin ootteko nyt paremmin tietoisia siitä, että mitä teidän pitää tehdä", se on se ensimmäinen kysymys, "säästettiinkö me teiltä aikaa ja rahaa", ja niinkun sitten tulee se niinku kolmas kysymys siihen niinku taustalle. että "vaikuttaako tää teidän suunnitelmiin". [...] jos vastaukset on "joo, me saatiin se mitä me tultiin hakemaan tai saatiin enemmän" niin silloin piste meille. Ja jos me pystytään tai he pystyy vastaamaan juuri siihen että onko heidän suunniteluprosessi lyhyempi nvtten tai vaikka se olis pitentvnvt mutta he sai niinku hyötyä tarkentuneella budjetilla tai suunnitelmalla, niin se

they got benefit with more precise budget or plan, so we are fine if the answer is yes. Then it is two to zero, we got two points out of two – then you are happy." riittää meille jos vastaus on kyllä, se on kaks-nolla, me saatiin kaks pistettä tästä kahdesta mahdollisesta – silloin ollaan tyytyväisiä."

(In-company architect working at enterprise level, in public sector, with over ten years of experience)

To summarize the current state of user-centered evaluation, it seems to be limited to the project level evaluation from end-user perspective or verbal feedback in meetings from the business users.

## 5.4.2 Perception on Evaluation from User's Perspective

Overall, the evaluation would provide valuable feedback, but the evaluation perspective and methods are context dependent. Twelve practitioners considered applying third ISO 9241-210:2010(E) principle "*the design is driven and refined by user-centred evaluation*" suitable for enterprise architecture. Three practitioners mentioned especially evaluation from business user perspective.

"Definition is guided by 'is driven and refined by usercentered evaluation', yes, so from the perspective of the business development, or from its perspective we must draw and discuss those things." "Määrittely ohjautuu ton is driven and refined by user-centered evaluation, joo, elikkä sen liiketoiminnan kehittämisen, tai sen näkökulmasta täytyy piirtää ja keskustella niistä asioita."

(Solution level architect & Consultant, private sector, experience 5-10 years)

Three practitioners especially emphasized the dependency of the context and how literally the principle was going to be interpreted. One experienced practitioner underlined that applicability of this principle depends on whether the design would be *driven* by the user-centered evaluation or *refined* by the user-centered evaluation. This practitioner stressed that users tend to see only their own

perspective, not the whole picture. An architect or someone else, who understands the whole, would be needed to integrate the different perspectives.

"Well, if we say that 'design is driven', then I don't quite sign this. The user-centered evaluation with the process is not always the most effective way to create optimized processes because they see only their own perspective. There needs to be an architect who matches those different perspectives [...] there needs to be the head architect. It does not have to be called that but fact is that somebody needs to pull the strings together and find the contradictions and inconsistencies. That cannot happen as committee work. [...] There has to be someone who at level understands some everything, and that person is the architect. Often it isn't called that, but there is that kind of person. If there isn't, the thing goes wrong. [...] Refined, ves, then we can go to the details one-person of viewpoints."

[...] no, jos me puhutaan, että design is driven, niin tätä mä en täysin allekirjoita, se user-centered evaluation prosessin yhteydessä ei aina ole se tuloksekkain tapa saada aikaan optimoituja prosesseja, koska ne näkee vain oman näkökulmansa, siinä täytyy olla arkkitehti, joka sovittaa yhteen ne erilaiset näkökulmat [...] siinä täytyy olla pääarkkitehti. Ei tartte olla sillä nimellä, mutta faktisesti jonkun täytyy vetää yhteen ne langat ja löytää ne ristiriidat ja epäkonsistentit sieltä. Se ei voi tapahtua komiteatyönä. [...]Siellä täytyy olla joku joka jollain tasolla ymmärtää sen kaiken, ja se on se arkkitehti. Useinkaan sillä ei oo sitä nimikettä, mutta siellä on semmonen henkilö. Jos ei sitä oo, se homma menee pieleen. [...] Refined jees, silloin päästään siihen yhden henkilön näkökulman detaileihin."

(Management-role, working at enterprise level, both in company architecture and consulting, over ten years of experience)

Another experienced architect mentioned an example case where the agile and iterative evaluation fixated on perspectives of few users instead of understanding the whole. This practitioner emphasized that architecture team should understand that fixation in the current state does not benefit the whole. Without understanding the whole, result might be an infinite loop which adds no value, on the contrary.

"one program that I mentioned, so the problem there was that ... they acted like not seeing the whole, and then when the users were stuck with the current process [...] one user wanted things to function this way and some other [user] another way, so.. and things just got modeled and modeled, and nothing got ready [...] agile methods were practiced, so when the next demo was ready, it got renewed, and as said they were in infinite loop and nothing became ready."

"vksi hanke, josta mä mainitsin, niin se ongelmahan oli sitten siellä, että... kun siellä toimittiin näkemättä sitä kokonaisuutta, ja sitten kun käyttäjät olivat kiinni nykyprosessissa, niin siellä ei niinku.. se yksi syy, miksi siellä ei sitten päästy eteenpäin, oli että toinen käyttäjä halusi asian toimivan näin ja joku toinen toisin, eli .. ja sitten asioita vaan mallinnettiin ja mallinnettiin, eikä ikinä saatu mitään valmiiksi sitten sen pohjalta, ja sen jälkeen kun seuraava, tässä hankkeessa käytettiin ketteriä menetelmiä, niin kun seuraava näyttö kun saatiin valmiiksi niin se laitettiin sitten taas uusiksi, ja niinku sanottu niin oltiin siellä ikuisessa loopissa, saamatta koskaan mitään valmiiksi."

(Consultant working at solution architecture level, in public sector, over ten years of experience)

One experienced practitioner considered this principle as customer-centered evaluation, and thus this principle was mentioned to be important and applicable. Feedback from customers would indicate possible improvement areas. However, this experienced practitioner in the private sector acknowledged they do not apply this principle yet.

"Customer-centered evaluation, well we are not yet in this evaluation, but I would see... because, if you don't do evaluation, you don't get feedback, so you don't know what is wrong, so, yes, I buy also this, this should be done, but we don't really do it yet." "Asiakaskeskeinen arviointi, niin tässä arvioinnissahan ei vielä olla, mutta kyllä mä näkisin että...koska jos ei sitä arviointia tee, niin sä et saa palautetta, niin sä et tiedä että mikä siinä mättää, että kyllä mä ostan tänkin, että tätä pitäis tehdä, mutta tätä me ei vielä sinänsä tehdä."

(In-company architect working at enterprise level, in private sector, with over ten years of experience)

Evaluation from the business user perspective could also imply following business cases, which are important for the business users. A couple of practitioners mentioned that enterprise architecture programs and projects forget to evaluate the impacts with respect to the business cases. Business cases have been be present at decisions, but forgotten after the programs and projects have started. Practitioners mentioned that in some cases, plans have even been altered and those alternations were never adjusted to the business cases. Evaluating the realized business case should be essential for the enterprise architecture user from the business side. After all, they drive to value in money such as cost savings or profit, even though the value would be called competitive edge with excellent customer experience.

One of those practitioners referred that for example the value deriving from new service focusing on customer experience could be defined and evaluated with empirical tests with selected target group. In other words, evaluate the future system from user perspective in order to prepare the business case. Evaluation results would give rationale for the calculations of business case, when transferred in values.

"But, whatever you do, you must be able to transfer it into euro, if they are not in euro...there won't be any business case" [...] I represent that school which says that you can transfer everything into euro, there is that chain of reasoning for everything..." "mutta mitä ikinä sä teetkin, niin se täytyy pystyä kääntämään euroiksi, jos ne ei oo euroja, niin sulla ei oo business casea. [...] Mä oon sitä koulukuntaa, että kaiken pystyy laittamaan euroiksi, kaikelle löytyy se päättelyketju..

(Solution level architect & Consultant, private sector, experience 5-10 years)

Due to these user-centered business goals, such as user experience and usability, providing some knowledge on user-centered evaluation methods for the enterprise architecture practitioners would be advantageous for the whole. One consultant admitted that concept of user-centered evaluation is not familiar. In addition, this practitioner stressed that enterprise architecture should be business-driven.

"That user-centred evaluation is not a familiar concept [...] It depends, I'd say, in most of the cases C-part is not the main driver of enterprise architecture work, it is not user-centered, it is business...It is possible that a business goal is to enhance usability, so then sure." "Toi user-centred evaluation ei ole tuttu käsite. [...] Se riippuu tapauksessa, mä sanoisin, että suurimmassa osassa C-kohta ei ole kokonaisarkkitehtuurityön niinku päädraiveri, ei ole se käyttäjälähtöinen, että se on muut liiketoiminta...voi olla että liiketoimintatavoitteena on niinku parantaa käytettävyyttä, niin silloin toki."

(Consultant working at solution level, private sector, experience 5-10 years)

To conclude, evaluation is seen important, but the suitable methods have not been found.

## 5.5 Principle D: Iterative Process

This subchapter elaborates findings and analysis of Principle D: Iterative process, with the foundation in page 22. Almost every practitioner mentioned that enterprise architecture work is already iterative. This subchapter analyses whether the enterprise architecture processes really are iterative. The iterative process enables receiving feedback before decisions are final. Different architectural artifacts such as state descriptions and other documents can be produced iteratively.

## 5.5.1 Current State of Iterative Process

Similar to the current state of evaluation from the user's perspective, the current state of the iterative process depends on whether development projects are considered as enterprise architecture work. The iterative processes were mainly seen within the development programs and projects. Enterprise architecture artifacts such as documents were usually produced incrementally within the programs. Drafts and outputs of those documents were revised by the business users and contents were refined based on comments.

"It actually started with the architecture, where were the products and systems, and from that we started... then in the next phase came requirements, use cases and processes. And everything was done iteratively; we revised (middle) outputs together with customer representatives, mostly from business and also from IT. And then there were the official commentaries and reviews, in which there were more people present. [...] Officially we noted the comments and made updates and took official ok for the output. [...] Then the functional specification which in we discussed more how we implement with this product the processes and use cases and these requirements. "

"Se oikeestaan lähti liikkeelle siitä arkkitehtuurista, missä näkvi ne tuotteet ja järjestelmät, ja sitten siitä suoraan alettiin...no sitä seuraavassa vaiheessa tuli sitten vaatimukset, käyttötapaukset ja prosessit. Ja kaikkia tehtiin silleen iteratiivisesti, käytiin niinku välituotoksia läpi näitten asiakkaan, lähinnä niinku liiketoiminnan, oli myös IT:n, edustajien kanssa. Ja sitten viralliset kommentointikierrokset ja katselmoinnit, joissa oli sitten populaa enemmän. [...] Virallisesti kirjattiin sitten kommentit ja tehtiin päivitykset ja otettiin sit ok sille päivitetylle lopputuotteelle. [...] sitten semmonen toiminnallinen määrittely missä sitten mentiin enemmän siihen, että miten just tällä tuotteella toteutetaan nää prosessit ja nää käyttötapaukset ja nää vaatimukset."

(Consultant working at solution level, in both public and private sector, experience 5-10 years)

In addition, one experienced practitioner mentioned that the negotiating procurement was used in a public sector case. The negotiating procurement is actually an iterative approach to procurement contracts. Another experienced solution level practitioner mentioned seeking feedback from users before making larger architectural decisions. With wireframe models depicting future solution the discussions with user representatives should stay at the relevant level, but provide meaningful feedback for cost effective architectural alternations and decisions.

One experienced practitioner reflected though that their process actually was not iterative. Although they collected feedback, it was only at the beginning and at the end of the program.

"...here are things that we clearly lack, such as this iterative [process]. It was more like one-time effort. That was missing that we would go back to the end-user." "...tässä on asioita, jotka selvästi puuttuu, esim. niinku tää iteratiivisuus, että se oli niinku one-time efortti, se puuttu niinku että mennään takaisin sitten sinne loppukäyttäjälle,"

(In-company architect working at enterprise level, in private sector, with over ten years of experience)

### 5.5.2 Perceptions on Iterative Process

Enterprise architecture work could benefit even more the enhanced communication with a really iterative approach. As mentioned in the beginning of this subchapter, almost everyone considered that enterprise architecture work is iterative.

"but from our own perspective these are already there, that we have for example in our current principles like our process is iterative, we seek for the communication when we do things and we have project models and we of course aim to understand things as a whole" "mutta omalta osalta nämäkin ovat tuolla meillä esimerkiksi jo nykyisissä periaatteissa niinku se että meidän prosessi on iteratiivinen, me haetaan niinku sitä kommunikointia kun me tehdään asioita ja meillä on projektimallit ja se että me pyritään tottakai kokonaisuutena hahmottamaan asioita,"

(In-company architect working at enterprise level, in public sector, with over ten years of experience)

One practitioner reflected that iterative approach would be better than traditional V-model.

"That iterative [process] could be, well it could be easily applied, meaning that although it would be proceed with management, centralized it could be carried out more than this kind of traditional V-model, where we first collect the requirements, from which the architecture is derived and then it is ready for implementation. Because then our end-users see it only after implementation that this was the outcome"

"Toi iteratiivisuus ois, se olis niinku helposti tehtävissä, että vaikka sitä tehtäis sen keskitetyn hallinnon kanssa niin sitä vois tehdä enemmän, kuin tämmöisen niinku perinteisen V-mallin kerätään mukaan, että ensin vaatimukset, josta johdetaan arkkitehtuuri, ja sit se onkin valmis toteutukseen. Koska sit meidän loppukäyttäjät näkee vasta sen toteutuksen jälkeen että tällaine tuli."

(In-company architect working at enterprise level, in private sector, with over ten years of experience)

# 5.6 Principle E: Addressing the Whole User Experience

This Subchapter presents findings and analysis which are based on the contents of chapter 3, and especially contents of Principle E: Addressing whole user experience (page 22). The contents are interrelated with Principle A: Understanding users, tasks and environments and thus the challenges analyzed in subchapter 5.2.1 are current also with this principle. In the public sector, user experience and usability aspects seemed to be important especially in those public sector cases which were active programs during the interviews. In the private sector, the customer experience is one of the targets within business-driven enterprise architecture, which was presented in 5.1.3.

## 5.6.1 Current state of Addressing the Whole User Experience

Whether the whole user experience is addressed depends on the collaboration level of the organization, the attitudes of the participants and understanding the concept of user experience. Based on the data, the interpretation is that the whole user experience is not really addressed when the enterprise architecture practices focus only on technical architecture within IT-department, and thus the business-IT alignment seems to be missing. On the contrary, the business-driven enterprise architecture incorporates user experience related aspects into enterprise architecture practices. This was seen in the examples containing business-driven enterprise architecture endeavors (see 5.1.3). Within those previous examples mentioned, practitioners participated in enterprise architecture work at the enterprise level. In addition, the public sector cases considering usability included experienced enterprise architects.

#### **Example: Considering other functions**

Addressing the whole user experience requires collaboration. In this example case, enterprise architecture function collaborated among others with communications in order to enhance the usability of the systems with focus on customer perspective. The practitioner mentioned that the end-result has received positive feedback from the sales department, which in turn was the channel for customer feedback. The whole process required among others explicit understanding the users' tasks and the use cases.

"the usability of the use of this system from the end-customer perspective [...] additionally it is in accordance with visual guidelines that also our communications were designing. But primarily, if the use case is [...] then we aim to make the process as userfriendly as possible, thinking all the time from the perspective of the customer."

"Käytettävyydellä tarkoitettiin tän järjestelmän niinku käytön käytettävyyttä sille loppuasiakkaalle, ja lisättynä sillä että se on niinku meidän tiettyjen tämmösten visuaalisten guidelinejen mukainen, jossa oli sitten vrityksen viestintäosasto oli mukana suunnittelemassa. Mutta ennen kaikkea se käytettävyys, jos use case on että pyritään [...] niin tekemään mahdollisimman käyttäjäystävällinen siitä prosessista, koko ajan sen asiakkaan näkökulmasta ajatellen."

(In-company architect working at enterprise level, in private sector, with over ten years of experience)

With experience and wider perspective, it seems easier to consider usability and user experience in enterprise architecture activities.

#### 5.6.2 Perceptions on Addressing the Whole User Experience

Twelve interviewees considered the fifth ISO 9241-210:2010(E) principle "the design addresses the whole user experience" applicable in the enterprise architecture. One of them emphasized that especially because enterprise

architecture considers the whole this principle could be applied in enterprise architecture. One business-driven enterprise architect considered user experience as key point in enterprise architecture. Thus, addressing whole user experience matched with customer experience ecosystem thinking.

"... but if you think about handling the whole user experience, so it matches with that idea of customer experience ecosystem, so that it takes into account not only own services but also what else is linked with the customer's situation" "...mutta jos ajattelee vaikka tuota koko käyttäjäkokemuksen hanskaamista, niin kyllä tää mätsää tohon asiakaskokemuksen ekosysteemin ajatukseen, että siinä huomioidaan paitsi omat palvelut niin myös mitä muuta siihen asiakkaan tilanteeseen liittyy"

(In-company architect working at enterprise level, in private sector, with over ten years of experience)

Furthermore, experienced consultant practitioner working mainly in the public sector stressed that user experience and related requirements should be taken into account from the very beginning. In addition, this practitioner emphasized that all related parties should commit to those user experience related requirements to avoid disputes between parties and failures in the outcome. Enterprise architecture is a tool for addressing the whole, thus it can also address the whole user experience.

*"With enterprise architecture* we aim for better working things, so then the usercentricity has to be a part [...] if there are failures in user experience then usually the purchaser organization and the supplier organization have disputes with each other, and that is sort of weird, since both should be committed. Usually both announces that's not my business, and if this happens, as it often in large information systems programs happens, well then I'd say that the starting

"kokonaisarkkitehtuurilla pyritään niin kun asioiden parempaan toimimiseen, silloin se täytyy olla niin se käyttäjäkeskeisyys mukana.... [...] jos tulee niin kun käyttäjäkokemuksessa epäonnistumisia, niin lopputulos on usein ollut se, että hankkiva organisaatio ja järjestelmää toimittava organisaatio, niin ne on riidoissa, ja se on jotenkin kummallista, koska se pitäisi olla sillä tavalla, että molemmat on sitoutuneita näihin asioihin, yleensä molemmat ilmoittaa, että se ei oo heidän business, ja jos näin tapahtuu, niinku isoissa tietojärjestelmähankkeissa monesti tapahtuu, niin kyllä mä sanoisin että lähtökohta on niin että siellä ei ole sitä user experienceä ja siihen liittyviä

point has been that it hasn't been taken into account from the beginning, the user experience and related requirements, not by the purchaser nor by the supplier." vaatimuksia alusta lähtien otettu huomioon, ei siellä järjestelmiä hankkivalta organisaatiolta kuin toimittavaltakaan"

(Consultant working at solution architecture level, in public sector, over ten years of experience)

Four practitioners expressed that the whole user experience could not be addressed in enterprise architecture, with reference to end-users as users. One of those practitioners expressed thought that with reference to business users applying it is possible. These all four practitioners were or had been consultants and had less than ten years of experience. In addition, they mostly associated user experience designing occurring at application level; thus principle was thought not to be applicable in enterprise architecture. They mentioned that an architect does not plan user experience; however, one of them emphasized that the architect should understand the components and the whole picture. The total-cost of ownership links with the five-point-formula of Dreyfuss presented in Chapter 3.

"Architecture does not relate to the whole user experience, may address, but no, I'd say that in most cases not.." "Arkkitehtuuri ei kosketa koko käyttökokemusta, voi koskettaa, mutta ei, sanoisin, että suurimmassa osassa tapauksia ei..."

(Consultant working at solution level, private sector, experience 5-10 years)

"The architect should do his/her homework long before application came to the *development/design, and at that* point vou should have reasonable building blocks from which you could build it up, so that we would not need to *compromise the user experience* just because the TCO [=Totalcost-of-ownership] raises too high, or performance...so that it won't become too expensive to develop, maintain, or both.... However, I don't see that the architect would like design and consider the user experience as such...

"Toi mun mielestä kulminoituu siihen, että sen arkkitehdin tehtävä on ...siis sen arkkitehdin olis pitänyt tehdä kotiläksvnsä jo kauan aikaa sitten ennen ku se sovellus tuli tehtäväksi ja silloin sulla pitäisi olla järkeviä palikoita, mistä sen voi kasata, jotta meidän ei tarvi tinkiä siitä käyttökokemuksesta sen takia, että TCO nousee liian suureksi tai suorituskyky, niin että se ei vaan tuu [...] kalliksi... joko kehittää, tai ylläpitää, tai molempia... Mutta en mä nää sitä, että se arkkitehti suunnittelisi ja miettisi sitä niinku käyttökokemusta itsessään sellaisenaan ... '

(Solution level architect & Consultant, private sector, experience 5-10 years)

One experienced practitioner stressed the context dependency with respect to the enterprise architecture contents. This practitioner mentioned that instead of the whole user experience only parts of it could be addressed in enterprise architecture work. The practitioner explained that enterprise architecture contains parts from different disciplines (e.g. from system and software engineering) and thus also some parts of user experience could be addressed as enterprise architecture work; however, not the whole lifecycle. This practitioner stressed that the focus with user experience should be on the process context and the use situation, and the way user experience applies to that process and those users.

"When we talk about enterprise architecture, then it contains certain disciplines, or parts of other disciplines, it isn't a new thing, in which you invent everything from the scratch, but there is collected this kind of tool set of necessary things from before knonw disciplines, such as system development and

puhutaan "kun kokonaisarkkitehtuurista, niin se pitää sisällään tiettyjä disciplinejä, tai osia muista disciplineistä, se ei siis, kokonaisarkkitehtuurihan ei oo mikään uusi juttu, jossa keksitään kaikki uudestaan, vaan siinä on niinku koottu sellaine työkalupakki tarpeellisia asioita monista jo ennaltaan tunnetuista disciplineistä, esimerkiksi systeemisuunnitelu ja softasuunnittelu, olennaiset osat sieltä kuuluu

software development, and from there the essential parts belong to the tool box of enterprise architecture, and in that sense some user experience subareas can be considered and should be considered in enterprise architecture, but not for the whole lifecycle, that goes already so far from the focus of enterprise architecture that it isn't worthwhile to define that as enterprise architecture work. And I'd say that it must focus on the process context and the use phase, how it fits the process and the users. Then these other phases of the lifecycle such as deployment and um maintenance, they belong to the traditional software architecture and system design. "

kokonaisarkkitehtuurin työkalupakkiin, ja siinä mielessä jotain tuota user experiencen osa-alueita niinku voidaan ottaa huomioon ja pitää ottaa huomioon kokonaisarkkitehtuurissa, mutta ei koko elinkaaren ajalta, että se menee sitten jo niin kauas siitä kokonaisarkkitehtuurin fokuksesta, että ei oo hyödyllistä määritellä sitä kokonaisarkkitehtuurityöksi enää. Ja sanoisin, että sen täytyy fokusoitua siihen prosessikontekstiin ja siihen käyttövaiheeseen, miten se soveltuu siihen prosessiin ja niille käyttäjille. Sitten nää elinkaaren muut vaiheet, niinku tää asentaminen, ja tota ylläpito, ne on enemmän sitä perinteistä softaarkkitehtuurin systeemin ja suunnittelua."

(Management-role, working at enterprise level, both in company architecture and consulting, over ten years of experience)

On the other hand, one practitioner considered this principle as investigating from all perspectives.

"examining use experience precisely from all views i.e. as a whole... that is what user experience designing precisely means ...you cannot really limit it to certain font size of UI colors but it is the whole process, what the end-user will experience..." "käyttökokemuksen tarkastelu nimenomaan kaikilta osilta, eli kokonaisuutena... sitähän se käyttökokemuksen suunnittelu nimenomaan tarkoittaa... että sitähän ei oikeestaan voi rajata johonkin tietyn fontin kokoon taikka käyttöliittymän väreihin vaan se on se koko prosessi, mikä sillä loppukäyttäjällä tulee olemaan siitä kokemus.."

(Consultant working at solution architecture level, in public sector, over ten years of experience)

Addressing really the whole user experience requires incorporating all the principles within the enterprise architecture practices.

# 5.7 Principle F: Multidisciplinary Team

The analysis and findings in this subchapter refer to the contents of Principle F: Multidisciplinary team (page 23). The analysis focused especially on perceptions toward having end-user representatives or user-centered design experts within the team.

## 5.7.1 Current State of Multidisciplinary Teams

The participants of current architecture teams depend on the definition of team. Usually the enterprise architecture work was mentioned being practiced in larger groups or within few persons. When considering the team as a wide concept, the architecture teams seemed to involve representatives of users, especially business users. However, usually those business users had IT-background. Additionally, one discussed case included user-centered design experts within the project teams.

In a solution level case, the core architecture team was technical, but the participants of the project included also business users. In a public sector enterprise architecture case, field experts belonged to the architecture group. This architecture group also received the summaries from the end-user research, which was conducted by two consultants (presented in 5.2.1).

"...one manager directly below CIO and couple of his/hers underlings, and then these like [field] experts and business system owners and this kind of people as need be, but the core team was that there was this like manager and some more technical. Naturally not developers, but those general senior experts.

"..tämmönen just suoraan tietohallintojohtajan alla oleva päällikkötason ihminen ja sitten hänen alaisiaan pari kolme, ja sitten näitä just [tukiyksiköstä] asiantuntijoita ja niinku liiketoimintajärjestelmien omistajia ja tän tyyppistä ihmistä niinku tarpeen mukaan mutta se ydintiimi oli, että siinä oli niinku tää päällikkötason ihminen ja niinku muutama teknisempi. Ei toki mitään koodareita, vaan semmosta yleistä vanhempaa asiantuntijaa."

(Consultant working at solution level, in both public and private sector, experience 5-10 years)

"During the program, there was an architecture group that contained representatives from all stakeholder groups, usually present. They were experts in their own fields and experts relating to information systems, so they could consider things from the end-user point of view and additionally think about whether it is possible IT-wise, or not."

"Oli semmonen hankkeen aikainen arkkitehtuuriryhmä, jossa oli kaikkien sidosryhmien, sidosryhmistä oli edustaja tai yleensä oli paikalla ainakin. Sinne tuotiin tällaisia asioita, että he oli oman alansa asiantuntijoita sitten ja sen myös niinku tietojärjestelmiin liittyviä asiantuntijoita, jolloin tota he pystyivät astumaan loppukäyttäjän kenkiin ja sitten miettimään tietoteknisesti, että onko se mahdollista vai eikö se ole'

(Consultant working at solution level, in both public and private sector, experience 5-10 years)

A large public sector program included user experience experts in project teams. According to the enterprise architecture practitioner, the user experience experts provided support for rationalizing decisions and creating requirements. Those decisions and requirements had to be suitable also from the user experience pointof-view. The practitioner reflected that support was needed, although the practitioner had some experience in user experience matters.

"[external] usability people were involved to ensure that we could say no to that [bad] alternative. And another phase is now at the end phase of tendering when we have adjusted these UX-requirements so that they can be measured in the delivery phase.[...] Now we have polished the request for proposal so that [...] to really get that kind of requirements so that supplier must commit to them and they can be measured, it was good that there was a person supporting, sure I have also some UX experience, but to get good requirements, it was worth to have support from a [usability expert] person."

"niin siinä oli käytettävyysihmisiä mukana juurikin sen takia, että saataisiin juurikin se varmuus, että me uskalletaan torpata se vaihtoehto sieltä mikä oli [tuotenimi] pois. Ja toinen vaihe on nyt kilpailutuksen loppuvaiheessa kun ollaan muokattu nää UX-vaatimukset sellaisiksi että ne saadaan toimitusvaiheessa mitattavaksi[...] nyt kun ollaan hiottu tätä tarjouspyyntöä sellaiseksi [..] että oikeasti saadaan sellaisia vaatimuksia että toimittajan pakko sitoutua niihin ja saadaan mitattavaksi, niin vksi ihminen tukena, toki mulla itsellänikin on jonkun verran UX-kokemusta on, mutta sellaista, että oikeasti saadaan sellaset hyvät vaatimukset, niin oli hyvä että oli tukena ihminen."

(Consultant working at solution architecture level, in public sector, over ten years of experience)

One practitioner mentioned a public sector case where the enterprise architecture team received good feedback from some business users. These business users spread the word to the other business users. As a result, team got larger and same kinds of interest were covered within larger area.

"internal people noticed [the benefits of architectural approach].. own people, and request started to come... we figured out that if we would get [everybody] around the same table we could cover a larger area" "sisäisiä ihmisiä huomasi.. omaa väkeä ja alkoi tulla pyyntöjä... hoksattiin, että jos saataisiin saman pöydän ääreen niin isompi alue katettua..."

(Consultant working at solution architecture level, in public sector, over ten years of experience)

## 5.7.2 Perceptions on Multidisciplinary Team

Practitioners believed that multidisciplinary teams would enhance the communication and collaboration and thus serve better the purposes of enterprise architecture. Different backgrounds of team members would increase the need for right level communication and enhance the collaboration. These teams can also be virtual teams. However, need for ownership and someone who sees the whole picture was stressed a couple of times.

The practitioners considered applying this last ISO 9241-210:2010(E) principle '*the design team includes multidisciplinary skills and perspectives*' within enterprise architecture possible. However, they had some differences regarding suitable participants depending on the context of the team. Two practitioners expressed that end-users do not belong to the team, but business users can be involved.

This kind of principle was already self-exploratory best practice for project management experienced practitioners. For the best end-result, different skills and perspectives are needed.

"Well, that's a clear thing. From the beginning... we instinctively stated that in order to do definitions we need to have sufficiently broad competence set participating in that planning and designing work" "No, joo, toihan on ihan selvä juttu. Alusta alkaen... totesimme selkäydinreaktiolla, että jotta me voidaan tehdä määrittelyitä meillä pitää olla riittävän laaja kompetenssisetti sitten mukana siinä suunnittelutyössä... "

(Consultant working at solution architecture level, in public sector, over ten years of experience)

Current state indicated that *business users* are involved in teams at some level. However, one practitioner noted architecture work is still carried out only among architects and thus lacking the user perspective. This practitioner acknowledged that teams of this kind could require an architect to consider and thus enhance level of communication with people who are unfamiliar with the domain. "This includes good things that we could utilize such as this last, that there would be [...] different views, that often architecture work is carried out by just architects and it lacks this user perspective. It would require, for this to be possible, it puts even more pressure on that architecture could be visualized and communicated to people who don't know the domain already." "Tässä on niinku hyviä juttuja mitä me niinku voitais käyttää esimerkiksi tää viimeinen että se ois niinku multidiscipline skills and perspectives, että erilaisia näkemyksiä, että monesti tää arkkitehtuurityö tehdään pelkästään arkkitehtien kesken ja sieltä puuttuu tää käyttäjännäkökulma. Se vaatis, jotta tällaista pystyis tekemään, niin tavallaan se asettaa vielä enemmän paineita sille, että sitä arkkitehtuuria pystyis visualisoimaan ja kertomaan henkilöille, jotka ei entuudestaan tunne sitä domainia."

(In-company architect working at enterprise level, in private sector, with over ten years of experience)

The ideal business-driven enterprise architecture includes capabilities. These capabilities consist of different elements from different dimensions with different experts. Thus also architecture teams should contain those.

"Yes, true to a great extent. It is so, that some capability, it comprises, by definition, of a set of elements, which might have belonged to either the process dimension, the application dimension or the organization dimension, all these dimensions have a bit different experts" "joo, mitä suurimmissa määrin totta. Onhan se niin, että joku kyvykkyys, se koostuu niinku määritelmän mukaisesti joukosta elementtejä, jotka on voinut kuulua joko prosessidimensioon, applikaatiodimensioon tai organisaatiodimensioon, kaikilla näillä dimensioilla on vähän eri asiantuntijat."

(Management-role, working at enterprise level, both in company architecture and consulting, over ten years of experience)

Furthermore, multidisciplinary teams can be applied as virtual teams.

"Multidisciplinary skills, well, I was talking about those virtual teams, so this is exactly what I am trying to look for... that there are these business people and then those concern function people and ICT-people, developers and then also those who do operative business are needed..." "Multidisciplinary skills, no mähän puhuin näistä virtuaalitiimeistä, niin tää on nimenomaan se mihin mä pyrin tässä hakemaan, ...että on niitä liiketoimintaihmisiä ja sitten on niitä konsernifunktioihmisiä ja ICT-ihmisiä, kehittäjiä ja sitten ihan niinku busineksen operatiivista hommaa pyörittäviä tarvitaan sitte"

(In-company architect working at enterprise level, in private sector, with over ten years of experience)

According to one solution level practitioner teams consists of architects and business users. End-users are not needed because business user should understand them.

"We have the architect and we have the business developer, but we do not have those endusers...(A: How about someone who understands those endusers?) Well, the starting point is that [the business developer] must understand [the end-user] perspective in developing the business..." "Meillä on se arkkitehti ja sit meillä on liiketoiminnan kehittäjä, mutta ei meillä oo niinku niitä loppukäyttäjiä... (A: Entä onko jotain joka ymmärtäis niitä loppukäyttäjiä?) No, lähdetään siitä, että sen täytyy ymmärtää sen liiketoiminnan kehittämisen se näkökulma."

(Solution level architect & Consultant, private sector, experience 5-10 years)

## 5.8 Overall Perceptions on User-Centered Aspects

This subchapter presents the overall perceptions on user-centered aspects including concepts of usability and user experience as understood by the practitioners. In addition, this subchapter includes perceptions of the practitioners towards overall applicability of ISO 9241-210:2010(E) principles (3.2.1) within enterprise architecture practices.

### 5.8.1 Usability and User Experience Explained by the Practitioners

During the interviews, the practitioners were asked to explain their understanding of concepts such as usability, users experience, customer experience or userfriendliness, depending on which term they had themselves mentioned. Understanding the way enterprise architecture practitioners associate the words should guide the possible collaboration between user-centered design practitioners and enterprise architecture practitioners. Common, shared language is essential for collaboration.

Practitioners' perceptions for the concept user experience (i.e. in this case the same as customer experience) varied the most. For some practitioner user experience was high-level concept, whereas others associated it only with applications. Some practitioners connected user experience with wow-effect and pleasant user interface, but on the other hand they also mentioned the importance of being able to do efficiently and easily the tasks you are supposed to do, as well as the images user is left with after use. Nobody mentioned the anticipated use aspect of user experience.

The perceptions on usability were mostly focused on a system. Thus, usability was seen mostly as a low level concept in enterprise architecture context. Therefore, it would be advisable to user centered design professionals to use some other term when they want to emphasize the importance of usability, or explain what they mean, or why usability would be a higher level concept.

"Usability is that I can intuitively conclude what I need to do next, information is presented understandably and clearly, and then it is quite smooth, flexible to use [...] also accessibility, findability [...]navigatability" Käytettävyys on se, että mä pystyn intuitiivisesti päättelemään mitä mun pitää tehdä seuraavaksi, tiedot on esitetty ymmärrettävästi ja selkeesti, ja sit se on suht jouheva, joustava käyttää, [...] Toki sit tämmönen saatavuus, löydettävyys, [...], navigoitavuus

(Management/Consultant-role, working at solution level, in both public and private sector, with over ten years of experience)

Within the field of user-centered design, the word user-friendliness is not used. However, it seems to be common word for usability related aspects outside the user-centered design field. For example, some interviewees talked about userfriendliness. Their definition of user-friendliness included the aspects of usability.

"User friendliness [...] if I want some service I will get it when I need... in an understandable form, so that I don't have to look for very long where it is...not many clicks... response time pleasant, no frustration... reliable, truly accessible when needed." "käyttäjäystävällisyyttä [...], että jos mä haluan

jotain palvelua, niin sitten mä saan sen silloin ku mä tarviin, ja mä saan sen ymmärrettävässä muodossa, ettei mun tarvi hakea sitä kauheen kauan niinku hakea missä se on.. ei monia klikkauksia...vasteaika on miellyttävä, ei tule turhautumista, että milloin se vastaa... ja sit luotettavuus, että se todellakin on käytettävissä silloin ku tarvii...

(Consultant working at solution architecture level, in public sector, over ten years of experience)

Some practitioners considered usability part of user experience or customer experience, which in turn were emphasized as essential factors in business-driven enterprise architecture.

"...I see that usability is part of customer experience, and customer experience is essentially important, because in the end the customer pays our salaries and if the customer does not find us a pleasant actor with which things roll [...] this will end badly, if we don't get the course changed..." "nään, että se käytettävyys on osa asiakaskokemusta, ja se asiakaskokemus on keskeisen tärkeä, koska se asiakas on loppujen lopuksi se, joka maksaa meidän palkat ja jos ei asiakas koe meitä niinku miellyttäväksi toimijaksi, niin miellyttäväksi tahoksi, jonka kanssa asiat sujuu [...] tässä käy huonosti, jos ei suuntaa saada korjattua"

(In-company architect working at enterprise level, in private sector, with over ten years of experience)

Wow-effect as target for customer experience which bases on different user needs:

"...what kind of [different] user groups were found and they then have different needs, and for these we tried to focus that customer experience [...] in general, we were perhaps looking for this kind of woweffect..." "..minkä tyyppisiä käyttäjäryhmiä sieltä löydettiin, ja niillä oli sitten eri tarpeita, ja näille sit pyrittiin kohdentamaan sitä customer experienceä. [...] no yleisesti siinä ehkä haettiin tämmöistä Wau-efektiä.."

(In-company architect working at enterprise level, in private sector, with over ten years of experience)

## 5.8.2 Overall Applicability of the ISO 9241-210:2010(E) Principles

Overall perceptions on user consideration in enterprise architecture were affirmative. As show in the table below, most of the practitioners mentioned that ISO 9241-210:2010(E) principles (3.2.1) were applicable in enterprise architecture. As a matter of fact, eleven practitioners considered all principles applicable. Only one considered that principles are not applicable. Few considered that applicability depends on context and thus affirmative response is not possible. However, the affirmative responses included also some dependency, although not stated in the table.

<i>Could this ISO 9241-210 principle be applied in enterprise architecture?</i>						
	Α	В	С	D	Е	F
Yes	14	12	12	15	12	14
No	1	1	1	0	3	0
Depends / N/A	1	3 *	3	1 **	1	2 **
Total	16	16	16	16	16	16
Notes	* 1x Business user yes, end user no			** Business user yes, end-user no		

The principles of ISO 9241-210:2010(E) standard could be applicable in enterprise architecture context, if the context would be first defined and

communicated. One practitioner pondered that the use context of these principles could be considered in two ways. First considers only the implementation of enterprise architecture as a form of a single application.

"I see that there is still two options, from which one is...that the end-result is that we want to design better that application for the user, and now the question is which different layers, which in one way or another participate in the creation of the application [and] its life cycle, consider those principles in the development of the application, this is like one thing."

""Mä nään kaks tossa vielä vaihtoehtoa, joista toinen on se, ...että se lopputuloksena on kuitenkin se, että me haluamme suunnitella paremmin sitä sovellusta sinne käyttäjälle, ja nyt kysymys kuuluu, että mitkä eri kerrokset, jotka tavalla tai toisella siihen sovelluksen syntyyn, sen elinkaareen, osallistuu, huomioivat ne periaatteet sen sovelluksen kehittämisessä, tää on niinku yksi juttu."

(Solution level architect & Consultant, private sector, experience 5-10 years)

The second way for the context considers broader context for the use of principles. This latter perspective is closer to the objective of this research.

"The other is that in my opinion those principles, which were written for considering the enduser in application development, they are as such valid as a whole like in the interaction between two organizations that have nothing to do with applications or systems" "Toinen on se, että ku mun mielestä ne periaatteet, mitkä siihen loppukäyttäjän huomioimiseen siinä sovelluskehityksessä kirjoitettiin, niin ne on sellasenaan valideja ylipäätään niinku kahden organisaation väliseen interaktioon, millä ei välttämättä ole mitään tekemistä sovelluksien tai järjestelmien kanssa."

(Solution level architect & Consultant, private sector, experience 5-10 years)

The first, narrow, application use related context was considered perhaps due to word 'design'. The word 'design' was misleading for some enterprise architecture practitioners. They were not able to consider applying those principles at enterprise architecture level. "If we go to that what is design [...] this implicates that you have something concrete, and enterprise architecture does not have any concrete outcome, unless you mean that my roadmap over there is a concrete outcome." " jos mennään sinne mikä on se designi, niin tää on, tää viittaa jo vahvasti siihen, että sulla on jotain konkreettista, ja kokonaisarkkitehtuurissahan ei oo konkreettista tuotosta, ellet sä puhu siitä, että tämä niinku mun tiekartta tuossa on konkreettinen tuotos, "

(In-company architect working at enterprise level, in public sector, with over ten years of experience)

"...try to analyze how design as a word suits architecture, also in practice... I examine this now from that angle that we guide development program, and with design I mean how the architect sees the architecture..." "...yritän jäsentää miten design sanana istuu arkkitehtuuriin, käytännössä siis... tarkastelen tätä nyt enemmän siltä kantilta, että jos nyt ohjataan jotain kehityshanketta vaikka... ja desingilla tarkoitan sitä minkälaiseksi arkkitehti näkee arkkitehtuurin niin..."

(Consultant working at solution level, in both public and private sector, experience 5-10 years)

One experienced practitioner explained the difference between architecture and system design this way:

"If we think about what is architecture and what system design. They have a clear difference: architecture is a class, system design is an instance." "...jos ajatellaan mitä on arkkitehtuuri ja mitä on system design. Niillä on ihan selkeä ero: arkkitehtuuri on luokka, system design on instanssi."

(Management-role, working at enterprise level, both in company architecture and consulting, over ten years of experience)

General perceptions on using principles include worries such as principles in general do not guide enough; they are self-explanatory and best practices, which others know very well and others not at all. Therefore, it would be more essential to incorporate the main contents of the principles to the enterprise architecture practices.

"These are relevant, but they have, in general with these principles I have that personal problem that I have not found the place for the principles, so that they would steer and then also that these principles such as those IT principles, they are kind of best practices and self evident truth in a certain way to everyone, who have read, but of course the most haven't read." "Että nää on relevantteja, mutta näissä on, yleensäkin näissä periaatteissa mulla on ainakin henkilökohtaine ongelma että mä en oo koskaan keksinyt sitä paikkaa principleille, että miten ne saatais ohjaamaan ja sitten just sekin, että nämä principlet yhtälailla kun noi IT principlet, ne on kaikki sellasia best practices ja itsestään selvyyksiä kuitenkin tietyllä lailla kaikille, jotka näitä on lukenut, mutta suurin osa ei tietysti oo lukenut."

(In-company architect working at enterprise level, in private sector, experience 5-10 years)

In addition, the suitable level for human-centered actions in enterprise architecture should also be considered. User perspective could be located to the motivation layer or for business architecture. It could also be applied to technical views.

"This context approach is so to say [the] human, and what does that mean [...] this human approach lands either on the motivation level which is the highest level, we motivate people to act in a certain way, or then it falls precisely to that business/operations architecture, that is how we design our processes, how we design our business-based things, if this is from a human perspective. Then we can change from this to what it means from the technology viewpoint, then we go, we look should this user that ok, interface understand that user is visually or hearing impaired, or is color-blind, et cetera, I could go on, but this depends on from which perspective you want to look at these [...] This is like important, if we really look from

"tämähän konteksti lähestymistapa on niin sanotusti ihminen, ja tuota..mikä tarkoittaa silloin siitä että ku tää on ihminen niin meidän kokonaisarkkitehtuuri tämä ihmislähestyminen tippuu joko siihen motivaatiotasolle elikkä sille ylimmälle tasolle, motivoidaan ihmisiä toimimaan tietyllä tavalla tai sitten se tippuu nimenomaan siihen toimintaarkkitehtuuriin elikkä kuinka me suunnitellaan meidän prosesseja, kuinka me suunnitellaan meidän liiketoimintapohjaisesti tapahtuvia asioita, jos tää on ihmistennäkökulmasta. Sitten se voidaan tästä muuttaa, että mitä tää tarkoittaa sitten teknologianäkökulmasta, niin silloin me mennään, niin ku katsotaan, että okei, pitääkö se käyttöliittymä ymmärtää että käyttäjä on huononäköinen, se huonokuulonen, vai onko se värisokea, ja niin poispäin, tätähän vois jatkaa loputtomiin, mutta tää on se riippuu miltä näkökulmasta halutaan näitä asioita katsoa [...]tää on niinku tärkee, että jos me katsotaan sitä tosiaan tän niinku ihmisnäkökulmasta, niin silloin me mennään niinku vaan tän

the human perspective, then we go through this motivation and operations meaning business definitions, but if we take this technology aspect we also have to look at the information and data and technology there in the background and how they like turn in the background." motivaation ja toiminnan niinku busineksen niinku määrittelyn kautta, mutta sit jos me otetaan tää teknologiaaspekti niin sitten meidän täytyy katsoa se informaatio ja data ja teknologia sinne taustalle ja miten se niinku kääntyy tuolla taustalla."

(In-company architect working at enterprise level, in public sector, with over ten years of experience)

One experienced enterprise architect in the private sector noted benefits from the customer experience driven user research. Combining user-centered and enterprise architecture approaches with business-driven problem finding can benefit with right detail level regarding understanding of service process related problems.

"...the funniest is, that over the years we have found out what is wrong in the [service] process, and there are like hundreds of rows of problem lists and emphases that something needs to get done et cetera, but they have led to nothing, so now we aim to that when you examine things at sufficiently high level, you can grip the bigger things on a suitable level..."

"...hauskinta että vuositolkulla selvitetty vaikka että mikä mättää [palvelu]prosessissa, ja sieltä on löytyy satojen tällaisia rivien ongelmakohtalistauksia ja painotuksia, että mihin pitäis tehdä jotain et cetera, mutta ne ei oo johtanu yhtään mihinkään niin nyt tässä haetaan sitä, että kun asiaa tarkastelee riittävän korkealla tasolla, niin sitten pystyy niihin isoimpiin asioihin tarttumaan oikealla tasolla....'

(In-company architect working at enterprise level, in private sector, with over ten years of experience)

Applying human-centered aspects into enterprise architecture work was considered important, because they would provide better understanding, if applied early enough. Thus they would be advantageous for the whole.

"In my opinion, these are all good, everything fits. [...] Then if that kind of ukases are, if people would be forced to follow these in programs and projects – sure, these are that kind that they don't give advice, if vou don't understand, but let's assume that there are experts involved. But these would be excellent in the public sector, so that when they order from suppliers that they would remember to include these there. The quality and the organization... these are usually offered outward... so I'd say the whole would benefit from that."

" Mun mielestä nää on kaikki hyviä, kaikki käy. [...] Sit jos tommoset ukaasit on, jos jengi olis pakotettu projekteissa hankkeissa, noita noudattaan – toki näähän on sellasia, että eihän nää neuvo, jos ei asiasta ymmärrä mitään, mutta oletetaan että siinä on asiantuntijaporukkaa. Mutta kyllähän nää olis erinomaisia julkisella puolella, niin tota, sitten kun ne tilaa toimittajilta, niin että ne muistais nämä sisällyttää sinne. Kyllähän se laatu – ja se organisaatio...näitähän yleensä tarjotaan ulospäin...niin kyllähän se kokonaisuus hyötyisi tuosta."

Management/Consultant-role, working at solution level, in both public and private sector, with over ten years of experience

The current challenges (5.1.2) with enterprise architecture hinder the benefits that could be received from enterprise architecture practices. This quote condenses those problems:

"...well, all of those [ISO 9241-210:2010(E) principles] are actually important. I guess the problem in enterprise architecture is that one does not necessarily understand, what all the possible use cases and related stakeholders could be and then we start with a small IT-driven key group to dabble with it and don't necessarily take along all those that could possibly benefit from that architecture, that means that when it is in a phase where we could benefit from it, those benefits are a lot smaller that they could at their best be."

"...kyll' noi kaikki on oikeestaan tärkeitä. Varmaan se ongelma on kokonaisarkkitehtuurissa just siinä, että ei välttämättä käsitetä sitä, että mitkä ne kaikki mahdolliset käyttötapaukset on, ja niihin liittyvät sidosryhmät vois olla, että sitten just lähdetään jollain IT-lähtöisellä pienellä ydinporukalla sitä puuhaamaan, eikä välttämättä alustakaan asti oteta mukaan niitä kaikkia, jotka mahollisesti vois hyötyä siitä arkkitehtuurista, jolloin sitten kun se saadaan johonkin vaiheeseen, että sitä vois alkaa hyödyntään, niin ne hyödyt on paljon pienempiä kun mitkä ne parhaimmillaan voisi olla."

(Consultant working at solution level, in both public and private sector, experience 5-10 years)

The quote above raises the question whether these problems could be solved by incorporating user perspective into enterprise architecture practices. Those business-driven examples at enterprise architecture level aiming for customer experience showed evidence that user-focused approach provides mutual understanding and benefits the whole.
#### **6 DISCUSSION AND CONCLUSIONS**

This chapter discusses the answers to the research questions based on the main findings, i.e. reflects on if and how the user perspective incorporates within enterprise architecture. This chapter summarizes first the current state of enterprise architecture work in 6.1.1, and then answers the research question 1 in 6.1.2 and research question 2 in 6.1.3. Thereafter the implications and contribution of these findings are discussed in 6.2, and further studies are suggested in 6.3. The chapter ends with conclusions in 6.4.

### 6.1 Main Findings and Answers to Research Questions

#### 6.1.1 Two-sided Enterprise Architecture Work in Finland

The research findings (5.1) showed that based on this sample, enterprise architecture work in Finland appears two-sided. One side is the IT-centric enterprise architecture with challenges to fulfill the purpose, which practitioners stated to be business-driven. The other side is business-driven enterprise architecture. A rough division is that IT-centric enterprise architecture work appears especially in the practices at the solution architecture level, whereas business-driven practices occur at the enterprise architecture level (cf. Figure 2, p.12). However, in practice, also solution level architects present the examples of business-driven approaches; thus, the boundary between the levels is not strict.

A caricatured presentation of IT-centric enterprise architecture (5.1.2) includes following strictly the enterprise architecture frameworks (2.2.2) originating from IT-architecture. An IT-centric architect models extensively with formal modeling languages the current state and target state without questioning the purpose of modeling. This architect considers that management and business people do not appreciate the important work he/she carries out. This IT-centric enterprise architect understands as users (5.1.4) the end-users of applications only. In addition, this architect thinks that those users have no linkage to the architecture, and thus users should not be considered (e.g. 5.2.2, 5.6.2).

Contrastingly, "pure" business-driven enterprise architecture aims at organizational transformation according to business strategy (5.1.1, 5.1.3). Work of that kind requires systematic approaches and collaboration. Thus, this businessdriven enterprise architect promotes communication and collaboration with enterprise architecture mindset. This architect considers "everybody" as users of the enterprise architecture (5.1.4). The teams consist of architects, "business users" and end-user representatives (5.7, 5.3.2). The management is committed to the enterprise architecture work since the benefits of the work have been shown and the work satisfies the needs of the management (5.1.3, 5.2).

These two extreme categories present the Finnish "polyphony in architecture" and are in line with the categories presented by van der Raadt et al. (2004). Differences in architectural issues and business-IT alignment in organizations still exist at some level, even though Finnish practitioners emphasize that enterprise architecture practices should be business-driven and demonstrate an enterprise architecture mindset. Nevertheless, enterprise architecture work in Finland includes also business-driven enterprise architecture practices. It seemed that especially business-driven practices contain user-centered aspects. These aspects were evident especially in the customer experience driven enterprise architecture practices could support transforming IT-centric enterprise architecture into business-driven enterprise architecture.

### 6.1.2 Current Enterprise Architecture Work

The first research question aimed to examine the current status in Finnish organizations regarding user-centered aspects.

*RQ1:* How are user-centered aspects considered in current enterprise architecture work?

User centered aspects, as presented in chapter 3 included the concept of user as well as the contents of the user-centered principles. The concept of user is multifold in the context of enterprise architecture (Niemi, 2007). Mostly, the enterprise architecture practitioners comprehend system end-users with the word 'user' (5.1.4). Especially, during the probe of whether the ISO 9241-210:2010(E) principles could be applied in enterprise architecture, the reasoning focused mainly on the end-users (5.2.2, 5.3.2, 5.4.2, 5.5.2, 5.6.2, 5.7.2). This was surprising, because during the interviews practitioners emphasized that enterprise architecture should be business-driven and thus business needs should be understood. Nevertheless, some cases discussed demonstrated also considering business users as users within the enterprise architecture (e.g. 5.1.3, 0). However, here is to note that the word "user" is misleading, when the use context is not clearly defined.

The overall impression is that the more experience a practitioner has, the more consideration on users exist in the practices of that practitioner, although it appears mostly subconscious. Surprisingly many cases demonstrated efforts aiming to understand real users and use contexts (e.g. pp. 42, 44, 49, 51, 61, 63, 68). Examples showed that information regarding end-users was collected or used mainly within solution architecture projects. Enterprise level architecture work considered end-users when organizations had strategic initiatives towards a better customer experience. Some practitioners had eye-opening experiences when meeting with the real end-users. The challenges for receiving real-life based knowledge of users included many issues, such as management issues, organizational hierarchies, and the attitudes of participants (5.2.1). Experiences with user experience or customer experience approaches had helped practitioners to understand business problems and to turn focus from problem solving to problem finding (p. 44 ff). User consideration was linked to user requirements (5.2.1). Requirements belong to the second abstraction level, i.e. to the conceptual level (Figure 3, p.13).

### 6.1.3 Incorporating Principles into Enterprise Architecture Work

The second research question aimed to explore how practitioners see the value of incorporating user centered considerations in the form of user-centered principles in enterprise architecture work.

*RQ2:* How do the practitioners of enterprise architecture perceive the value of incorporating user-centered principles in the enterprise architecture work?

Interpretations of the ISO 9241-210:2010(E) principles (3.2.1) and their suitability for enterprise architecture work varied between the practitioners. In general, practitioners considered that the principles could be applied within enterprise architecture work (5.8.2).

The practitioners remarked on some challenges with the principles, such as suitable work levels and on certain concepts, which were considered too strict for the wide concept of enterprise architecture. Some practitioners did not see much value in the principles, because they thought that users should be considered only at the project level, not at the enterprise-level. They usually referred only to the end-users of information systems. Those practitioners who considered also business users as users understood better the value deriving from considering the users. Problematic concepts included also the word 'design' since it has a different connotation in architecture than in user-centered design. The words 'explicit' and 'driven' were also problematic.

According to practitioners, for successful enterprise architecture work, the architect should to understand the operations and processes within the organization (5.2.2). These include understanding the users and their tasks. The importance of understanding "*real life*" instead of thinking in the "*ivory tower*" was emphasized by the practitioners. In addition, understanding the strategic goals of the organization reflect in understanding the management. Especially those, to whom value is being provided, i.e. usually business users, should be considered and involved within enterprise architecture practices (5.3.2, 5.7.2). Feedback from those users would be valuable (5.4.2). The view of the practitioners on whether the whole user experience should be addressed in enterprise architecture depended on the perceptions regarding the concept of user experience. Two different perspectives became apparent. The first view considered user experience only as a limited, application level thing in which an architect is not involved. The other view considered user experience essential in business-driven enterprise

architecture and linked it to ecosystem thinking, to customer experience ecosystem mapping (5.6.2, 5.8.1).

## 6.2 Contribution and Implications

This research focused on discovering user-centered aspects within Finnish enterprise architecture practices with the assumption that benefits of enterprise architecture could be improved with the user perspective. The adaptation of the information system success model within enterprise architecture requires considering the users and their needs as relevant parts of the use context. Understanding context of use and thus understanding the users is essential for determining user satisfaction which in turn is an essential part of Delone and McLean IS Success Model (Figure 1, p. 2). Enterprise architecture benefit researches that applied model (Lange et al., 2012; Niemi and Pekkola, 2009) have not addressed the use context of enterprise architecture from the user perspective. Therefore, this research focused on whether the practitioners perceive those benefits could be improved with user centered aspects that emphasize the context of use and understanding of the users. User centered approaches, such as user studies, involving users, user-centered evaluation based on real-life scenarios, and teams with different skills and perspectives enhance the understanding of different user groups. User perspective in enterprise architecture work seems to enrich especially the business-driven approach.

Success factors in user perspective include understanding that the user perspective, also at the enterprise architecture level benefits the whole the most. Enterprise architecture products and services should benefit the whole organization (Niemi and Pekkola, 2013). This kind of perspective considers also business users (5.1.4, "Two simple user types identified") as users of enterprise architecture. Thus, the whole enterprise benefits through increased user involvement and commitment. Increased involvement and commitment include considering the whole value chain from producers to end customers. In other words, understanding that in the end the customers "*pay the salaries*" and thus they need to be served well. Therefore, also the internal processes of the

organization are required to work effectively, i.e. organizational usability (Hertzum, 2010) should be considered.

The overall goal of this thesis was to determine, whether user-centered design and enterprise architecture could be incorporated (1.2). Based on the results, these two disciplines have commonalities and they could be incorporated to some extent. These disciplines are already linked at some level through the current concepts of service design and customer experience. Both disciplines support the development of services and customer experiences—from different angles. However, the lack of common terminology might cause problems. The largest problem for incorporating is, based on this research, the term 'design' that has different connotations in each discipline.

The way of thinking is probably the key to successful incorporation of these disciplines in practice. Despite the technical connotation of the word "architecture" (5.1.2), the idea behind enterprise architectural thinking (5.1.3) is essential for the incorporation. The enterprise architecture mindset includes understanding the big picture and the interrelations between entities in a structured and systematic manner. Thus, the enterprise architecture mindset could benefit user-centered design. Additionally, the same applies for incorporating user-centered design into enterprise architecture functions. The word "user" may restrict the thinking only to the application level and user interfaces, although the focus should be on humans who are users of enterprise architecture functions and outcomes. More important than the exactly correct term is to really comprehend for whom and why something is performed. This understanding should, however, focus on reality and not on stereotypes and assumptions.

In order to support enterprise architecture practices, user-centered design practitioners could focus on providing tools for the better understanding of humans as well as for evaluating practices and outcomes from the user perspective. A couple of interviewed practitioners referred to the quote from Henry Ford regarding faster horses when discussing about whether an architect should understand users and their needs. However, user centered design and understanding user needs does not imply bluntly asking people what they need and deciding that it shall be. Instead the focus on user-centered design is on indepth understanding and discovering solutions for the user needs, sometimes even hidden needs. Similarly, enterprise architecture aims at discovering from the structures the hidden needs, hidden problems and solving them before they become real problems.

A suitable abstraction level for considering user-centered aspects within enterprise architecture could be the first, i.e. contextual level (cf. Figure 3, p. 13). The enterprise architecture function should understand the reasons for conducting the work in order to proceed to the following level, which includes defining requirements for the work. Understanding the reason requires understanding the context of use and needs. Needs and use context should determine the boundaries of new architecture. Thus, considering user-centered aspects belongs to the contextual level.

Stelzer (2010) requested generic enterprise architecture design principles that would be applicable for all layers of enterprise architecture. Based on the research, modified user-centered design principles reviewed in this thesis (3.2.2) could present a viable alternative which could be applied to all layers. However, these principles as such are partly interrelated and do not follow the required syntax of enterprise architecture principles. Additionally, semantic differences are possible.

# 6.3 Future Research Suggestions

Incorporating user-centered aspects into enterprise architecture requires more investigation. Further study could examine ways to link the user-centered design process (e.g. ISO 9241-210:2010(E), 2010) to enterprise architecture process methods.

Additionally, the use context viewpoint in relation with different abstraction layers and domains should be modeled and validated. This includes questions such as:

- What kind of user-centered aspects are essential in different abstraction layers in different domains, and to which extents?
- How could the essential user-centered aspects in different layers be considered in enterprise architecture work?
- What kind of user-centered methods could be applied in different abstraction layers and domains?

Answering these questions supports modifying principles for different abstraction layers and different domains: general at the upper level, more detailer at lower levels.

In addition, it could be worthwhile to study how user-centered design practitioners understand the concepts and practices of enterprise architecture and their perceptions towards user-centered enterprise architecture practices. This would support grounding a common terminology in real-life practice, for efficient collaboration.

For the incorporation of the disciplines, the linkage between enterprise architecture maturity and usability maturity could have a significant role, and thus, research on the maturity levels is suggested.

# 6.4 Conclusion

Based on this research, enterprise architecture work in Finland seems to comprise of two types: IT-centric enterprise architecture and business-driven enterprise architecture. Most of the enterprise architecture work in Finland appears to still be IT-centric, and thus the benefits of enterprise architecture are likely not realized in the widest possible way. Business-driven enterprise architecture demonstrates some user-centered aspects. Practitioners see the enrichment of enterprise architecture work with user perspective possible.

Considering user-centered aspects could enhance transformation from IT-centric enterprise architecture to the business driven. User-centered aspects should be considered already at the beginning of the enterprise architecture work in order to increase mutual understanding and collaboration between enterprise architecture and business. Enterprise architects could begin the process by analyzing the real needs of the real users of the enterprise architecture function, i.e. business units, and thus the benefit realization would increase. Naturally, the business needs include understanding the customers, i.e. the users of the products and services of the business. Therefore, enterprise architects should also understand the real users at some level. Nevertheless, enterprise architecture practices should be team work including business users, and perhaps also user-centered experts.

An enterprise architecture should not be centered only on users. However, the ideas behind user-centered design principles could be incorporated into enterprise architecture practices. These ideas include:

- understanding users and especially the use context of enterprise architecture based on real life scenarios
- involving users, especially business users, but also at some level endusers, in enterprise architecture practices
- evaluating direct and indirect results from users' perspectives, including the business users' perspectives
- using an iterative process, including evaluation, analysis, re-planning and re-creation in cycles at different levels
- addressing the whole user experience, i.e. not focusing only on one part, and
- including multidisciplinary teams in the enterprise architecture work.

Within the complex context of enterprise architecture, one person cannot comprehend all this, i.e. human limitations are understandable. For understanding real user needs and evaluating processes and outcomes from a user's perspective, multidisciplinary teams involve users and user-centered experts. The teams should include also enterprise architects, who consider the whole. Enterprise architects should possess the enterprise architecture mindset and craft for understanding and describing complex systems and structures.

Incorporating user-centered aspects with enterprise architecture practices faces challenges such as the attitudes of the participants, IT-centric thinking, and limiting the concept of user only to the end-users of systems. Pitfall attitudes include thinking such as "everybody knows who the users are" and "users should not be considered at all since the implementation is an automated process". IT-centric thinking involves attitudes, in which considering users does not belong to the enterprise architecture. Users are not "our business" the others take care of them. These others are referred to business units and system development. Thinking of this kind involves considering user as a low level concept which refers only to the end-users of applications.

With reference to pitfalls, incorporating user-centered principles into enterprise architecture practices should include clarifying concepts with participants. Special care should be applied when using the following words: *enterprise architecture*, *user*, *design*, *explicit*, *driven*, *usability*, and *user experience*. Outside current enterprise architecture function "architecture" connotes something technically. Participants easily limit the word "user" easily only to the end-users of concrete systems. Design implies lower level work to the enterprise architects and higher level work for user-centered experts. The words explicit and driven require the context and abstraction level. Especially usability refers to a lower level concept within enterprise architects and some of them associate also user experience with applications only.

The user-centered design professionals and practitioners have requested better constructs for promoting usability thinking at the strategic level within organizations. The enterprise architecture mindset could provide some suitable constructs. However, when promoting user-centered concepts to the strategic decision makers, the user-centered design professionals and practitioners should understand the ways business-driven enterprise architecture practitioners reflect on the main concepts. For example, usability should probably not be used when the aim is to influence higher level decisions. User research services could be offered as customer or service experience studies.

To conclude, some user-centered aspects presented themselves in enterprise architecture practices; mostly regarding business-driven enterprise architecture practices. However, the current abstraction level of user-centered aspects was between the conceptual and physical levels. For more benefits, the abstraction level of user-centered aspects within enterprise architecture could be raised to the contextual level. The user-centered approach enhances understanding the use context and needs. Understanding the real use context of enterprise architecture and the real needs of business units and management seems to be required for successful business-driven enterprise architecture. Involving business and management in enterprise architecture work probably increases the benefit realization of enterprise architecture.

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