

Taina Kaapu

Reaching the Diversity of Users'
Understandings:
A Methodological Renewal

ACADEMIC DISSERTATION

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ABSTRACT

"Youngsters often share their own pictures and information about themselves in the Internet" or "To support their buying decisions, Finnish people eagerly use discussion groups and web pages for price comparisons" are quotations the like of which can again and again be seen in the media. Often also in the scientific discussions the users of computers are described through diverse groups. However, "youngsters" or "Finnish people" as such cannot use computers. The users of computers are individuals.

The goal of this dissertation is to examine how individual users' diversity of understandings can be studied in the information systems science. An interpretative research approach called phenomenography has been used for collecting and analysing the diversity of users' interpretations. The users of information technology have been studied empirically in the context of e-commerce.

The users have varied understandings of information technology. Thinking of users as a single group may lead to incorrect interpretations. The user tests and interviews included in this study show the diversity of individuals' understandings. For example, privacy in electronic commerce may mean to some users only threats, even though in general privacy and its protection are seen as something positive. Another example is that when discussing virtual prototypes of products the user can concentrate mainly on the possibilities of the presentation technology. In this situation the user bypasses the primary product features.

The results of this study show that the research approach employed here has the advantage of reaching a multilevel understanding of users' conceptions. By moving from one level to another the researcher can: 1) report individuals' conceptions, 2) present classifications of individuals' conceptions, 3) present categorizations using aspects of conceptions, and 4) create forms of thought. All of these levels can comprise relevant research results. When the researcher creates forms of thought the result represents a model of the studied phenomenon in a multilevel fashion.

Keywords: users; information systems; experiences; views of technology; understanding technology; trust; privacy; virtual product experience; virtual prototypes of products; electronic commerce; consumers; information systems science; research methods; interpretative studies; phenomenography

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TIIVISTELMÄ

”Nuoret jakavat paljon omia kuviaan sekä itseään koskevia tietoja netissä” tai ”Suomalaiset käyttävät innokkaasti hintavertailusivuja ja keskustelupalstoja ostopäätöksensä tukena” ovat lainauksia, joiden kaltaisia voi nähdä tiedotusvälineissä jatkuvasti. Usein myös tieteellisissä keskusteluissa tietokoneen käyttäjiä kuvataan erilaisten ryhmien kautta. ”Nuoret” tai ”suomalaiset” eivät kuitenkaan voi todellisuudessa käyttää tietokonetta vaan tietokoneen käyttäjät ovat yksilöitä.

Tämän väitöskirjan tavoitteena on selvittää, miten yksilöllisten käyttäjien moninaisia käsityksiä voidaan tutkia tietojärjestelmätieteessä. Käyttäjien erilaisten tulkintojen keräämiseen ja analysointiin on käytetty tulkinnallista tutkimusotetta, fenomenografiaa. Tietotekniikan käyttäjiä on tutkittu empiirisesti haastattelujen avulla sähköisen kaupan kontekstissa.

Käyttäjät suhtautuvat tietotekniikkaan vaihtelevasti. Heidän ajattelemisensa yhtenä ryhmänä voi johtaa vääriin käsityksiin. Tutkimukseen liittyneissä käyttäjätesteissä ja haastatteluissa tuli esiin yksilöllisen ymmärryksen kirjo. Esimerkiksi yksityisyys sähköisessä kaupassa saattoi merkitä jollekin käyttäjälle vain uhkia vaikka yleisesti yksityisyys ja sen säilyttäminen nähdään myönteisenä asiana. Toisaalta virtuaalisista tuotemalleista puhuttaessa käyttäjä voi keskittyä pääasiassa teknologian mahdollisuuksiin, jolloin varsinaiset tuotteen ominaisuudet jäävät hänen ymmärtämyksessään vähemmälle huomiolle.

Tutkimusten tulosten perusteella käytetyn tutkimusotteen avulla voidaan saavuttaa monitasoinen käsitys käyttäjien käsityksistä. Nousten askeleelta seuraavalle tutkija voi 1) raportoida yksilöiden käsityksiä, 2) esittää luokitteluja yksilöiden käsityksistä, 3) esittää kategorioita käyttäen käsitysten aspekteja ja 4) luoda ajatusmalleja. Kaikki askeleet voivat muodostaa merkityksellisiä tutkimustuloksia. Kun tutkija luo ajatusmalleja, kyseessä on mallin muodostaminen tutkittavasta ilmiöstä monitasoisella tavalla.

Avainsanat: käyttäjät; tietojärjestelmät; kokemukset; teknologia-käsitykset; teknologian ymmärtäminen; luottamus; yksityisyys; virtuaalinen tuotekokemus; tuotteiden virtuaaliset prototyypit; sähköinen kauppa; kuluttajat; tietojärjestelmätiede; tutkimusmenetelmät; tulkinnallinen tutkimus; fenomenografia

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When I was a child, my mother always used to read to me great stories consisting of fairytale classics by authors such as Hans Christian Andersen, Grimms' brothers, or Tove Jansson. I enjoyed them deeply and I dreamt about writing my own book. Well, now I have written one, except that it is not exactly the kind of story book I planned to write when I was little. This compound study for Ph.D. dissertation has required a great amount of work, but also I have received guidance, help, and support from others. This is the place to thank all those people.

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LIST OF ABBREVIATIONS

Abbreviation	Description
B2B	business-to-business
B2C	business-to-consumer
CAVE	cave automatic virtual environment
CS	computer science
C2C	consumer-to-consumer
ICT	information and communication technology
IPT	immersive projection technology
IS	information systems
IT	information technology
M.Sc.	Master of Science
PET	privacy enhancing technology
Ph.D.	Doctor of Philosophy
Ph.Lic.	Licentiate of Philosophy
STOPS	steps of outcomes in phenomenographical studies
TAM	technology acceptance model
3D	three-dimensional
UX	user experience
VE	virtual environment
VP	virtual prototype
VPE	virtual product experience
VR	virtual reality

CONTENTS OF PART II

This doctoral dissertation includes the following articles:

Article 1: E-Privacy I

Kaapu, T. (2005), The Concept of Information Privacy in E-Commerce: A Phenomenographical Analysis of Consumers' Views, *The Plenary Papers of 28th Information Systems Research Seminar in Scandinavia, IRIS28, Kristiansand, Norway*, August, 6-9, 2005, 16 p.

Article 2: E-Privacy II

Kaapu, T., and Tiainen, T. (2009), Consumers' Views on Privacy in E-Commerce, *Scandinavian Journal of Information Systems*, 21:(1), pp. 3-22.

Article 3: Behaviour Patterns

Tiainen, T., Ellman, A., and Kaapu, T. (2010), Occasional Users' Moving in Virtual Environment - Physical and Virtual Locomotion, *Series of Publications D, D-2010-8. Department of Computer Sciences, University of Tampere, Tampere, Finland*, 13 p.

Article 4: Virtual Prototypes I

Kaapu, T., and Tiainen, T. (2010), User Experience in Evaluating Virtual Product Prototypes, *In T. Alexander, M. Turpin, and J.P. van Deventer (Eds.) 18th European Conference on Information Systems ECIS 2010 Conference Proceedings, Pretoria, South Africa*, June, 7-9, 2010, 12 p, ECIS2010-0032.

Article 5: Virtual Prototypes II

Kaapu, T., Tiainen, T., and Ellman, A. (2009), Virtual Prototyping in Product Development: Users' Context Related Understanding, *In the Proceedings of 16th International Product Development Management Conference, IPDM2009, Twente, Netherlands*, June, 7-9, 2009, 18 p.

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PART I

1 INTRODUCTION

Today the need to understand humans and their actions is generally accepted in the information systems (IS) field (e.g., Walsham 1995, Klein and Myers 1999, Walsham 2006). A human using information and communication technology (ICT) is commonly called the user (Lamb and Kling 2003). From a methodological standpoint user's understanding of ICT is known to be a complex issue (e.g., Hevner et al. 2004). My dissertation is about reaching the diversity of users' technological understandings. This research goal acknowledges users as those who make technology meaningful. In the following, I formulate the research question by examining first the previous studies about users' understandings and by explaining then how the diversity in them can be studied.

1.1 Main Concepts

The main concepts of my dissertation are **user** and **user's understandings**. In the IS field, it is common to refer to user as an individual who use computers (e.g., Lamb and Kling 2003, Tiainen 2004). The most common conception of the user in IS research is "an atomic individual with well-articulated preferences and the ability to exercise discretion in ICT choice and use, within certain cognitive limits" (Lamb and Kling 2003, p. 198). Lamb and Kling (2003) invite IS researchers to refine user as a multidimensional social actor. This means that the researcher has to ask with whom a user is interacting, about what issues, under what conditions, for what ends, with what resources, etc.

The concept user has also been criticized because it associates all kinds of activity together by putting the computer in focus and treating people as the background (Greenbaum and Kyng 1991). Also Kyng (1998) commented that during the initial phases the insight needed into the work of an organization developing a system is provided by the managers of the users-to-be. This trend has been so powerful that in Kyng's (1998, p. 9) days "we often have to retreat to such labels as end-users to be sure that they, the real users, are not confused with their managers".

In some studies the users are labeled in line with their work place or situational actions. For example, in e-commerce studies users are often called consumers (e.g., Scornavacca et al. 2005, Wang et al. 2008). In the IS field, especially in the social construction of technology, researchers have investigated how knowledge shared by members of a social group (e.g., citizens, office workers, managers, educators) influences their understanding of technology (Davidson 2002). In these studies users are called in accordance with their position in the examined group.

I use the concept user because it is commonly used and it can be generalized to all different situations. Besides of user, the other main concept of my dissertation is user's understandings. From a constructive point of view, reaching user's understandings means that the question is how to develop tools, techniques and theories to support the major aspects of users' different roles. This includes, for example, cooperation with professional designers in system development projects. In these cases a user has the role of "contributor to design" as Kyng (1998, p. 9) names it.

The individual level of user's understandings refers, in many studies, to researchers' view of the use of technology as behavior, in which system use is measured via indicators such as duration of use or an individual's frequency of use (Trice and Treacy 1986). Less often these researchers conceptualize the understandings of technology as cognition. This means that the user's understanding is measured via indicators such as the user's level of cognitive absorption when using IS. (Burton-Jones and Straub 2006.) Measuring understandings of technology as cognition is generally a more demanding task than examining them through other kinds of indicators. In my dissertation, studying user's understandings mean cognition. The idea is to reach the diversity of users' technological interpretations. These interpretations can be related directly to the used technology, to the content, to the use context, etc.

1.2 Previous Studies of Users' Understandings

Although users and related issues have been studied for many years, researchers stress how little we know about the use of systems (DeLone and McLean 2003). While many aspects of users and system use can be studied, I focus on just one: reaching users' understandings. A need to find out the users' understandings and interpretations of technology is common to all human-centered design strategies (starting from, e.g., Mumford and Henshall 1979, Checkland 1981).

Also the characteristics of Scandinavian approach to IS development highlight the central role of user understanding (Bjerknes and Bratteteig 1995). Bansler (1989) categorizes Scandinavian IS research in systems development to three groups: 1) the systems theoretical school, 2) the socio-technical school, and 3) the critical school. Systems theoretical researchers have an economic perspective to rationalize work processes. Socio-technical researchers are interested in the system designers' neglect of human factors. Critical researchers study the use of information technology and workplace democracy. These differences may not be so certain in real life: many studies do not clearly belong to one group (Bansler 1989).

Bjerknes and Bratteteig (1995) present reasons for the interest of users: 1) improving the knowledge upon which systems are built, 2) helping people to develop realistic expectations towards systems, and 3) increasing workplace democracy by giving the members of an organization the right to participate in decisions. By viewing the people who use computers in their work has been central in the previous studies of users' understandings. The systems are seen as tools to be designed under the control of the people using them; the systems should not make work activities more rigid

(Greenbaum and Kyng 1991). My study is different to these studies because the use is related also to other than work use and the emphasis is on the use phase – not design. The focus is mainly socio-technical: the interest is related to individuals' interpretations and bringing them to light. My study follows Scandinavian tradition, as my aim is to empower non-professionals in their roles in using IS.

From users' perspective, one approach to study the use of technology is the technology acceptance model (TAM) (e.g., Davis et al. 1989, Venkatesh et al. 2003). The TAM is a theory that models how users come to accept and use a certain technology. The model suggests that when users are presented with a new technology, a number of factors influence their decisions about how and when they will use it. The most important factors in this theory are perceived usefulness and perceived ease-of-use (Davis et al. 1989). The perceived usefulness means "the degree to which a person believes that using a particular system would enhance his or her job performance" and the perceived ease-of-use means "the degree to which a person believes that using a particular system would be free from effort" (Davis et al. 1989, p. 985).

The TAM has been replicated and used in several studies (Wu and Lederer 2009), for example, to explain the intention to use mobile ticketing on public transportation (Mallat et al. 2009). Researchers have also begun to explore other kinds of issues, such as the impact of social cues and warmth of websites that are related to the user experience (UX) of the website (e.g., Yoo and Alavi 2001, Gefen and Straub 2003, Hassanein and Head 2007). These studies are aimed to create new theoretical perspectives that move beyond the TAM into the realm of emotive reactions.

Other kind of conceptual tool for understanding IS users' views is technological frames (Bijker 1995). Technology frames are that subset of members' organizational frames that concern the assumptions, expectations, and knowledge they use to understand technology in organizations (Orlikowski and Gash 1994). This includes not only the nature and role of the technology itself, but the specific conditions, applications, and consequences of that technology in particular contexts (Orlikowski and Gash 1994, Davidson 2002). Davidson (2002) reports a case study to develop a process model of how frames and shifts in frame salience influence sense making during requirements determination. This study presents an example of using technological frames to study users' understandings.

The discussion of users' understandings is present also in the social sciences. The findings from interviews with domestic users have been framed in relation to literature relating to domestic media consumption (Sørensen 1994, Silverstone et al. 1992, Silverstone 1994). The concept domestic suggests a household environment. Still, the concept of domestication is also applicable to other areas as work context, for example (Sørensen 2005). Domestication is a concept within media and communications studies, but also within the studies of the sociology of technology that has been developed to describe and analyse processes of technology's acceptance, rejection and use (Berker et al. 2006). Domestication is an analytical tool, which helps to illuminate the process where the user makes the technology his/her own (Silverstone et al. 1992, Lie and Sørensen 1996, Silverstone et al. 2005). This process takes place through various phases or dimensions. In the domestication process the artifact is fitted into the practices of everyday life.

In practice, the studies of the domestication of technology have relied largely on qualitative research methods (Berker et al. 2006). Silverstone and Hirsch (1992), using ethnography, examined the relationship between media technology, consumption and the domestic sphere. Hirsch (1992) presents an ethnographic case study about a family in which the consumption of ICTs is appropriated in the context of a family's relationships and moral environments. Also Ward (2005) focuses on the way in which the meaning surrounding Internet use is constructed within the household environment. The domestication studies present one way to reach users' understandings when the emphasis is on the individual level.

TAM, the technological frames and the theory of domestication of technology all offer ways to study users' understandings. Nevertheless, there is a gap within the present scientific literature. My aim is to reach beyond models such as TAM and seek ways how to capture users' interpretations of technology. The idea of my dissertation is that technology should be designed to satisfy users' desires. In many user studies the elements of experience have been given very little importance (Hassenzahl 2006). To satisfy these desires, I understand that researchers should take a step back and to understand, via the theory-building approach, users' experience in the use of technology and users' technology-related conceptions.

The other requirement is to study the IS users in a multilevel fashion, keeping an eye on the whole as well as its parts. Multilevel research refers to any research that "entails more than one level of conceptualization and analysis" (Kozlowski and Klein 2000, p.79). Often system use is studied as a way in which collectives "use" IS (Burton-Jones and Gallivan 2007). I understand that examining multilevel issues have to start from the bottom, and that's where I start scrutinizing the individual differences in users' interpretations. My focus is to take individual interpretations to collective level of understandings. Technological frames or the domestication theory do not offer enough room for this kind of conceptualization because they are related mainly to individuals' understandings.

1.3 Examining Diversity of Understandings

As the focus of this dissertation is to study users' interpretations, I need an approach that supports this goal. The multidisciplinary nature of IS science and diverse philosophical perspectives in it have led to a wider diversity in research methods and, more specifically, to the emergence of qualitative methods (e.g., Trauth 2001, Dubé and Paré 2003). A large variation in methods is needed since IS is a discipline that is "at the intersection of knowledge of the properties of physical objects (machines) and knowledge of human behaviour", as Gregor (2006, p. 613) puts it.

Deetz's (1996) classification of dimensions of studies describes the nature of the needed research approach. As methodological approaches are placed in this classification, information can be obtained about what is the nature of the approach. Deetz proposed two dimensions for studies (Figure 1.1). One dimension describes the origin of concepts and problems. The opposite ends are local (the concepts and problems come from practical situations) and elite (the concepts and problems are taken from scientific discussions). For example, Walsham (1995) understands that

interpretive research covers all dialogic, interpretive, and critical studies in Deetz's classification. So Deetz's classification is more detailed.

For my dissertation, I need an approach that aims to find out how individuals view the phenomenon, so the origin of my concepts should be local in Deetz's (1996) classification. The other dimension in Deetz's (1996) classification focuses on the type of the result, consensus (reach the dominant view) or dissensus (give space to alternative views). I need an approach for making the variation of conceptions visible (i.e., intentionality) to present alternative views. In Deetz's (1996) classification, my chosen methodological approach needs to be located in *relations in dominant social discourse* to dissensus and in *origin of concepts and problems to local/emergent*.

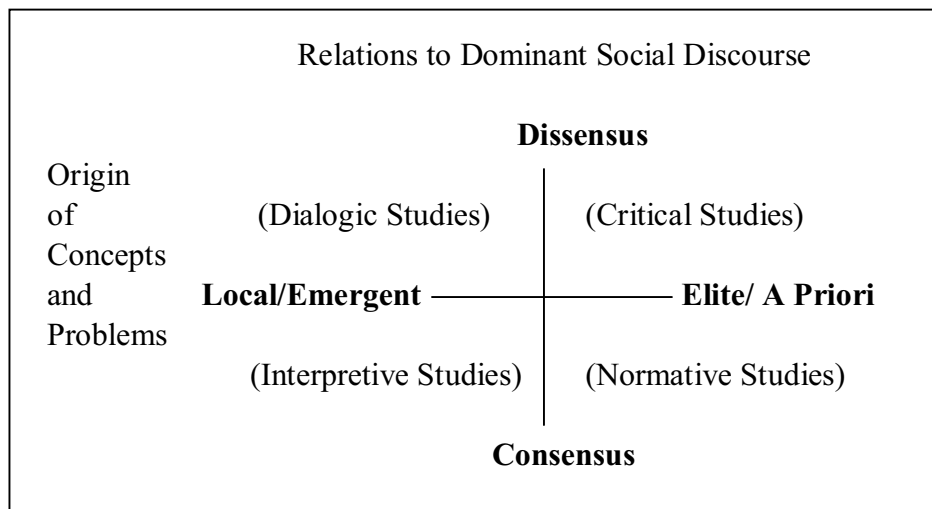


Figure 1.1. *Contrasting Dimensions of Studies (Deetz 1996).*

Phenomenography satisfies the requirements outlined. It is a methodological approach focused on describing the phenomenon in the world as others (than researcher) see it (Marton 1982). Often phenomenography is also called a research method or methodology. However, Marton and Booth (1997) prefer labeling it research approach, because it does not contain implicit guidelines how phenomenographical study should be conducted. Research method means that there are recommended techniques, e.g., for data collection and analysis. Phenomenography gives much freedom for the researcher.

The freedom is mainly related to the begin of the phenomenographical approach, Phenomenography was developed among educational researchers for understanding students' conceptions and the development of conceptions during a teaching process (Marton 1981). The emphasis was on experience that has been reflected on to the extent that it could be discussed and described by the experiencer (Marton and Booth 1997). In this case, the researcher is aiming to see the studied phenomenon from the informants' perspective.

The roots of the phenomenographical approach are strongly connected to empirical studies of learning. Marton (1981) adopted the term of phenomenography as a label for a new idea in educational research. Phenomenography comes from the Greek words "phainemenon" (appearance) and "graphein" (description). According to

Pang's (2003) thorough review, first phenomenographical studies examined the way in which Swedish university students learnt from reading academic texts (e.g., Marton 1974, Dahlgren 1975, Säljö 1975, Svensson 1976).

The qualitative differences in the outcome of learning were closely linked to the variation in approaches to learning (the deep versus the surface approach) that were adopted by the learners (Pang 2003). Although phenomenography was at first developed in order to obtain new knowledge about learning (Marton 1981), it has been developed further. Phenomenography is nowadays used to study a range of issues, including 1) approaches to learning, 2) understanding scientific phenomena learned at school, and 3) understanding general issues in society unrelated to educational systems (Marton and Booth 1997).

Methodologically, the aim of the phenomenographical research is to describe qualitatively different ways of experiencing various phenomena. This implies a second-order perspective, through which the researcher seeks to capture how the world appears to other people (Marton 1981). As the aim in phenomenography is to find out how individuals view the phenomenon, the origin of concepts is local in Deetz's (1996) classification. The other dimension in Deetz's (1996) classification focuses on the type of the result, describing consensus (reach the dominant view) and dissensus (give space to alternative views). More studies which present multiple voices and interpretations are needed, but few methods support this (Buchanan 2003). However, phenomenography is a method for making the variation of conceptions visible (i.e., intentionality), so its target is to present alternative views.

1.4 Research Question

In all applied contexts, the result of a phenomenographical study is a categorization which presents the variation (Marton and Booth 1997, p. 119). Thus, in the context of users' technological understandings, phenomenography offers a way to do research that leads to a multifaceted view of users' technological understandings.

The contribution of this dissertation is methodological. The aim is to understand the users' interpretations of technology using the phenomenographical approach. So the theoretical underpinning for this research is phenomenography. I form the research question as follows:

How can phenomenographical approach be used to reach users' technological understandings?

The answer to the research question consists of the empirical experiences using phenomenographical approach to study understandings of users. I describe the experiences of phenomenographical work in relation to phenomenographical literature. The results are also aimed for developing phenomenography, especially when studying IS users' understandings. By so doing, my aim is to contribute to a deeper understanding when examining users and system use.

1.5 Structure of Part I

The Part I of this dissertation is organized as follows. This chapter, Chapter 1, outlined the main concepts, presented previous studies of users' understandings and the research question. In Chapter 2, I present the literature review about reaching the diversity of understandings with phenomenography that forms the main theoretical underpinnings for this dissertation. I divide this review to two sections: background use of phenomenography and IS's use of phenomenography.

In Chapter 3, I outline the selections, considering a chosen methodology and how it is carried out in my dissertation. After that I describe my personal study process. Finally, I summarize the data collection and analysis procedures (presented in detail in the attached articles).

In Chapter 4, first I briefly describe five articles included in this dissertation and present their selected contributions to the reaching of the diversity of users' understandings. Second I come to an evaluation of how the empirical studies of this dissertation are carried out according to the principles of Klein and Myers (1999), who identified seven interdependent principles of interpretive studies.

In Chapter 5, I give answers to the question how phenomenographical approach can be used for reaching the diversity of users' understandings. The methodological contribution of my dissertation is related to the empirical experiences as when I used phenomenographical approach to study users' technological understandings. I also make use of my experiences in relation to a review of phenomenographical IS perspective studies.

In Chapter 6, I present the discussion, which includes the limitations and the implications for further research. In Chapter 7, I conclude the results.

2 LITERATURE REVIEW

My dissertation focuses on using the phenomenographical approach to study users' interpretations of technology in the IS field. Phenomenography plays part in the IS field but is rarely used. In this chapter I first briefly outline the approach's main ideas and methodological background. I use for this purpose the methodological literature related to phenomenography.

Marton (1986) identified three lines of development of phenomenographical research. In the first, the interest lies in more general aspects of learning, concentrating on the qualitative differences in the approach to learning. The second line of research focuses on learning within a disciplinary context and on student conceptions of subject matter. The third line contrasts this with the everyday context, which is concerned with how individuals conceive various aspects of life. The aim of my work is to study aspects of life that are connected to the IS science. My dissertation focuses to the third line of development of phenomenographical research (Marton 1986). The general aim of this chapter is, however, to systematically analyse how phenomenography is employed in the IS field.

This review helps to identify trends and patterns in the use of phenomenographical research. The review serves as an instrument to reflect the phenomenographers' progress and my personal experiences in the use of phenomenography. In this review I decided to seek articles that are written concerning the IS field while using a very broad lens. The IS field includes articles that discuss issues related to ICT and humans in relation to it. The use of ICT can be related, for example, to management or educational purposes. My review provides a systematic examination of research published over the last two decades (the period between 1989 and June 2009) focusing on the trends in the analysed articles. Furthermore, my aim is to find the number of phenomenographical publications of selected criteria and empirically seek to find the trends in these studies. The topics and the outcomes together form the various research streams of the phenomenographical studies.

2.1 Main Ideas of Phenomenography

Phenomenography is a qualitative, empirically based research approach that aims to interpret, describe, and categorise how a phenomenon is experienced or understood by a group of informants (Marton and Booth 1997). The roots of the phenomenographical approach are strongly connected to empirical studies of learning (Marton 1982). For example, the relatively well-known dual concepts of deep learning and surface learning have their origins in phenomenographical research (Lister et al. 2007). Learning assumes a central importance because it represents a qualitative change from one conception concerning some particular aspect of reality to another

(Richardson 1999). This aim originates from the phenomenographers' desire to gain insights on the phenomenon studied.

Most of the research methods focus on the essence of a phenomenon. This kind of focus in research is called the first-order perspective. Phenomenography, on the other hand, focuses on the second-order perspective: the researcher focuses on people's views of the phenomenon (Uljens 1991). In this sense, second-order perspective means that the objective of a phenomenographical study is to reveal the inherent variation in people's views (Figure 2.1, modified from Järvinen 2004, p. 80). Furthermore, new interpretations are continuously being made (Uljens 1993), and should be taken into account. It is not even relevant to ponder whether a certain conception is realistic or not (Marton and Booth 1997). The main issue is that the informant thinks in the way presented.

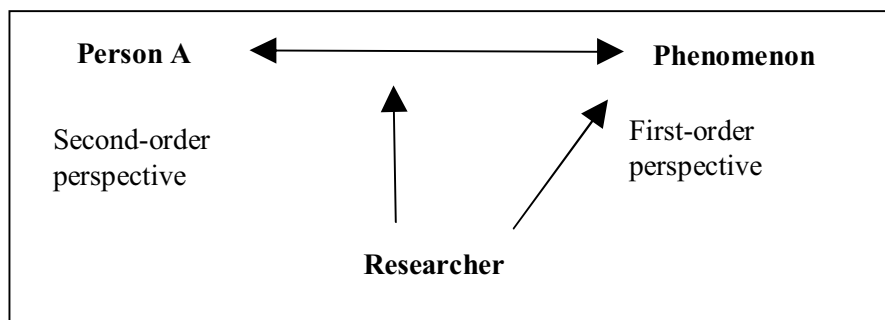


Figure 2.1. First-order and Second-order Perspective.

As qualitative research in general, also in phenomenography, the research process usually includes two stages: data collection and data analysis (Marton and Booth 1997). What is different in phenomenography is that the researcher seeks to maximize the variation of experiences and interpretations, and so the data collection and selection of participants must be carefully planned. For example, the informant should be able to describe his/her own understandings and not to choose any optional answers made by the researchers. The interview is typically used to collect data in phenomenography, although other methods are possible (written answers, for example) (Sandberg 2000). In the phenomenographical data collection process it is expected that data collection reaches a saturation point (Marton 1981). Saturation point means that after some number of interviews the same themes continually emerge and additional interviews do not uncover any new themes.

The use of the phenomenographical approach places researchers in a “learning role”. This means that the researcher has to be humble to understand how the informants see the phenomenon under study. The researcher has to listen and accept different understandings to those of her/his own and not to try to correct the informant's conceptions. A researcher taking this approach wishes to get deeply involved into how people view things and to discover the underlying causes, the nuances and the details for them (Marton and Booth 1997). In this way phenomenography merges research and praxis, and informants' answers are not disconnected from the context.

Phenomenographical data analysis is a demanding, iterative process to reach the final outcome. It usually starts at the same time with data collection (Richardson 1999). In

its data analysis part, the aim is to elicit individuals' referential descriptions of the phenomenon. These descriptions are then probed for their structural aspects of experience. The aim of phenomenographic research is to obtain a rich description, but not necessarily to reach generalised results (Marton and Booth 1997).

Renström (1988, p. 218) illustrates the phenomenographical representation levels of data interpretation with associated categories (Figure 2.2). They uncover the relationships between informants' descriptions. It is stressed in phenomenography that the collective understanding is revealed through the variation of the respondents' different conceptions (Pang 2003). Then multiple perspectives are pursued within an individual's thoughts, which are subsequently connected as a collective view. First level *conceptions* mean individual views without hierarchy or explanations of relations to other conceptions. Each of the resulting *categories* comes to describe a certain way in which the phenomenon under investigation is understood (second level categories). Taken together, the categories describe the variety of understandings that can be found in a group (third level frameworks). A *framework* is made up of the combinations of presented categories comprising thought forms or higher levels of understandings. (Renström 1988.)

Since the categories illustrate different aspects of the same phenomenon, they are logically related to each other. In general, some categories offer a wider or richer perspective and often come to embrace others in an inclusive structure. (Renström 1988.) It tends also to be the case that for a given phenomenon, the categories of description are hierarchical (Marton and Booth 1997). Commonly, the understanding of the novice will generally fit into the simplest category. As people become more expert (also more familiar) with the phenomenon, they will often progress to higher-level understandings (Eteläpelto 1997). In such cases, the highest level of understanding encompasses all the lower levels.

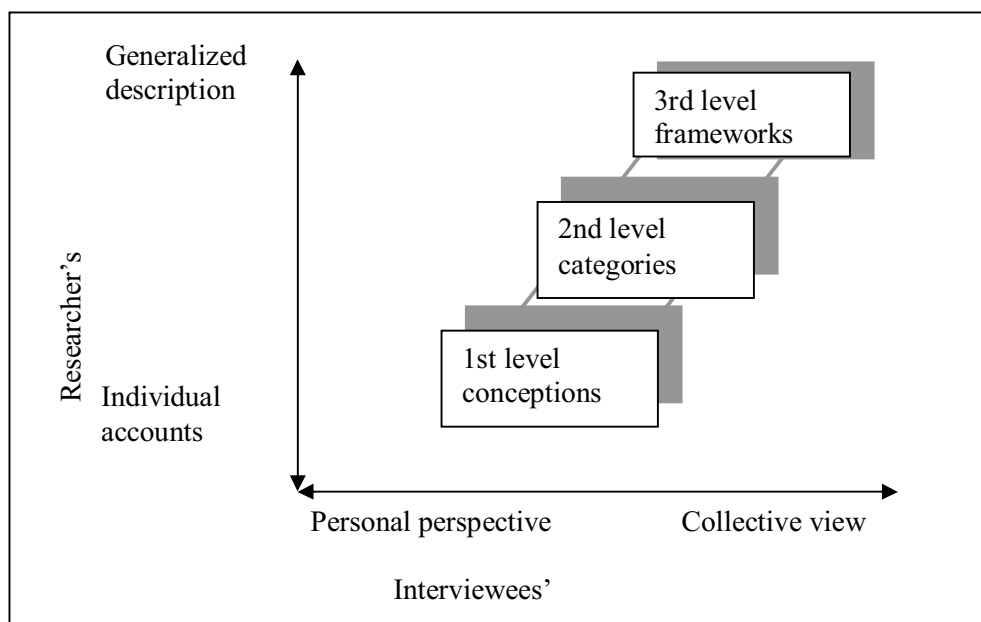


Figure 2.2. Representation Levels of Data Interpretation in Phenomenography (Renström 1988).

Recently phenomenography has moved on from attempts to describe different levels of experiencing various phenomena to attempts to answer such questions as “what is a way of experiencing something” and “what is the actual difference between two ways of experiencing the same thing?” (Pang 2003, p. 146). This shift is probably emphasised because the phenomenographical approach is used also in disciplines other than education. Phenomenography has been adopted for several fields including business (e.g., Sandberg 2000), health (e.g., Barnard et al. 1999) as well as computer science (CS) and IS (e.g., Bruce 1999). In all these cases research focuses on learning within a disciplinary context (Marton 1986). So the way of experiencing something is more important than dealing with purely educational contexts (Pang 2003). This is also the situation in my dissertation where the contribution focuses to the IS field examining users and their understandings of technology.

2.2 Phenomenography and Information Systems Studies

In this literature review I examine what kinds of phenomenographical work have been published in the IS field and related disciplines. My aim is to find the trends in articles, and the review procedure employs this goal. First, I needed to decide from which publication forums to look for the articles. As I am familiar with the fact that the number of published articles in IS journals is quite limited, I decided to take into account conference publications also. As the process in conferences is usually faster than in journals, it is easier to find more recently conducted studies from conferences. It is important to examine the breadth of publications when undertaking a review such as this. The second step in the process was to decide about the criteria for defining whether an article belongs to the target area of this review. Third, I decided how to analyse the articles. After the description of this process, I will present the trends in the phenomenographical IS studies.

2.2.1 Review Procedure

Journal and conference selection was undertaken with careful consideration. My intent was to assure a wide representation of phenomenographical studies conducted from the perspective of IS. I decided to seek the phenomenographical studies from different publication forums in three steps.

Step 1: IS Journals. I sought phenomenographical articles published in high-quality IS journals. The following journals were selected, based on the rankings (Bharati and Tarasewich 2002, ISWorld 2009):

- Communications of the ACM (CACM),
- European Journal of Information Systems (EJIS),
- Information Systems Journal (ISJ),
- Information Systems Research (ISR),
- Information Technology and People (ITP),
- Journal of the Association for Information Systems (JAIS),

- Journal of Management Information Systems (JMIS),
- Management Information Systems Quarterly (MISQ).

Step 2: Other Relevant Journals. Candidate articles were sought via phenomenographical resources. Phenomenography Crossroads is often referred to as the “official” phenomenography site (e.g., Lister 2003) and it can be geographically located to Marton’s research group (Sweden) among whom the phenomenographical method was developed. Through Phenomenographica (<http://www.ped.gu.se/biorn/phgraph/civil/graphica/graph.html>) I reviewed journal abstracts and the annotated bibliography to find out in which journals phenomenographical articles are published. The referred journals are:

- Campus-Wide Information Systems,
- Computer Science Education,
- Computers in Human Behavior,
- Journal of Information Technology Education,
- Scandinavian Journal of Educational Research.

Step 3: Conferences. I sought phenomenographical articles published in conferences via ACM Digital Library (<http://portal.acm.org/>), because the conference articles mentioned in the “official” phenomenographical (Phenomenographica) site are available there. The referred conference proceedings are:

- Conference on Australasian computing education ACE,
- Australasian conference on computing education ACSE,
- International workshop on computing education research ICER,
- Annual SIGCSE conference on Innovation and technology in computer science education ITICSE,
- Baltic Sea conference on computing education research: Koli Calling.

As the phenomenographical method is relatively young (beginning Marton 1981, 1982) and only recently applied to the IS field, two decades is an adequate time period for a review. I decided to seek phenomenographical articles from the beginning of 1989 to June 2009. All articles published in the selected forums and during the time-period specified were examined to identify the candidate articles to be included. The following describes the process undertaken:

1. The first criterion was to find phenomenographic articles: The word “phenomenography” was entered to search in title, abstract, and keywords.
2. The second criterion was to limit the search to articles from the perspective of IS. The determination about whether a phenomenographic article was written from the IS perspective was based on the title and the abstract of the article.
3. The third criterion was to limit the research to empirical study articles and I did not include, for example, articles that evaluated the phenomenographical approach or articles where the methodological approach is not reported clearly enough to allow the reader to see the

procedure of the study. The abstract was read and a decision was made either to include or exclude the article.

Having examined the articles, I included none of the articles in step one (IS Journals) and about 50 percent of the articles found in steps two (Other Relevant Journals) and three (Conferences). The number of articles satisfying the criteria presented above and selected for the analysis was:

- Step 1 (IS Journals): 0 articles
- Step 2 (Other Relevant Journals): 12 articles
- Step 3 (Conferences): 17 articles

As my aim was to discover research trends, I first focused on consecutive time periods. The analysis started by dividing the articles in each publication class (Other Relevant Journals, Conferences) to four time categories (five years each, except the last category from 2004 to June 2009). The second objective was to identify main research streams by the following criteria: (1) the group under study, referring to a group whose conceptions have been examined, and (2) conceptions about, referring to the phenomenon. The analysis continued by reading the articles and defining the main research streams. I present them by author(s) and publication year.

The final aim was to define the articles' class of research outcome. The criteria I used for this is according to Renström's (1988) model (see Figure 2.2). I defined the outcome as class individuals' conceptions (I) if it does not show how the components are aggregated or the hierarchy of the result is compounded in relation to other components. The second class, categories (C), includes different aspects of a phenomenon or the outcome is otherwise presented consisting of separate parts in a relationship. The third class, frameworks (F), requires that the combinations of the presented categories comprise thought forms or higher levels of understandings. This categorization includes my interpretations since the authors of study articles are generally forced to describe their results in publications where article length is limited. Nevertheless, my assumptions are principally based on the article and what the reader can see in it. I present the class of research outcome by author(s) and publication year.

2.2.2 Trends of Studies

Of the total of 29 articles published, 12 were in the target journals and 17 came from conferences (see Table 2.1). The first finding is that the use of phenomenography in IS perspective studies is increasing. In the last period 23 phenomenographical IS articles were published whereas in three earlier periods only 6 articles were published. Also, most of the journal articles were published in the last period (see Table 2.1). The results (see Table 2.2) describe two aspects: first, whose are the concepts presented in the articles and what are those concepts (research streams), and second, the kinds of results that the articles present.

Research Streams. First, I identified those groups whose conceptions were examined in the articles. The articles within each research stream are presented in the

publication order (Table 2.2). Next, I describe the content of each research stream (whose concepts were examined). I also present some illustrations of the categories.

Table 2.1. Number of Phenomenographical Information Systems Articles.

Publication	1989-1993	1994-1998	1999-2003	2004-Jun.2009	Total
Step 1: IS Journals	-	-	-	-	-
Step 2: Other Relevant Journals	2	-	1	9	12
Step 3: Conferences	-	1	2	14	17
Total	2	1	3	23	29

The first stream focuses on *students'* point-of-view. In the articles, students' conceptions consist roughly of four themes. Most of the analysed articles examine the subject of learning, which most often is related to programming. For example, Bruce et al. (2004) investigate the variation in students' early experiences of learning to program, with a particular focus on revealing differences in how they feel about learning to program. The resulting outcomes of the programming related articles give implications about how to teach and learn to program. The second theme from the students' point-of-view is learning experience and motivation. One example of this is provided by Berglund and Eckerdal (2006) who explored students' motives for taking a course. The third theme from the students' point-of-view is ICT/IS in teaching. Demetriadis et al. (2003) studied students' attitudes about multimedia for educational purposes. Also other people in learning situations have been examined. Vartiainen (2006, 2008) studied students' understanding of moral conflicts in IS projects.

The second stream consists of *educators'* conceptions. An educator can be, for example, a teacher, academician, or an educational textbook; all of their conceptions have been analysed. From the educators' perspective, many of the studies are categorized as experiences and practice of teaching. For example, Carbone et al. (2007) studied the conceptions of successful and unsuccessful teaching among ICT, IT, and CS academics. The other theme of educators' conceptions is ICT/IS in teaching. For example, Ben-Bassat Levy and Ben-Ari (2007, 2008, 2009) present the attitudes that teachers possess on the use of animation systems as a pedagogical tool. Another example is provided by Zhao et al. (2009): they examine teachers' conceptions of e-learning and how e-learning is applied in teaching and learning in the field of Chinese higher education. The third theme is educators' conceptions about students: Kinnunen et al. (2007) studied educators' conceptions about students' success.

Besides the above education related research streams, there was only one article with other context and constitutes the third stream, which consists of *IS designers'* conceptions. That fairly recent article by Box (2009) investigated how IS designers understand IS design. Although the use of phenomenography has widened just recently, also this article deals with educational context. Its author connects the discussion to education as follows. In an educational setting, when teaching analysis/design, it is necessary to first decide what it is the teacher wishes the students to learn. Then the teacher has to place the students in situations where different approaches to analysis/design are experienced and in which the student can contrast, generalise, separate, and fuse the critical aspects of the varying approaches.

Table 2.2. Main Research Focus and Outcome Classes of Analysed Articles (*I* = individuals' conceptions, *C* = categories, or *F*= frameworks, see Figure 2.2).

The group whose conceptions are investigated	Conceptions investigated	Articles	I/C/F	Total number of outcomes per conception (%)	Total number of outcomes per group (%)
Students	Subject under learning	Booth 1993	C	8 (27.6 %)	17 (58.6 %)
		Lindström et al. 1993	C		
		Booth 2001	C		
		Bruce et al. 2004	C		
	Learning experience and motivation	Eckerdal et al. 2005	C	5 (17.2 %)	
		Eckerdal and Thuné 2005	I		
		Stamouli and Huggard 2006	C		
		Boustedt 2009	C		
	ICT/IS in learning	Demetriadis et al. 2003	I	1 (3.4 %)	
	Other people in learning situations	Vartiainen 2006 Wiggberg 2006 Vartiainen 2008	C I C	3 (10.3 %)	
Educators	Teaching	Lister et. al. 2004	I	5 (17.2 %)	11 (37.9 %)
		Lister et al. 2006	I		
		Carbone et al. 2007	I		
	ICT/IS in teaching	Lister et al. 2007	I	5 (17.2 %)	
		Tutty et al. 2008	C		
		Simon et al. 2006	C		
	Students	Ben-Bassat Levy and Ben-Ari 2007	I	1 (3.4 %)	
		Ben-Bassat Levy and Ben-Ari 2008	I		
		Ben-Bassat Levy and Ben-Ari 2009	I		
IS designers	IS design	Zhao et al. 2009	I	1 (3.4 %)	1 (3.4 %)
		Box 2009	C		

Classes of Outcomes. I also pondered what kind of phenomenography the analysed IS studies presents. The resulting classes of phenomenographical studies are of three kinds: individuals' conceptions (Class I), categorization of conceptions (Class C) and frameworks (Class F). These three classes can be connected to Figure 2.2, which illustrates the representation levels from individual views to general conceptions (Renström 1988). According to my analysis, the trend in research outcomes is towards categorization from examining individuals' conceptions. Frameworks are rarely created in the process of categorization. However, presenting the research outcome just in the lowest level (individuals' conceptions) can be justified and offers a contribution to the IS science in certain situations where it is important to see individual views.

In 13 of the analysed IS publications, the research presents individuals' views (Class I in Table 2.2). This class is hardly used in studying students' conceptions about the subject under learning, which is the original target of phenomenography use (Marton 1981). Instead, it is the class that commonly results when phenomenography is used in other educational situations.

An example of individuals' conceptions (I in Table 2.2) is the study of Carbone et al. (2007) about IT educators' views of teaching. According to it, teachers describe successful teaching as bringing feelings of success, ensuring good delivery and developing students' thinking. On the other hand, teachers understand unsuccessful teaching in five ways: as lack of teacher skills, lack of organizational support for the teacher, students evading responsibility, domain complexity, and students not demonstrating understanding. (Carbone et al. 2007.)

Where the individuals' views are presented on the level of individual conceptions in the results, the contribution of the study is practical. So is the case with Carbone et al. (2007): the result of that study helps IT teachers in a process of self-reflection, leading to improved teaching practices. However, all phenomenographical studies present alternative interpretations about a phenomenon. This challenges the idea of objective truth, which is one assumption in the IS field (Iivari 2007, Grundy 1998). Besides of phenomenographical studies, the assumption of objective truths is discussed and questioned in interpretive research (Walsham 1995) and, especially, in feminist IS research (see, e.g., Adam et al. 2004).

Categorization of informants' conceptions (C in Table 2.2) is the most often used class in the analysed IS studies. Of the publications, 15 come up with this kind of result. An example of this is Tutty et al. (2008), whose paper builds on previous research into teachers' conceptions of learning and teaching with an investigation of information technology (IT) academics. They found five hierarchical categories that describe qualitatively different ways that computing academics experienced their higher education teaching, namely:

- Teacher as the isolated authority delivering a subject.
- Teacher as the authority delivering a course.
- Teacher as the facilitator of students' learning.
- Teacher as a facilitator of a learner-centred environment.
- Teacher as a member of a learning community.

Among the analysed IS studies, the most common result is a categorization. This class of result consists of some generalised findings (i.e., making sense of the world). This is also the target of culture by making studies (Walsham 1995). When the result is a categorisation, it does not just describe the studied situation. In a more general way, the result helps to understand other situations of the same kind, as well.

The third class of the result by Renström (1988) is a framework (F in Table 2.2). In one of the analysed IS studies there is a result of this class (Cope 2000). This is a study about the conceptions in IS. Cope presents the understanding by its hierarchical aspects and then compounds the aspects to levels with an internal and external structure. The levels (forms) that Cope defines are:

- (1) A personal search of a static information source.
- (2) A simple information retrieval system.
- (3) A data manipulation system supporting an individual within a single organizational function.
- (4) A computerized data manipulation system supporting many people within a single organizational function.
- (5) A computerized data manipulation system and all the people and the data-related procedures they perform to support a single organizational function.
- (6) A number of communicating IS within a single organization.

When a research result is a framework, it is on an even more general level than categorization. It is easier to accept it as a research outcome, as it is a step in theory building. According to March and Smith (1995), one possible research output is to create a model (of the studied phenomena). A model can be viewed as a set of propositions or statements expressing relationships among constructs. A framework as a result of phenomenographical IS study resembles this idea in many respects. None of the analysed publications include a complete model together with the relationships of its elements. However, Cope (2000) comes close to doing that.

In this review I presented the trends in using phenomenography from the IS perspective. The overarching time period I used in my analysis extended over two decades. I identified three main trends in phenomenographical studies from the IS perspective. First, although phenomenography is not yet widely used in IS, the trend to use phenomenography there is still growing. Second, while the method was used to study students' conceptions, it was found later to be a useful method for other kinds of situations as well: i.e., educators' and IS designers' conceptions about diverse topics. Third, the trend in phenomenographic research outcomes is towards categorizations from examining individuals' conceptions.

When I locate my dissertation topic to the above classification (Table 2.2), the context of IS field is relatively new there. Instead of education context, my dissertation concentrates on how individuals conceive IS use (i.e., how individuals conceive various aspects of life). In the following chapter I outline the methodological decisions taken for this study.

3 METHODOLOGY

In this chapter I outline the methodology and how it is carried out in my dissertation. First, I describe the research design. When the aim is to reach the diversity of users' technological understandings with phenomenography, the first methodological decision is the selection of what kind of understandings should be examined to fulfill the study's purpose. Second, I focus on the research context of e-commerce and its facets to specify the chosen selections. This is followed by the description of the cases through which understandings are studied; they are e-privacy and virtual prototypes (VPs) of products.

Third, I describe my personal study process and my role in research work done in projects related to this dissertation. The dissertation project is not only creating a new knowledge; the major part of my dissertation project consists of studying a personal process to learn to think as a researcher. Finally, I present a summary of data collection and analysis.

3.1 Research Design

In the following I outline the methodological decision for the selection of what kind of understandings should be examined to fulfill the study purpose. The determined requirements are that the studied phenomenon should: 1) contain everyday actions, 2) be consequential to both scientific and practical discussions, 3) be evolving.

The first requirement for the selection of the context is the possibility to study conceptions of different people in their own actions. As modern societies increasingly become technology-mediated, we need to understand our daily interactions with technologies on the streets, at home, and in the office. Looking for an understanding of the role of technology in everyday life is ultimately trying to understand what characterizes modern life (Berker et al. 2006). In practice this means that the technology should be integrated into the existing patterns of users. In the social sciences, this process is called domestication of technology and requires active involvement (Silverstone 1994, Silverstone and Hirsch 1992). In the process of domestication, the technology is transformed into a desirable part of the home (Berker et al. 2006). For my study purpose, this requirement of everyday actions means that I should study understandings that are present in everyday life.

The second requirement is that, from the IS research perspective, studying understandings should provide new knowledge and offer practical implications in respect to the engaged scholarship (e.g., Van de Ven 2007). Engaged scholarship means that the research is relevant when it addresses the needs of researchers and practitioners. One main criticism of explanatory IS research is that the research lags

behind practice and does not completely take into account stakeholders' perspectives (e.g., Jennex 2001, Khazanchi and Munkvold 2001). Other way of outlining the theory-practice gap is that scientific knowledge and practical knowledge are seen as distinct kinds of knowing (Van de Ven 2007). As the IS community is concerned about the relevance of its research (Rosemann and Vessey 2008), the second requirement for my dissertation is that the research objective of my study is to focus on users' understandings in a context that has also practical implications.

The third requirement is that the phenomenon should be relatively evolving so that it leaves room for diversity (i.e., learning perspective in Marton and Booth 1997). In phenomenography the emphasis is on description, implying an assumption about the importance of and the need for description. The importance is related to an understanding of knowledge as a matter of meaning and to similarities and differences in meaning (Svensson 1997). Starting with a description follows from the assumption that conceptions form both the results of and conditions for human activity. The object of phenomenographical study is not the phenomenon per se, but the relationships between the actors and the phenomenon (Richardson 1999). As the diversity of understandings is reached with phenomenography, the third requirement for my dissertation is that the research context need to contain possibilities for variation.

The alternatives considered for studied understandings were the understandings in e-commerce, e-services, e-government, and e-health. Based on the requirements, I decided to study users' understandings in the context of e-commerce. The selection of e-commerce for a research context was guided by the understanding of e-commerce as a multidisciplinary concept by its nature (Ngai and Wat 2002) and as a pervasive phenomenon in modern society. E-commerce is an everyday activity in which the development has been extremely rapid (e.g., Wareham et al. 2005, Fisher et al. 2007, Wang et al. 2008). Examining users' understandings of technology in e-commerce is a relevant issue for the researchers and the practitioners in the IS field.

3.2 Empirical Research Context

Because I selected the understandings of e-commerce, I now describe the nature of this empirical research context. I make this description by focusing on the facets of e-commerce study. In the previous literature the main elements of e-commerce have been identified as *technology*, *vendor*, and *consumer* (e.g. Schiffman and Kanuk 2000, Turban et al. 2002, Rosenbloom 2003).

I sought articles that deal with the e-commerce phenomenon itself not articles that examine e-commerce research. A glance at the literature on e-commerce and to the relevant journals in the field¹ reveals that e-commerce research includes also *societal* elements (e.g., laws and regulations, cultural differences, online communities) through which the researchers have approached the phenomenon. Also empirical

¹ Such as Communications of the ACM, Electronic Commerce Research, European Journal of Information Systems, Information Systems Research, Information Technology and People, International Journal of Electronic Commerce, Journal of Management Information Systems, and MIS Quarterly.

support on seeing societal elements as a part of e-commerce is provided in the previous literature (e.g., Tiainen et al. 2004).

3.2.1 Facets of E-Commerce Research

In the following I take a look at four perspectives from the directions of which the phenomenon of e-commerce is studied (Figure 3.1). I do this to present the area of e-commerce studies and the context of study. Each perspective contributes a facet of e-commerce, while sharing some arguments with other perspectives. This means that one study usually contains at least some features also from other facets but in many studies the main facet is easy to find. One facet stresses the technological development; the second facet deals with vendors' perspective; the third facet focuses on consumers' viewpoint; and the fourth facet deals with societal dimensions of e-commerce. These facets can be applied to business-to-consumer (B2C), business-to-business (B2B), and to consumer-to-consumer (C2C) e-commerce also. In my study, the phenomenon of e-commerce will be mainly viewed from the consumers' viewpoint in business-to-consumers (B2C) commerce. In this empirical research context consumers are the users of technology.

1: Technological Facet. First facet means that the e-commerce phenomenon is approached from the direction of technology that is needed for selling and buying online. The technological facet includes various types of technology-related research topics such as: how to improve the technological solutions to help the e-commerce actions. So the research written in technological perspective focuses on developing and evaluating existing technologies and systems used with technologies.

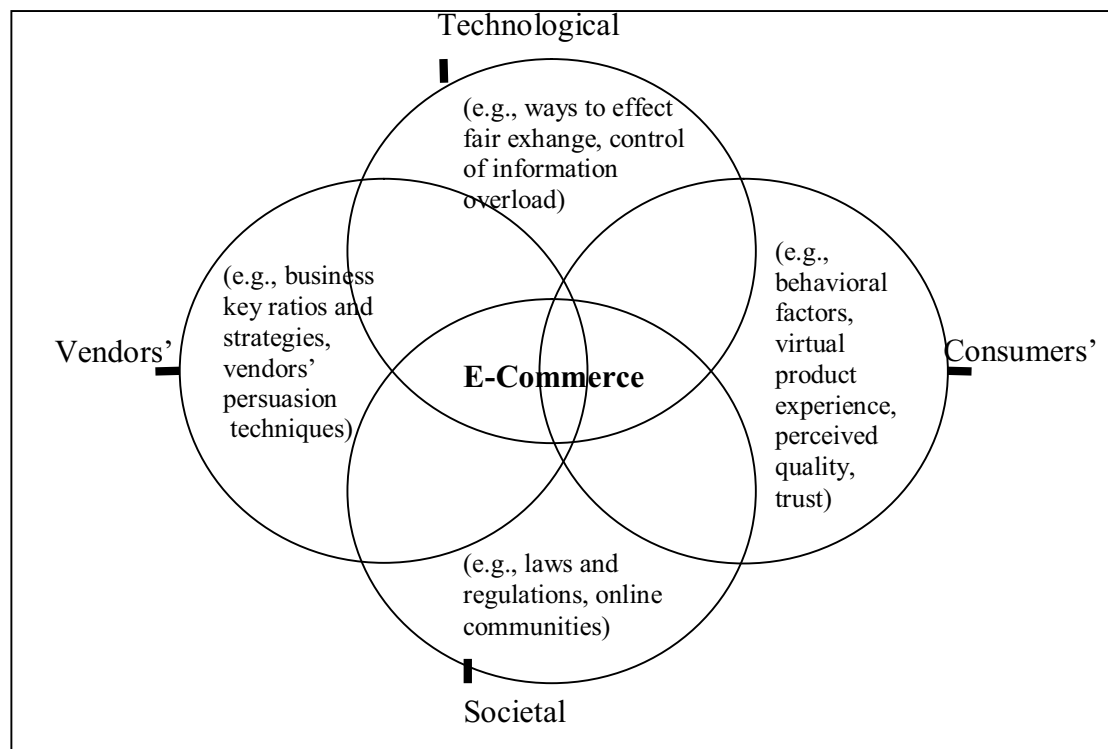


Figure 3.1. Four Facets of E-Commerce Research.

Usually the referred technology is the Internet and the assumption that modern computer systems can support much richer and more flexible mechanisms for e-commerce than in the 1990's (Ngai and Wat 2002). The background idea is that the pervasive connectivity of the Internet and the powerful architecture of World Wide Web have changed many market conventions and created new opportunities for conducting business on Internet (Porter 2001). The technology of e-commerce encompasses a wide range of transactions, from private e-mails to online retailing. The technological facet does not focus on humans' actions when using this developed technology or the humans' actions with technology are not in the main role there. The technological facet of e-commerce research discusses many benefits of e-commerce systems (Truman 2000, Jiang and Benbasat 2004-5), but it also includes problematic issues such as information overload, fair exchange, cyber crimes, logistical problems, and system breakdowns (e.g., Polat and Du 2005, Bottoni et al. 2007, Feigenbaum et al. 2009).

The technological facet is not in the center of my research context, and the main focus of my dissertation is not humans' actions when using some certain developed technology to advance it further (instead, humans' actions themselves are). I examine the technology through human actions and, in this way, the technology is more than just programs and devices to use.

2: Vendors' Facet. The second facet refers to the vendors' perspective when the vendor sells products via technology. The research topics in the articles mainly of vendors' facet are related to a larger question: how should vendors act to increase e-commerce? The vendors' facet can be reached through business key ratios (e.g., Dehning et al. 2004, Telang et al. 2004, Treiblmaier and Strebinger 2008). Some studies are more clearly related to business strategies, such as marketing strategy (e.g., Song and Baker 2007, Amblee and Bui 2008). Another type of research in the vendors' facet consists of studies which are related to developing technologies that can increase vendors' success. This process is studied from the vendor's perspective (e.g., Sen et al. 2006, Alonso-Mendo et al. 2009). However, some studies of the vendors' facet are also nearer consumers' understanding when focusing on retailers' use of information (e.g., Huang et al. 2006, Dewan et al. 2007).

In my research context, the vendors' facet is in a minor role. The vendors should know consumers understandings to satisfy their desires, and I provide a methodological contribution on how to reach consumers' understanding. However, the consumers are familiar with different kinds of areas and vendors in them. This is the case also with the informants in my study, and it offers a background for discussions.

3: Consumers' Facet. The third facet applies to situations where the phenomenon of e-commerce is approached from the consumers' viewpoint. Consumers use the systems of e-commerce and they want to buy goods or services from vendors (e.g. Schiffman and Kanuk 2000, Turban et al. 2002, Rosenbloom 2003). One research topic is related to developing e-commerce by understanding consumers: How do consumers act with e-commerce systems and technologies?

There are some noteworthy differences between consumers' actions in e-commerce and in the physical world. For example, one unique factor affecting the interaction is

surroundings. The Internet presents an ever-shifting landscape for consumers to navigate. In the physical world, all consumers who enter a store are presented with the same surroundings. Online this may not be the case. Consumers may approach an online store virtually from a number of directions (i.e., other Web sites, search engines, etc.). Many of the e-commerce studies concerning the consumers' facet are related to these differences between traditional and e-commerce shops: one type of study focuses on consumers' learning and understanding of virtually presented products (e.g., Suh and Lee 2005). Some of the studies written about the consumers' facet are more clearly related to a certain technological solution, such as software agents, search engines, online purchases, or human images as one element of Web site design (e.g., Zhang et al. 2006-7, Jiang and Benbasat 2007, Cyr et al. 2009). One large area of research topics is related to consumers' trust in e-commerce, through concepts such as perceived quality of an online store (Everard and Galletta 2005-6, Qureshi et al. 2009), risk beliefs (Dinev and Hart 2006, Featherman et al. 2006), or trustworthiness (Stewart and Malaga 2009).

In my dissertation, I am mainly focusing in understanding how consumers act with e-commerce systems and technologies from the viewpoint of the consumers' facet. Empirically, the technological solutions used to tackle e-commerce in my disposal were, although partly very general, however, also very limited. My research acknowledges users (consumers) as those who make technology meaningful. In practice, this means that the use of technology in the e-commerce context is central in my dissertation.

4: Societal Facet. The fourth facet applies to situations where the societal or the cultural issues, such as laws and regulations or online communities, are in the key role in the e-commerce study. One type of societal facet studies is research topics related to online communities in investigations of relationships between online communities and online brands (Jang et al. 2008). Research has also shown that consumers who are pleased or displeased with a brand will make their opinions known to others by word of mouth (Jang et al. 2008). Koh and Kim (2003-4) studied the sense of virtual community, and validated several of its antecedents. Other research line is to study cultural differences for why e-commerce is more popular in other countries than in others (Shih et al. 2005) or understanding the cultural aspects of Web site documents (Zahedi et al. 2006). Common to these studies is the idea that hidden cultural dimensions can inhibit the usability and communication effectiveness of Web sites.

In my dissertation, the societal issues are present in consumers' technological understandings, but not in the key role in the dissertation itself. Consumers live with other people and their experiences change with the use of technology. Also the informants of my study are affected by societal and cultural issues.

3.2.2 Understandings of E-Privacy and Virtual Prototypes

Above I outlined the reasons for the decision to study understandings of e-commerce. This area includes a very wide spectrum of all kinds of diverse technological understandings by different people and in varying contexts. In the following I use the same principles as in Section 3.1 to outline the understandings that are applicable to my study's purpose.

The first selection requires that the studied understandings should be consequential to both scientific and practical discussions. In the literature of e-commerce the security issues (mainly the consumers' facet in Figure 3.1) are one of the most commonly cited reasons for not purchasing goods over the Internet (e.g., Cassidy and Chae 2006, Hui et al. 2007). Another commonly cited reason is the consumer's inability to judge the quality of products (Jiang and Benbasat 2007). Also, although online purchasing is one of the fastest growing areas of Internet use and online stores provide convenience by overcoming time and location constraints, most online consumers still remain window shoppers and are reluctant to purchase items online (e.g., Malhotra et al. 2004, Verhagen et al. 2006, Choughury and Karahanna 2008). So the motivation to select the research areas of **e-trust** and **virtual product experience** (VPE) is practical for our purposes.

In both of these I decided to focus on one special topic that contains everyday practices and is evolving. These selected understandings are related to **online privacy** and three-dimensional (3D) **virtual prototypes** (VPs) of products.

E-Privacy. The motivation to study online privacy is related to the consequence that the fears regarding information privacy have increased (Malhotra et al. 2004): the biggest concerns to Internet users are viruses, spam, spyware, and hackers (Paine et al. 2007). New technical and legal developments pose greater and greater privacy dilemmas. Surveillance and other types of monitoring of individuals is also a threat in the private sector: private organizations are, for instance, increasingly using profiling and data mining techniques for targeted marketing, analyzing customers by buying predictions or social sorting. New means of surveillance are also enabled by social networks, in which individuals are publishing many intimate personal details about themselves and others.

If these problems are not solved, the consumers whose privacy concerns have not been addressed may delay their purchases or even forgo them, and some concerned consumers might prefer traditional ways of purchasing (Prabhaker 2000). These concerns have been engaged at least by two methods: privacy enhancing technologies (PETs), and legal instruments. PETs are software programs, hardware devices and even publications, which help users to regain their privacy lost on the Internet (Camp and Osorio 2003). Legal instruments have been formulated as well: for example, the European Union has a directive (Directive 95/46/EC) that ensures that the citizens have a right to privacy.

Besides of e-vendors work to increase online purchasing, also research in IS aims to increase understanding about e-commerce and consumers' online behaviour (e.g., Hui et al. 2007). My research setting belongs to the same research area, although I focus solely on information privacy. A typical theory testing study would be to ask about informants' attitudes towards specific privacy statements with a fixed scale (e.g., Malhotra et al. 2004, Cassidy and Chae 2006). In theory testing studies, the researcher defines how information privacy is conceptualized, based on the theory under testing. However, I take a step back and investigate, using phenomenography, how consumers understand online privacy in everyday practices.

Virtual Prototypes. The research area of VPs of products needs more studies since many researchers continue to doubt the effectiveness of electronic shopping

environments (Jiang and Benbasat 2004-5). They have argued that online consumers can only passively receive the product information presented, without being able to feel, touch, or sample products online (Li et al. 2001, 2002, 2003). Consumers are less willing to buy on the Internet; hence, the lack of direct experience limits the ability of consumers to judge product quality and leaves them less emotionally engaged in shopping experiences (Jiang and Benbasat 2007). One approach is to enable online consumers to sample and experience products virtually, via VPE (Jiang and Benbasat 2004-5). Unlike in situations where users are online all along immersed in a virtual environment (VE), I do not attempt to simulate the entire shopping experience; instead, I aim to display some products in the manner of VPE with laboratory equipment.

3D VR technology, such as immersive projection technology (IPT), holds also a promising opportunity for presenting designers' plans to clients and negotiating over them. However, the negotiation process is not always easy and needs tools to ensure successful experience (e.g., Ulrich and Eppinger 2003, Tiainen 2004). A traditional way to make the designers' ideas concrete to the customers is to use physical prototypes, although these are often expensive and time-consuming to make (Tseng et al. 1998). However, acting immersed in a VE is not an easy task for an occasional user (Tiainen et al. 2006, Tiainen et al. 2007). The first step here is to analyze how consumers understand VPs of products. The starting point is that as I do not know how users view VPs, I let the consumers tell me about their experience in VE.

This research setting with online privacy and virtual prototypes complements the view of reaching the diversity of users' understandings. The reason for this is that the theme with very new technology (presenting 3D VPs of products) offers an opportunity to be present in the first use situations and observe the behaviour of consumers who have less previous experiences of the presented technology than with online privacy settings.

3.3 Personal Research Process

In the following I describe this research process from my personal perspective, because I am convinced that the personal process is very fundamental in the implemented methodology. The other reason to describe the personal research process is that I have worked with competent people from different research areas and disciplines in diverse research projects. Without them I would not have been able to put together this dissertation in the form it is today. However, in the next section, that of personal research process, I also make perceptible my active role in research projects and in article writings that are the second part of this dissertation.

3.3.1 First Ideas for Studying Users' Understandings

In 2000 I went to a basic course of IS where the lecturer kept repeating that many IS projects can fail and that even otherwise successful projects are often late. I supposed that the lecturer generalized; however, also in the literature researchers state that the

IS field has been plagued by various system failures (Lyytinen and Hirscheim 1987), such as failures to deliver a system, budget overruns, massive delays, or organizational rejection. Usually they are outcomes of cognitive limitations, or management inattention to addressing observed problems (Lyytinen et al. 1998, Iversen et al. 2002). To combat this, a wide variety of approaches have been developed but with relatively weak results (Lyytinen and Hirscheim 1987, Lyytinen 1988). IS development was seen as a high risk proposal.

The course lecturer commented that these problems and high risk exist, because the clients of software companies do not know what they need. I wanted to address this problem from the opposite direction: how would software designers be able to understand users better and develop better IS? I also studied marketing as a minor subject, and it strengthened my resolve to keep my focus on satisfying users' desires.

One current theme of research in 2000 was e-commerce because it was earlier expected to grow strongly. The Internet was an important new technology, and it was no surprise that it had received so much attention from entrepreneurs and researchers. There was a growing interest in the use of e-commerce as a means to perform business transactions. Many researchers and practitioners had assumed that the Internet changes everything, rendering all the old rules about companies and competition obsolete (Porter 2001). For many businesses, it has now become a priority issue. The ideas debated concern mainly companies' ability to connect with their trading partners for just-in-time production and just-in-time delivery, which would improve their competitiveness globally (Ngai and Wat 2002).

With my main personal interest on user perspective and e-commerce, I decided to take a course in information security that consisted of giving my own lecture and writing an essay of a selected topic. In this course work, I limited my topic to information privacy, and I explored the kind of information e-vendors offer in their Web sites for privacy questions. The lecturer in this course proposed that I should continue my work towards master's thesis by placing a question to customers in some e-vendors Web sites. For example, do you need more information on your privacy issues in this site? – and as options: yes, no, I do not know. I thought that the procedure suggested would not give the kind of information that I was seeking. I wanted to find some answers to questions like “how do consumers interpret their own privacy issues in certain Web pages”.

However, after the course I started to examine how to methodologically reach consumers' understandings of information privacy. With these ideas, I enrolled in 2003 to an advanced course of IS that was held by Professor Tarja Tiainen. The course themes included topics of IS science and what IS science is. In this course we read inspiring articles by authors such as Iivari (1991), Orlikowski and Gash (1994), Orlikowski (2000), and we discussed them afterwards. I learned via article readings that IS science can be understood from multiple different perspectives and I mostly enjoyed reading interpretative studies of users' perspective. These discussions offered me a good chance to reflect my ideas to the IS field. I assumed that consumers have different views on privacy and I should somehow be able to find out about their views. So I decided to plan and conduct some consumer interviews to learn interviewing techniques and to understand what kinds of answers to my question it is possible to have.

Minna-Kristiina Paakki introduced me to phenomenography. The first touch a valuable book on research methods (Järvinen 2004) where I could find a description of phenomenography among other methods. Soon I familiarized also Isomäki's (2002) dissertation where phenomenography is used to study IS professionals' views on humans. Besides of an empirical study, she presents a compact overview of the phenomenographical approach (Isomäki 2002). However, the most important phenomenographic publication for me at the beginning was Marton and Booth (1997). They illustrate that learning in the sense of gaining knowledge about the world is frequently seen as a progression that starts with acquiring some basic facts (where facts are seen as pieces of valid, elementary knowledge) and goes on through building ever more complex and advanced forms of knowledge out of, or on the grounds of, simpler forms. In Marton's and Booth's (1997) view, learning proceeds from an undifferentiated and poorly integrated understanding of the whole to an increased differentiation and integration of the whole and its parts. Thus, in order to learn about something you have to have some idea of what it is you are learning about. This idea has motivated me to continue with the book since. Afterwards I kept coming back to this basic book of phenomenography regularly.

3.3.2 Working in Multidisciplinary Research Projects

The empirical data of this dissertation was gathered mainly during two research projects. Both of them were multidisciplinary, and our group presented the IS side in the projects. In the following I focus on working with these projects mainly from my own perspective.

The cooperation with Minna-Kristiina Paakki was fluent, and I think that we understood each other's scientific inclinations extensively. I started in spring 2004 and I received a very rapid introduction to how to work as a researcher. It attracted me greatly and I caught an increasing interest to become a researcher.

In the beginning, the most important research project for this dissertation was the eLaku project and later the Husko project (see Table 3.1). The eLaku project was about e-services, and I worked in it around the theme media. During the project, we interviewed consumers about their experiences about e-commerce and e-services. The study was a multidisciplinary (IS Science, Consumer Studies, Health Technology, and Rural Business) study to learn about consumers' trust in e-commerce. However, the questions proposed were not limited only to this topic, and I was able to use also my own questions related to privacy.

I also outline my role in the projects in Table 3.1. The research team in the eLaku project were able to use my experiences and questions I had asked in my master thesis project to their advantage. I participated actively in the discussion, and later I had a major role in organizing consumer interviews and analyzing results. After the eLaku project in 2005 I started to work more closely with Professor Tiainen since she became my Licentiate of Philosophy (Ph.Lic.) and later Doctor of Philosophy (Ph.D.) dissertation supervisor. She was also my closest supervisor during the Husko project.

Table 3.1. Research Projects Closely Related to My Research Process.

	E-Privacy eLaku "Trust in E-Services: Consumer's and E-Vendor's interaction"	Virtual Prototypes Husko "Furniture Fitting-Room"
Project Time	1.1.2004-31.12.2004	1.1.2006-31.12.2007
Organizations of Participants	University of Tampere (Coordinator), University of Vaasa, University of Helsinki, Tampere University of Technology	University of Tampere (Coordinator), Seinäjoki University of Applied Sciences, Tampere University of Technology, Institute for Design Research, Technical Research Centre of Finland
Description of the Project	The aim was to build a framework about how consumer's trust towards the e-vendor develops. During the project this goal was reached by interviewing consumers in four themes of e-services: e-media, e-grocery, e-health, and rural business. (Project Report: Tiainen et al. 2004)	The first objective was to develop a prototype of a virtual Furniture Fitting-Room that is a virtual apartment where furniture can be presented to consumers. The second objective was to organize user tests in the developed prototype to evaluate its usefulness to its' purpose. (Project Report: Kaapu and Tiainen 2007)
Represented Disciplines	IS Science, Consumer Studies, Health Technology, Rural Business	IS Science, VR Technology, Furniture Design
My Role	Trainee, Researcher	Researcher
<i>Forming Theoretical Background</i>	The steering group of the project defined the research objectives. I participated in a group of researchers where we specified the theoretical background of the project.	The steering group of the project defined the research objectives. Mainly I was the one who chose our focus of the theoretical background.
<i>Designing Interviews/ User Tests</i>	I participated in a group of researchers where we designed consumer interviews. The steering group of the project guided us and accepted our plans.	I was responsible for organizing the needed people and the equipment for the user tests. I designed the details of user tests and interviews. The steering group of the project guided me and accepted my plans.
<i>Organizing Interviews/ User Tests</i>	In the practical level, I organized the interviews of the e-media team and I interviewed the informants with another researcher and also by myself.	In the practical level, I organized user tests and interviews. I interviewed the informants by myself.
<i>Analyzing Results</i>	I wrote the transcriptions of tapes and analyzed the results from my perspective (e-privacy). Each team analysed their results separately and the steering group guided in this process.	An assistant wrote transcriptions of tapes and I analysed the results. The supervisor guided in this process.
<i>Data for Articles of Dissertation</i>	Article 1: E-Privacy I Article 2: E-Privacy II	Article 3: Behaviour Patterns Article 4: Virtual Prototypes I Article 5: Virtual Prototypes II

The aim in the Husko project was to develop a prototype of virtual Furniture Fitting-Room that is a virtual apartment where furniture can be presented to consumers. The second objective was to organize a user test in the developed prototype to evaluate its usefulness for its purpose. When the Husko project started in 2006, I met many new people from even wider backgrounds than I had in the eLaku project. The Husko

project was also multidisciplinary and it included IS science, virtual reality (VR) technology, and furniture design. The project offered me a chance to gather empirical data different from the kind obtained in the previous project.

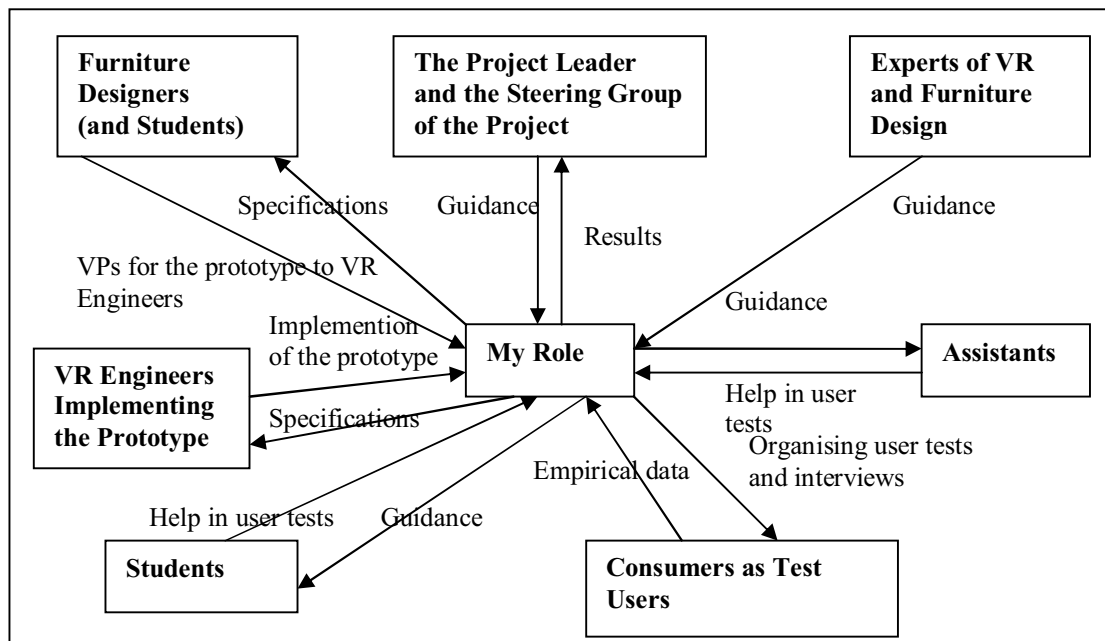


Figure 3.2. My Role in the Multidisciplinary Husko Project in Relation to Others.

By building a Furniture Fitting-Room and testing it with consumers, we got more information of its possibilities and limitations. As the strength of our project I see multidisciplinary cooperation, which is needed for getting a multi-side picture of furniture design and model evaluation. I cooperated between VE-specialists and design professionals. However, it was also challenging to work in a multidisciplinary project such as Husko since our theoretical backgrounds differed from each other. For example, studying human in a VE means different issues in different disciplines. A generalized view may be that an engineer focuses on the technology developments, a marketer on the consumer behaviour, and IS scientist on the use processes.

Another point to make here is that we understood the researcher's role differently. The phenomenographic idea of not reporting the researcher's own understandings (Marton and Booth 1997) was not easy to convey to the cooperating participants. The view of culture, on the other hand, was quite similar among the participants. For example, in IS studies concerning culture there is the assumption that all individuals within a given cultural unit will respond in a consistent fashion based on the group's cultural values (Leidner and Kayworth 2006). The potential problem with this view is that it does not take into account the possibility for individual differences within the particular cultural unit that may lead to different behavioral outcomes. Added to these challenges there are some unique methodological issues faced by researchers conducting multidisciplinary research. Another result was a learning possibility, which is offered by the diversified co-operation. The enterprise actors got to know the possibilities of computer technology in practice during the project, and I learned to know their way of approach.

As this project faced many challenges, being a very interdisciplinary project, it needed one person to take care of practical arrangements. I was appointed to this unofficial post because I had a personal motivation to be able to gather more empirical data for this dissertation. During the project I personally co-operated with several groups of people (see Figure 3.2).

3.3.3 Writing and Re-Writing Dissertation

In accordance with the above heading, I decided to begin it by “writing and re-writing”, because it describes my iterative process of writings. Usually I become absorbed in writing and write too much; finding the focus needs iterative rounds. Other reason is that my supervisor has taught me a way to write a lot: first, one version of the article and, later, second version. And her idea includes that the article really develops between rounds (with new empirical data or new theoretical part). The re-writing with the introduction part happened in pieces, chapter by chapter. Also the personal study process has been iterative (e.g., from time to time, working in projects, maternity leaves, and a graduate school financing period lead to breaks and returns back to previous work).

In two of the five articles the contribution is shared differently from the others: in one of them I am the only author and in the other article my supervisor has been the party responsible for writing the joint article. For the article when my supervisor was the first author also, I have written mainly the parts on experiment and methodology. In addition I organized the user tests in practice and helped in analyzing results. I had a considerable role in three articles of this dissertation, from the beginning to the end. With these three articles of this dissertation the writing process has been similar, and I am the first author of the articles.

The supervisor has been in a very close interaction with me: for example, she has helped me to find a larger research setting, finance for my studies, motivated me and approved my ideas. In practice, this cooperation has meant that I have sent a version of the article with track-changes on to my supervisor via e-mail and she has sent it back to me with comments and remarks. And that process continues until we both are satisfied.

The second e-privacy article is based on my idea, which my supervisor helped me to shorten and improve. The process of writing has taken much more time than I expected. I wrote the first version of this article to Information Systems Research Seminar in Scandinavia 28 (IRIS28) held in 2005 in Norway and presented it as a plenary paper. This article concluded my results of Ph.Lic. thesis that was under work at that time. At the beginning, the result of this article was in the form of informants' conceptions and later, after new rounds of analysis, I managed to find categorizations of conceptions. My supervisor came to be the second author of this article at this point, and she contributed to the article by helping me to make it more coherent and focused. The review and publication process in the journal was time-consuming, but it taught me much more about writing scientific articles. Also my methodological understanding developed at the same time.

Altogether, I have really enjoyed the feedback I have received from the reviewers even though the phenomenographical articles have received contradictory feedbacks. This has helped me to understand the difficulties of describing a phenomenographical study. Motivated by the feedback to the article on VPs of products, I came upon an idea to attach it more closely to the discussion of UX. My supervisor contributed to the article, especially by writing this theoretical link in an approachable form. The other article on VPs of products is based on my original draft of an article that was continued with other authors via commenting and considering details via e-mail.

While writing articles has been a demanding task in my research process, so has been writing of Part I. Part I includes my own contributions and is done under my supervisor's guidance. In putting together Part I, I received great inspiration from Paakki and Pennanen who have worked with me during the eLaku research project, and they managed to write explicit introductions to their compound dissertations (Paakki 2008, Pennanen 2009). As outlined in my introduction, the methodological perspective has been important for me since the very beginning of this process. I had also ideas to use different lenses to view the article level results in a new light: I was thinking to use at least domestication of technology, design science, social presence, or e-commerce. However, I finally decided to leave them for later, because they all can be seen mainly as by-plots in this dissertation. E-commerce is present, but only as far as outlining the empirical research context. I found my inspiration to use phenomenography worth of highlighting, because this approach is rarely used in the IS field and it can shed new light to different stakeholders' perspectives.

3.3.4 Timeline of Personal Research Process

To conclude my personal research process, I place the main points of the process along the timeline (Figure 3.3). My first interests in the research area of users' point of view arose already in 2000, in the beginning of my university studies. I started to work in Professor Tiainen's research group and eLaku project in 2004, and in 2005 my postgraduate studies began. In the research group, there were four other Ph.D. students. Two of them contributed also to IS science, one to consumer studies, and one to social-anthropology. Later we had also two other Ph.D. students in the IS field. We had very motivated discussions and we received support from each other. After the Husko project in 2008, I received a post in Tampere Doctoral Programme in Information Science and Engineering (TISE), and it offered me financing to finish my work with previously gathered empirical data.

One important part of my research process has been attending seminars and conferences (especially IRIS) to meet other researchers and have discussions with them. From my personal perspective, the most interesting event was IRIS30 in 2007 in Tampere, because I was one of the organizers. The discussions with other researchers have provided insights to the IS field and also possibilities to share perspectives with people who may have contradictory approaches. These situations have been golden opportunities for learning.

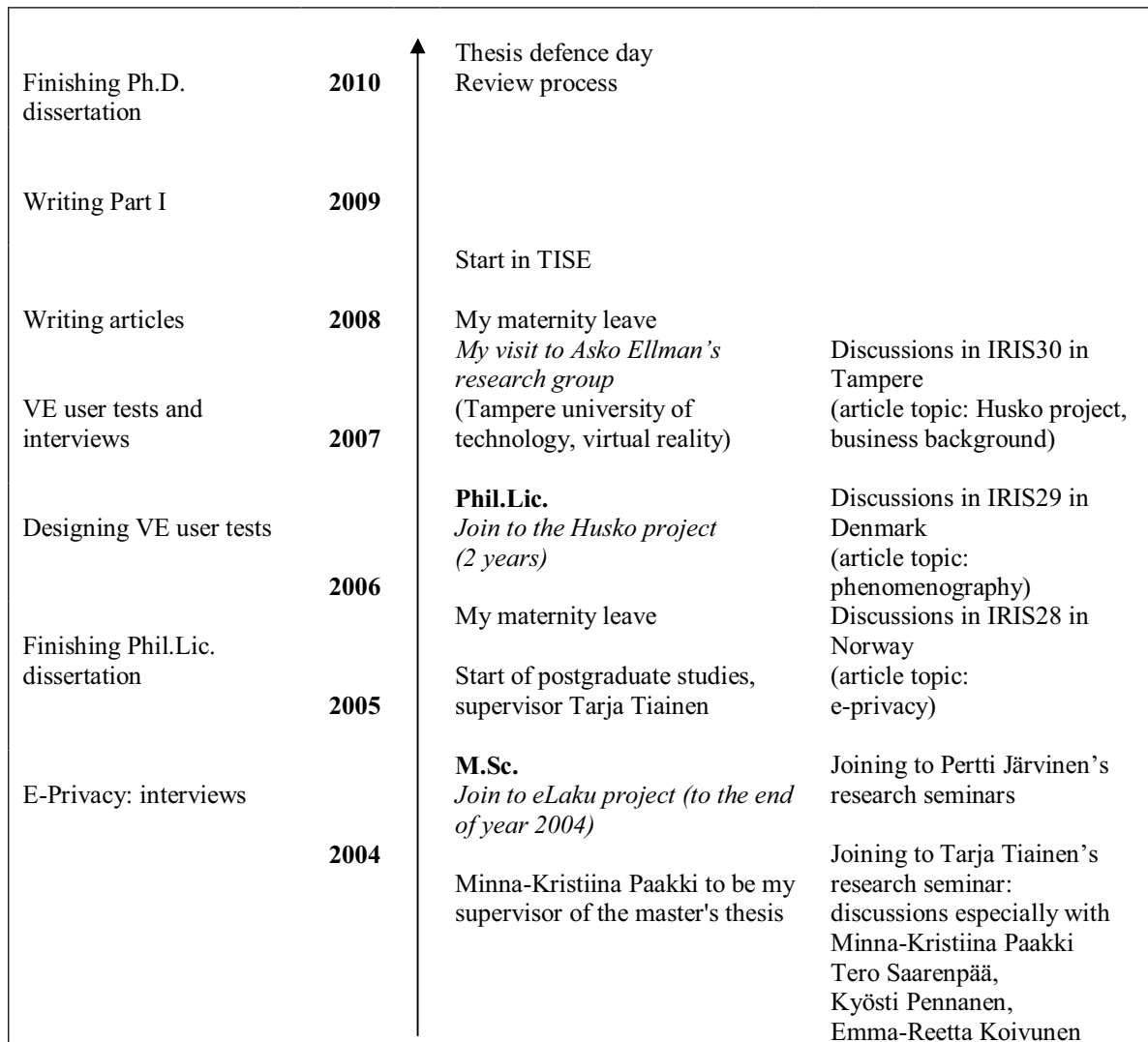


Figure 3.3. Main Points of My Personal Study Process.

Also the work with multidisciplinary people and practitioners has been rewarding. Especially in the Husko project we had co-operating partners from furniture manufacturers and retailers to furniture designers and technology engineers. My life during my Ph.D. studies has also dealt with other issues than research. From the research process perspective this meant two short breaks; however, they also provided me with an opportunity and time to focus on developing articles by myself.

3.4 Data Collection and Analysis

When using the phenomenographical perspective, it is important to give room for consumer's voice and his/her own interpretations regarding the studied phenomenon (Marton and Booth 1997). During planning, data collection and analysis periods of this dissertation, I have accurately followed the ideas of phenomenographical research (Marton 1982).

Table 3.2. Research Settings: Data Collection and Analysis.

	E-Privacy RQ: How do consumers understand privacy in e-commerce?
Date of Data Collection	January - June, 2004
Technology	Internet <i>Common interfaces of e-commerce such as e-banking and e-shops</i>
Participants	22 users
Data Collection and Analysis	Individual interviews The interviews were recorded and transcribed: iterative analysis of the resulting text
	Virtual Prototypes RQ: How do consumers interpret 3D VPs of products?
Date of Data Collection	March - September, 2007
Technology	An immersive walk-in VE, A movable 3D space <i>3D VPs of furniture presented in VE</i>
Participants	33 users
Data Collection and Analysis	VE visit and individual interviews after/ during the visit The interviews were recorded/ copied down selectively: iterative analysis comparing the results of a laboratory set up
	Background: Behaviour Patterns RQ: Which are users' behavior patterns of acting in a walk-in VE?
Date of Data Collection	March - April, 2007
Technology	An immersive walk-in VE <i>Virtual 3D shopping centre with a product presentation room and two shops</i>
Participants	40 users
Data Collection and Analysis	VE visit and a memory test Analysis of the portion of remembered issues presented in the VE and user behavior in the situation

I used interviews to collect the data. Before the actual interviews I conducted pilot studies for practicing and testing the procedure. In the empirical cases of e-privacy and VPs of products, the data collection procedure was different (Table 3.2). In the e-privacy case I conducted the interviews in Finland with Finnish consumers in 2004. In the interviews, we discussed common interfaces of e-commerce, such as e-banking and e-shops. The phenomenographical analysis was based on the interviews.

In VPs' case I conducted the user tests and interviews in Finland with Finnish consumers in 2007. In this setting, the used technology was new to the consumers and the technology was first introduced to them. For presenting 3D VPs, I used a Cave-like environment in a laboratory. As Cave Automatic Virtual Environment (CAVE) is a registered trademark, the term Cave-like environment is used of other cubic, walk-in VEs. In the VE laboratory used for the study, the height of the space is 2.4 meters and its other dimensions 3 x 3 meters. The space has five rear projection surfaces: three walls, a floor and a ceiling. The users' view is rendered according to his/her position and orientation with the help of a magnetic tracking system. An active 3D stereo image is produced and a conventional Wand input device is used for controlling movements.

The other environment was implemented in fair conditions with one rear projection surface. The Cave-like VE is not portable, so I used the other facility in this latter

experiment. Some design students made the VPs for this second set-up, because we were not allowed to present furniture prototypes of the companies involved to a wider audience. The phenomenographical analysis was based on the interviews after both of the test uses.

In the e-privacy case the aim was to focus on how consumers understand e-privacy and in the VPs' case how consumers interpret VPs of products. For both of the cases I decided to use qualitative consumer interviews for data gathering and I adopted an interview technique that can be called semi-structured or theme interviews. These types of interviews can also be called semi-structured theme interviews and I use this label in describing my interviews. In semi-structured theme interviews the themes of questions are prepared beforehand, but the interviewees are not required to select their answers from a set of readymade answers. Instead, the interviewees can answer the questions freely (Hirsjärvi and Hurme 2000). In the interviews I mainly encouraged the interviewees to talk about their experiences and, at the same time, checked that all the themes I had previously specified were covered in the interview situations.

In phenomenography, empirical material is typically collected by interviewing a relatively small number of relevant informants. The main point when choosing them is to reach the largest possible differentiation in their views (Marton and Booth 1997). I decided to seek interviewees who were familiar with e-commerce in the consumer's role but not necessarily experts in using computers.

The analysis with both collected data was a distinct process. In phenomenographical studies the analysis focuses on two components in the informants' experiences of the phenomenon; the referential component – which describes what the phenomenon means in everyday language – and the structural component – which refers to a deeper level of phenomenal meaning (Marton and Booth 1997). The referential component directs individuals' thought to the object, which can be physical or mental by nature. The structural component refers to the thought processes by which an object of thought is limited in relation to its environment (Marton 1981).

At first the focus in analysis was on the referential component (i.e., on what the interviewees meant on the level of everyday language). The interview texts were split in small items: each of them included one aspect of studied phenomenon. The items were categorized in order to obtain a single dimension of the categorization at a time; first, the what aspect of the final categorization. The analysis continued by focusing on the structural component of views. Structure is reached by analysing the target of the referential component.

4 ARTICLES IN PART II

This dissertation consists of an introduction (Part I) and five individual articles (Part II). In this chapter I present the articles in Part II. While each of these articles stands alone as a valued study, each article has its connections to others. However, presenting the articles is an intermediate phase for the final contributions of this dissertation.

First, I briefly describe the five articles included and summarize the contributions that each article gives to the question of how phenomenographical approach can be used to reach users' understandings. After that I critically evaluate the four qualitative phenomenographical articles in this dissertation. I use the principles of Klein and Myers (1999) to evaluate the articles.

4.1 My Articles through Methodological Lens

My dissertation is composed of five articles (Table 4.1). All of them are empirical articles that are related to a defined research area. Two of the articles are empirical articles which describe how consumers understand online privacy (Articles 1 & Article 2: E-Privacy). Two of the articles are empirical articles which show how consumers understand VPs of products (Articles 4 & Article 5: Virtual Prototypes). Article 3 is different from other articles since it relates to the study design how to present VPs in VE to test users. For this dissertation, the practical aim of this article was to get guidelines for organizing occasional users' VE visits related to Article 4 & Article 5.

In Table 4.1 the level applies to the representation levels of data interpretation (see Figure 2.2) in phenomenography (Renström 1988). The articles can be categorized by their results to 2nd level categories and 3rd level frameworks. This means that in the 2nd level the collected data is interpreted in higher representation levels than in individuals' conceptions. In the 3rd level means that the results are reported in the forms of thought. (Renström 1988.)

In the following I describe the included five articles through four points: 1) research question of the article, 2) data collection in the article, 3) the results of the article, and 4) the article in relation to the study's purpose. The first and second points are directly related to the articles. The third point highlights the result in the context of my dissertation. The fourth point unravels also the motivation for why I needed this article in my dissertation.

Table 4.1. The Articles in Relation to the Study's Purpose: Reaching the Diversity of Users' Understandings.

	The Subject of the Article	The Level of the Result
Article 1 E-Privacy I	An empirical case of understanding e-privacy	2 nd level categories
Article 2 E-Privacy II	An empirical case of understanding e-privacy	2 nd level categories
Article 3 Behaviour Patterns	An empirical case of users' behaviour patterns in a walk-in VE	Not a phenomenographical article (Result used for research design in Article 4 & Article 5)
Article 4 Virtual Prototypes I	An empirical case of understanding VPs of products	3 rd level frameworks
Article 5 Virtual Prototypes II	An empirical case of understanding VPs of products	2 nd level categories

4.1.1 Article 1: E-Privacy I

My goal in this article² is to call for a greater attention to the importance of consumers' concerns for privacy in the context of e-commerce. However, much of the literature on privacy concerns still the context of traditional direct marketing environment (Malhotra et al. 2004). I formed the **research question** of this article to the following: I seek for understanding of what consumers say about their views on privacy in e-commerce by using phenomenography as a qualitative research method.

For answering the research question I designed two interview sets, which both were collected during spring and summer 2004 in the western part of Finland. The theme of Interview Set 1 was privacy and the theme of Set 2 was electronic journals. In the both interview sets the main question was: "what is privacy in e-commerce". Interview Set 1 included twelve interviews and Set 2 ten, so all together there were 22 informants. I found the interviewees by advertising on a local newspaper's website, in one seminar, and by asking possible interviewees using the snowball method. There were 13 female and 9 male interviewees, whose ages were between 25 and 66 years. Based on the analysis of interview material I classified the interviewees' understanding of the concept of privacy in e-commerce.

In this article I describe the classification of consumers' views in two sections. The first class, **factors influencing information privacy**, contains six subclasses I1-I6:

² Kaapu, T. (2005), The Concept of Information Privacy in E-Commerce: A Phenomenographical Analysis of Consumers' Views, The Plenary Papers of 28th Information Systems Research Seminar in Scandinavia, IRIS28, Kristiansand, Norway, August, 6-9, 2005, 16 p.

- I1 Expectations combined to e-commerce,
- I2 Understanding of e-commerce systems as a business environment,
- I3 Views related to information security,
- I4 Effects of society,
- I5 Consumer's own skills,
- I6 Advices of neighborhood.

While the first class contains factors that influence privacy and how the privacy is understood in different situations, the second class is more about privacy itself. The second class, **issues connected to information privacy**, describes often problems. This was the way the consumers discussed privacy in the interviews. The second class consists of five subclasses C1-C5:

- C1 Use of customer information,
- C2 Consumer's surveillance,
- C3 Not-wanted e-mail,
- C4 Hackers and viruses,
- C5 Threats concerning payment.

The results of the article linked opposite views together, since the users' own interpretation of e-privacy varied based on the situation. When the nature of the concerns is understood, it offers building blocks for further research. For example, the researchers have to take situationality into account also in the case of information privacy. A familiar situation – e.g., acting with a known e-vendor – is regarded as safe, whereas a new, unknown situation is seen as fearful and risky. New experiences (e.g., using a new web site several times) and new information (e.g., from media) affect the consumer's behaviour. The view of privacy should thus not be regarded as stable, but as constantly under social construction.

For my dissertation, the article presents an empirical study of e-privacy. I wrote this article to describe the collected data on a practical level, and so the article includes several quotations from the interviews. The description of the results in this article is closely dealing with individuals' conceptions. However, the results form a hierarchy, meaning that the collected data is interpreted at higher representation levels than in individuals' conceptions (Renström 1988).

4.1.2 Article 2: E-Privacy II

In this article³ our aim was to focus on all types of consumers' views on information privacy without categorizing consumers beforehand. In doing so we aimed to present and discuss the subject matter so that business and legislative authorities could adequately respond to and address these consumers' needs and fears. This is necessary to allow maximizing the potential of e-commerce (Paine et al. 2007). So the **research question** of this article is: how do consumers view information privacy in B2C e-commerce?

³ Kaapu, T., and Tiainen, T. (2009), Consumers' Views on Privacy in E-Commerce, *Scandinavian Journal of Information Systems*, 21 (1), pp. 3-22.

The collected data was the same as in Article 1 of my dissertation. However, in this new article we identified different layers of understanding by focusing on the referential objects and the structural components of information privacy. The categorization did not evolve suddenly; instead, we repeated, again and again, our efforts to locate the interview quotations to prior formed classes. In this process one of the main problems was that mainly quotations could be placed to both classifications. Then we understood that we needed to transform the structure of categorization into two hierarchical levels, so that we could describe the informants' understandings as precisely as possible. For the same reason we also coordinated and renamed the objects and the components.

Based on a phenomenographical analysis of 22 consumer interviews, we identified a categorization of informants' conceptions. The result includes 25 different e-privacy conceptions, showing that consumers' view of privacy is situated and constantly under construction as the consumer gets new information or experiences. Consumers' conceptions are analyzed by two dimensions. The first one, the referential component, focuses on the meaning of privacy in the interviewees' everyday language (What). The result includes five objects:

- (1) Use and misuse of customer information,
- (2) Monitoring consumers,
- (3) Threat of spam,
- (4) Danger of hackers and viruses,
- (5) Risk with payment.

The second dimension is the structural component, which focuses on the form of thought when the interviewees talk about privacy (How). The result includes five objects:

- (1) Products and e-vendor,
- (2) Technology,
- (3) Societal norms,
- (4) Consumer him/herself,
- (5) Fellow men.

The results indicate that Internet privacy is not a stable and homogenous concept to consumers. While in one case the interviewee described herself as being careful about what information she gave to an e-vendor, in another case she was not that concerned about information privacy. She was not concerned when she acted with her own bank and e-supplier, since she had used their e-services several times. She seemed to feel safe in familiar situations, but in a new situation with an unknown vendor she was careful and did not provide whatever information. To get a good idea of the consumer's privacy views, the informant needs to be asked to describe both familiar situations, such as e-banking and e-actions with a long-standing vendor, and new situations in which the vendor is unknown as in casual Internet purchasing activities.

For the answer to the question of reaching the diversity of understandings, Article 2 shows that phenomenography can be used to strengthen the user-centered approach by focusing on users' understanding of the ICT tool or using context. This is especially beneficial when theoretical knowledge gives a contradictory picture.

When we continued the analysis with the e-privacy material used in Article 1 the result of the process was a new categorization of consumers' interpretations (see my study process in Subsection 3.4.3, Writing and Re-Writing Dissertation). The review process was also very fruitful to me and truly helped me to develop the article from a practical level (previous article) to make it a more theoretical contribution. This has a different perspective to the same topic from that in Article 1. Thus also Article 2 is needed for my dissertation.

4.1.3 Article 3: Behaviour Patterns

The immersive walk-in VEs are increasingly used for evaluation of various product prototypes. In such cases, the test persons are customers and other stakeholders who typically visit, for the first time, a walk-in VE in a product test situation. Locomotion in VE is generally acknowledged to be difficult for non-professional users (Tiainen et al. 2007). So the main **research question** of this third article⁴ is: how does the way of locomotion affects remembering the details of virtual objects?

We studied the problem by arranging user tests for 40 test users who visited the VE and who were subjected to a memory test. The test included both a guided tour in the VE and the test users' own navigation task. In the analysis we focused on occasional users' ways of locomotion control and on their recall of virtual objects.

We recognized two patterns of moving: a virtual one (using a control unit) and a physical one (taking steps). Virtual moving means the use of technical device (Wanda) for locomotion control. With Wanda it was possible to approach and draw objects away by zooming the image and to change the point of view by rotating the image. These actions are referred to as Virtual movement pattern, since they consist of a set of actions for moving in a VE. Besides virtual movements, the test users moved also physically. We refer to the latter as Physical movement pattern, meaning the use of body activities for locomotion control. In practice this means taking steps towards and away from the objects and changing the viewing perspective. A VE user can use one of the movement patterns, a combination of both of them, or neither of them. So there are four possible categories of using movement patterns:

1. Passives who use neither of the patterns
2. Walkers who use the physical pattern
3. Techno users who use the virtual pattern
4. Walk and techno users who use both of the patterns.

The active users recalled more objects in the memory test than the passive ones did. Not only the use of the virtual movement pattern but also the use of the physical pattern had a positive impact on the memory test. The result, which indicates that active users do better in the memory test, is in line with earlier studies on understanding information through technology (Hoch and Deighton 1989, Pugnetti et

⁴ Tiainen, T., Ellman, A., and Kaapu, T. (2010), Occasional Users' Moving in Virtual Environment - Physical and Virtual Locomotion, Series of Publications D, D-2010-8. Department of Computer Sciences, University of Tampere, Tampere, Finland, 13 p.

al. 1998, Jiang and Benbaset 2007, Plancher et al. 2008) and with studies on active learning (Carroll and Mack 1999).

For this dissertation, my practical aim was to get guidelines for organizing occasional users' VE visits. The focus in previous studies in the 3D VEs is mainly to develop one technological issue at the time and the aim has not been towards this kind of knowledge (e.g., Burigat and Chittaro 2007). The results of the study suggest that VE visits for that kinds of visitors should be designed so that they could use both the virtual as well as the physical movement pattern, as some actions can be performed in both ways. In addition, the result showed that concentrating on locomotion with devices may take attention from the actual content. My aim was to get the test users evaluate the actual content as well as possible so I decided to let the guide to do the navigation mainly. This was taken into account also when analyzing the results.

4.1.4 Article 4: Virtual Prototypes I

In this article⁵, we focused on user experience (UX) via users' evaluations of virtual product prototypes. As UX is subjective and situated (Hassenzahl and Tractinsky 2006), studying it requires a method which gives space to informants. The **research question** of this article is to describe the alternative views on how consumers understand VPs of products.

We tested the usefulness of 3D VPs in an immersive Cave-like VE laboratory where the user views images in 3D with the help of shutter glasses. An immersive Cave-like VE was used because it gives the best sense of immersion, i.e., actual feeling of being in the place (Turner and Turner 2006). The results of Article 3 helped in designing the user test.

The setting in our case was a virtual apartment, a logical place to present furniture prototypes. 3D prototypes of furniture were presented to 20 test users, who were interviewed afterwards. There were 9 female and 11 male interviewees, whose ages were between 20 and 70 years. The analysis was an iterative process. We conducted six analysis rounds, including comparisons and cross-checks with the whole material so that, finally, the categorization represented the interviewees' views.

The first layer contains the conceptions which consumers use when they describe virtual product prototypes. The referential aspect includes three alternative objects, which differ by their scope:

- Object A: One part of a product,
- Object B: One product,
- Object C: One product in an environment.

⁵ Kaapu, T., and Tiainen, T. (2010), User Experience in Evaluating Virtual Product Prototypes, In T. Alexander, M. Turpin, and J.P. van Deventer (Eds.) 18th European Conference on Information Systems ECIS 2010 Conference Proceedings, Pretoria, South Africa, June, 7-9, 2010, 12 p, ECIS2010-0032.

In the structural aspect, there are four levels of 3D VPs of furniture:

- Level 1: A technical implementation,
- Level 2: A photograph of a product,
- Level 3: A concrete product,
- Level 4: A desired/disliked product.

Based on the variations in the versatility of each test user's description we constructed the second layer, which focuses on the forms of thinking. The three forms are seeing:

- 1) A picture of a product via new technology,
- 2) A separate product,
- 3) A product in its context.

For my dissertation, this article gives answers to the question how phenomenography can be used for reaching understandings. Based on the study, the phenomenographical approach is found promising for studying UX. As the UX consists of smaller experiences and the UX is in each use case unique, because the user's internal state, the use context, and the system are dynamic (Hassenzahl and Tractinsky 2006). In the study, the reference period include one visit in a VR laboratory. It should be kept in mind that user's expectations for the examined UX together with information and perceptions received from other sources, build up an attitude towards virtual product presentations.

In the results, the UX is understood as a unique combination of various elements, which extends over time. Phenomenography allows informants to tell about their experiences in their own words, and it is possible to spot informants' expectations in their descriptions. A researcher who takes a phenomenographical approach wishes to get a deep understanding about how people view things, about the underlying causes, nuances and details (Marton and Booth 1997). In this way, phenomenography merges research and praxis, and thus the informants' answers are not disconnected from the context.

In Article 4 the praxis was also more present than in the e-privacy articles, because I was able to observe the test uses and so I was more aware of what the informants were talking about. In this way I had an opportunity to participate in the use situation.

4.1.5 Article 5: Virtual Prototypes II

In this article⁶ the focus is on the use of VPs in a new product development process (e.g., Dahan and Srinivasan 2000, Srinivasan et al., 1997). The first step was to analyze how consumers understand VPs. We wanted to find out whether their understanding of VPs is on such a level that it can be used in the negotiation of products between the marketer and the customer. We formed the **research question**

⁶ Kaapu, T., Tiainen, T., and Ellman, A. (2009), Virtual Prototyping in Product Development: Users' Context Related Understanding, In the Proceedings of 16th International Product Development Management Conference, IPDM2009, Twente, Netherlands, June, 7-9, 2009, 18 p.

of this article for this first step as follows: how do consumers interpret VPs of products?

Our aim was to verify the results, reported in Article 4 of this dissertation, with a comparative research set-up. Therefore, we went out of the laboratory to the actual context in the furniture fair. We interviewed 13 test users who participated individually. After that we analyzed the interviews by focusing on the interviewees' talk about the presented VPs. We identified the structural dimension of furniture models.

The results show how consumers interpret virtual 3D product prototypes. Each step from one class to the next one brings always some new element to the consumer understanding of VP:

- (1) Problems with using VE,
- (2) As a technical implementation,
- (3) Comparable to a photograph,
- (4) As a concrete product,
- (5) As a concrete product with the presentation format in the background,
- (6) Evaluation based on personal desire and taste.

The first component is Class 1 (Problems with using VE). This was a situation in which the interviewee did not want to evaluate the product prototypes at all because he/she thought that he/she lacked technical skills. This happened only in the fair situation.

Structural class 2 (Problems with using VE) was strongly present in the laboratory set-up but only few times in the fair setup. This class relates to the advantages and disadvantages of the technological implementation. The interviewees discussed the product (as they were asked to do) without including the product features in the discussion (e.g., what this sofa is like?).

Class 3 (Comparable to a photograph) was also repeatedly used in the laboratory situation, but it did not appear in the fair situation at all. At this level, the interviewee adds the product features to the technical implementation. Despite these product features, the interviewee does not see the prototype in 3D, but the interviewee compares the image in the VE to a traditional photograph.

Class 4 (As a concrete product) means that the level of understanding is attached closely to a product and a piece of furniture is understood in a concrete form. This understanding contains also the possibility to describe more personal preferences and evaluate the product, because the nature of the product is understood.

Class 5 (As a concrete product with the presentation format in the background) is related to the fair set-up. While in the laboratory set-up the interviewees discussed the presentation technology and products separately, in the fair set-up this level of understanding allowed the discussion include both fluently. All of the interviewees reached this level in the furniture fair situation. They were sure about their own desires and made their evaluations as they would have evaluated any concrete prototypes in the fair.

Class 6 (Evaluation based on personal desire and taste) appears also in both of the test set-ups. Sometimes the interviewee disliking some model might claim being unable to evaluate a piece of furniture at all or might just ignore it. However, this kind of statement nevertheless reveals that the person is interpreting the image as furniture and also did evaluate it. This category differs from the others because it is mainly negative and therefore lacks any comments.

The results show that although in the VE laboratory test the test users broadly focused on technical features, in the fair the test users' main focus was on furniture models. In the comparison test set-up in the fair, the test users talked to VPs in a way they would talk to any physical prototypes. The results indicate that the context in which 3D models are presented affects the way how consumers understand them. A furniture fair is an event where the visitors focus on furniture. A VR laboratory is a place where VR technology is well visible and in which the visitors focus often on technology. So for this dissertation, the results indicate that a phenomenographer has to take the context into account when designing and analyzing the results of phenomenographical studies.

When we conducted the user tests for Article 4 in one specific setting, we decided to use a comparative test set-up for Article 5 of my dissertation. For my dissertation, the fourth paper offers implications on how meaningful the context is in phenomenographical studies. The results form a hierarchy when describing one aspect of the studied phenomenon in two diverse contexts.

4.2 Evaluation of the Articles of E-Privacy and Virtual Prototypes

Phenomenography is a sensitive research approach that is based on informants' statements and on how the researcher interprets them (e.g., Richardson 1999, Pang 2003). There is a need to be critical towards my own work and evaluate the phenomenographical articles of this dissertation (Articles 1, 2, 4, and 5). Although I had several data collection and analysis procedures related to Articles 1, 2, 4, and 5, I discuss them mainly together. The reason for this is that I followed the same principles in all of them.

The quality of research can be discussed from many viewpoints (Davenport and Markus 1999). The perspective adopted in this dissertation is dialogic (Deetz 1996, see Figure 1.1), and also my dissertation's perspective can be categorized to interpretive studies (Walsham 1995). This requires that an interpretive study is outlined broadly. Klein and Myers (1999) identified seven interdependent principles of interpretive studies, and in the following I use these appropriate principles to evaluate my own interpretive study. I first describe the principle in general and then give one specific example of how it was implemented in the articles.

Principle 1: The fundamental principle of the hermeneutic circle. The first principle means that all human understanding is achieved by iterations. This iteration happens between considering the interdependent meaning of parts and the whole. This principle of human understanding is also a meta-principle to which the six other

principles rely. (Klein and Myers 1999.) In Articles 1, 2, 4, and 5, the principle of hermeneutic circle describes the main idea underlying phenomenographical approach.

The most visible example of the hermeneutic circle in Articles 1, 2, 4, and 5 is the data analysis. The analysis included diverse processes with the gathered data for all of the articles. Still, the principle remains same: the idea of the hermeneutic circle guided the processes. When I conducted the data analysis it was an iterative work, which consisted of reading and re-reading of gathered empirical materials. During the process I made comparisons between meanings of single statements and the surrounding statements, and the data as a whole. I also analysed the interdependencies of these meanings. During the analysis, I formed the categorizations and the forms of thoughts to describe informants' conceptions as precisely as possible. So the results were formed of parts and their interrelationships.

Principle 2: The principle of contextualization. The second principle requires critical reflection of the social and historical background of the research setting. The aim of this procedure is that the intended audience can see how the current situation under investigation emerges. (Klein and Myers 1999.) In Articles 1, 2, 4, and 5, I attempt to meet these requirements by reviewing the essential previous scientific literature on the studied issues. In addition to general studies, I connected e-privacy discussions, for example, to local European Union directives and VPs issues, for example, to local manufacturers. However, I partly dealt with these issues in a global perspective without presenting any aspect typical of Finland. Also my work with others in the multidisciplinary context (see Figure 3.2) highlighted the need for contextualization.

Principle 3: The principle of interaction between the researchers and the subjects. The third principle requires critical reflection on how the data were socially constructed through the interaction between the researchers and participants (Klein and Myers 1999). The issue of interaction between the interviewees and the researcher is an essential concern of Articles 1, 2, 4, and 5. Therefore, I conducted pilot studies in order to gain experience of the particular topic under investigation. When I planned the data collection (see Section 3.4 Data collection and analysis) the results and my experiences in the pilot studies facilitated the planning.

Therefore, I considered carefully the selection of the respondents and data collection in regard to authentic interaction. During the interviews, I avoided offering my own preconceptions as a correct answer to the respondents. In this way the conduct of interviews deviated from usual phenomenographic interviews. The aim of the interviews is to lead the interviewees to the topic of interest in question (Marton and Booth 1997). As phenomenography is a sensitive approach, I noticed that minor issues can be consequential. One example related to the interview technique is that when I interviewed informants and used time writing down their comments many of them stopped their own narration. When I put my pen down, rested my arms on the chair and smiled they continued their talk. However, my aim was to find a concord in the interaction between me and the informants and act similarly in all of the interview situations.

Other example of Articles 1, 2, 4, and 5 is related to the informants' narratives: are their answers honest? The interviewees were voluntarily participating in the research

and they had a chance to say “no more questions, please” at any time. However, all informants seemed willing to participate and their attitude was positive. This indicates that they were at least able (and willing) to tell about their own understandings in their narratives. One indication of the informants' positive attitude was their willingness to come back again as interviewees were there more research projects in the future.

Principle 4: The principle of abstraction and generalization. The fourth principle relates mainly to data interpretation. The aim is that the principle of abstraction is met by describing and illustrating in detail how informants' statements were interpreted (Klein and Myers 1999). In Articles 1, 2, 4, and 5, the principle of abstraction is met by describing and illustrating in detail the way that the informants' statements were interpreted and categorized. The statements were categorized into conceptions (Articles 1, 2, 5) and then into collective forms of thought (Article 4). I pursued the principle of generalization by discussing the research results in relation to generalized ideas and concepts that originate from earlier research. In this way the results will apply to multiple situations.

Principle 5: The principle of dialogical reasoning. The fifth principle requires sensitivity to possible contradictions guiding the research design and actual findings with subsequent cycles of revision (Klein and Myers 1999). When I designed the research I gave space to the informant's own voice. The research design did not include any frameworks because those are not used in phenomenography. Phenomenography is a methodological approach focused on describing the phenomenon as others (than the researcher) see this studied phenomenon (Marton 1982). In this way the approach in Articles 1, 2, 4, and 5 is sensitive to possible contradictions.

Principle 6: The principle of multiple interpretations. The sixth principle requires, among the participants, sensitivity to possible differences in interpretations, which are typically expressed in multiple narratives or stories of the same sequence of events under study (Klein and Myers 1999). The aim of the phenomenographical study is to reveal multiple interpretations (Marton and Booth 1997) and so is the aim of Articles 1, 2, 4, and 5. For the analysis I used interview transcripts. The transcripts were analysed iteratively beginning right after the interviews. I also formed some categories and after a break I analysed the gathered data again. Then I compared the results and formed categories through intermediate points. This procedure increases the researcher's sensitivity to possible differences in interpretations.

Principle 7: The principle of suspicion. The seventh principle requires sensitivity to possible biases and systematic distortions in the narratives collected from the informants. The possible biases and systematic biases can be caused both by the respondents and the researcher. (Klein and Myers 1999.) As a researcher I followed the norms of phenomenographical studies (see Section 2.1). My aim was to avoid possible biases and systematic distortions by discussing with my supervisor and other researchers, as I have also written research papers with others and shared the arguments of the procedure. The papers have then been submitted and reviewed by people whose attitude is critical. These discussions with other researchers follow the principle of suspicion.

Also informants can create problems to interpretations, because they may lie for some reason or they just do not understand what the researcher is asking. These problems do not decrease the meaning of the results presented in Articles 1, 2, 4, and 5, because in phenomenography the analysis focuses to issues through which the phenomenon is outlined by the informants. The purpose is to bring multiple interpretations in light. Other related aspect is that my interviews focused, for example, on how the informants talked when describing their experience. The systematic distortion (i.e., lying) is more difficult in these situations than when the researcher is asking about concrete issues such as likes and dislikes.

5 METHODOLOGICAL CONTRIBUTIONS

The methodological contribution highlights how users' understandings can be studied in a multilevel fashion in IS science. Phenomenography was empirically used for this purpose. In this chapter my aim is to give answers to the question: **how** can phenomenographical approach be used for reaching the diversity of users' understandings?

First, I ponder briefly the background of the phenomenographical approach in educational sciences and my decision to use phenomenography for studying IS users. I describe this in relation to a review of phenomenographical IS studies. In this perspective, **how** relates to the possible use applications of phenomenography. Second, I answer to the question **how** from the results perspective and form four steps of how to represent the results.

5.1 Phenomenography in New Context: Studying Users' Understandings

In my dissertation I used phenomenography in studying IS users' understandings. I reviewed phenomenographical studies from the IS perspective (see Section 2.2) and I noticed that phenomenography is rarely used in the IS field. However, the use of phenomenography in IS perspective studies is increasing. So my dissertation is in a relatively new context, that of IS studies. Unlike in the education context, my dissertation concentrates on how individuals conceive IS use. This means that the context of my dissertation is very new when proportioning it to IS studies without educational connections (i.e., how individuals conceive various aspects of life).

Still the phenomenography's educational background is present in using the approach to study users' understandings. When examining the phenomenon from the second-order perspective, it highlights users' learning processes. For example, in the cases of VPs (Article 4 & Article 5: Virtual Prototypes) the interviewed consumers have looked around them when using e-commerce services, they have seen some systems and available services and they know how to buy furniture in traditional or e-commerce shop. If they had never heard or seen a computer and e-commerce interfaces, it would not have been so apparent to them what virtual presentations of furniture mean in the first place. If they had never bought furniture, they would have understood furniture presentations differently. They have many prevailing interpretations. The interpretation about VPs of products may be a sum of, for example, the notion of their own e-vendor (previous experiences of the trustworthiness of the e-vendor), the system used (experienced easiness of use), and their helpful son (who assists in and affects their choices of furniture). I understand that much of this process is about individual learning.

Also in the e-privacy cases (Article 1 & Article 2: E-Privacy) I focused on persons' different conceptions about a phenomenon. There may be alternative interpretations from different experiences and, therefore, understanding is relative to the surrounding context. This is deeply attached to learning processes. For example, stealing of a credit card number is discussed in the media (the surrounding context), and the individual consumers learn via these discussions. However, these consumers' interpretations and subsequent actions and decisions differ: some consumers thought stolen credit card numbers as a sufficient reason for not to use e-commerce, while some decided to use their credit card numbers nevertheless.

Besides of learning process these two previous ones are examples of how experiencing something is more important in studying the diversity of IS users' understandings than in purely educational contexts. However, the IS use context differs from the discipline of education by its underlying assumptions about knowing and understanding. In educational studies, the emphasis is often on the architecture of conceptions in order to detect differences in people's deep or surface learning (Marton and Booth 1997). Based on the results the teachers can, for example, improve their teaching.

The situation is different when I apply phenomenography to reaching the diversity of IS users' understandings. On one hand, when IS researchers study users' views on a system or its element, there is no need to evaluate the correctness of prevailing conceptions. On the other hand, the variation in the users' interpretation is worth of studying. Better understanding of users' views will improve the quality of IS. The main motive of studying the variation in how students experience certain learning related situations or concepts is to make sense of how students handle those same situations (Pang 2003). Therefore, the results of a phenomenographical study have the potential to provide concrete tools to understand and evolve IS use processes.

5.2 Presenting Outcomes of Phenomenographical Studies

According to Renström (1988), the resulting classes of phenomenographical studies are of three kinds: individuals' conceptions, categorization of conceptions and a framework. These three classes can be connected to Figure 2.2, which illustrates the representation levels from individual views to general conceptions (Renström 1988). I use them to form the framework for the steps of outcomes in phenomenographical studies (STOPS) (Figure 5.1).

When I place my empirical results to Renström's categorization, three articles present that categorization of conceptions (Article 1 & Article 2: E-Privacy, Article 5: Virtual Prototypes II) and one article presents a framework (Article 4: Virtual Prototypes I). My three articles that present the categorizations, however, contain very different kinds of results. So I find a need to modify the figure by Renström (1988).

I outline here that there is a researcher who examines the informants' understandings of a certain phenomenon and I would like to make the researcher visible (see Figure 5.1). When a researcher takes a step to the next stair it is also a step from informants' personal perspective towards informants' collective view. The researcher has to take

all the steps: in is not possible to start but from the bottom stair. The emphasis is still in the result in Figure 5.1.

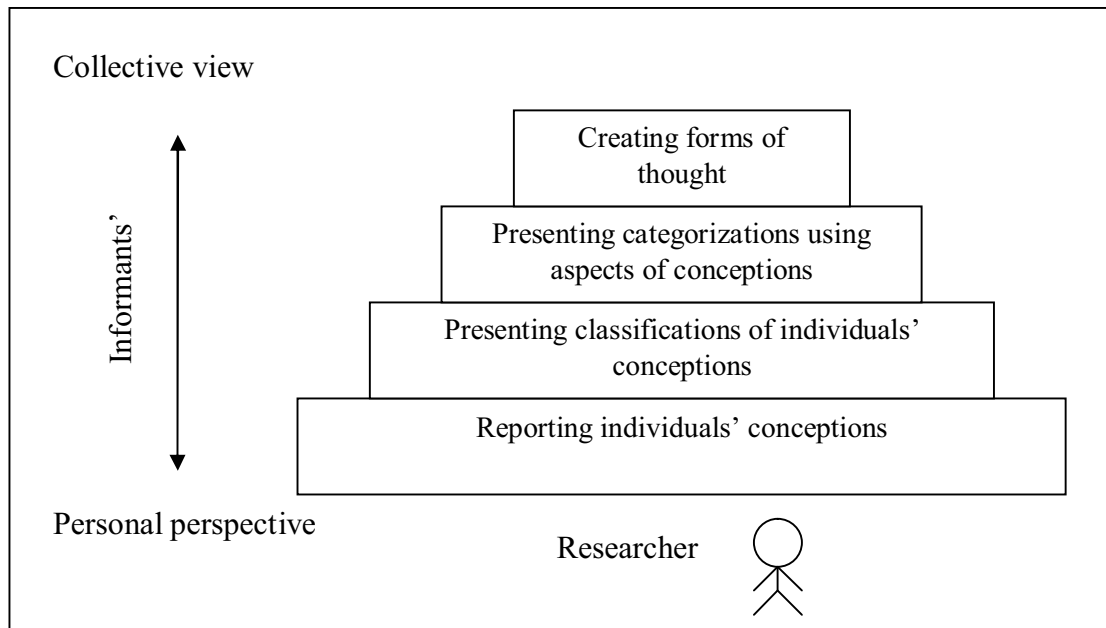


Figure 5.1. Steps of Outcomes in Phenomenographical Studies (STOPS).

The first stair in the STOPS is when the researcher is reporting individuals' conceptions. In my dissertation project, I do not have an example of this type of results. It can be used in certain situations when there is a need to reach individual level understandings. The literature review (in Section 2.2) reveals that this kind of reporting of results is common from the IS perspective.

The second stair in the STOPS is when the researcher is presenting classifications of individuals' conceptions. Here I outline that the classification consist usually one aspect of categorization. I have used the result type classification in VPs case (Article 5: VPs in Fair) where the study consists of user tests and interviews of different people in different contexts. So it was reasonable to focus, in the classification only, on the aspect of how informants understand VPs of products. Also the e-privacy case (Article 1: E-Privacy I) presents this kind of outcome, because the results include two aspects but they are not in relation to each other.

The third stair in the STOPS is when the researcher is presenting categorizations using aspects of conceptions. The results of such study are presented as descriptive categories. Each category characterises a particular way of experiencing the phenomenon, capturing key aspects of the essential differences between the categories. The categories are usually presented in a hierarchical manner, since some describe a more advanced some more complex understandings than others. The variations between the categories present the critical points in understanding and are highlighted in the analysis. (Marton and Booth 1997.)

I use the categorization of informants' conceptions in the e-privacy case about consumers' own interpretations of privacy in the context of B2C e-commerce (Article 2: E-Privacy II). Categorization as a class of result consists of some generalised findings, i.e., making sense of the world (which was the target of culture by making

studies by Walsham 1995). When the result is a categorisation, it does not just describe the studied situation but somehow, in a more general way, the result helps to understand other – same kind – of situations, as well.

The fourth step in the STOPS is when the researcher is creating the forms of thought (Renström's framework). In VPs case (Article 4: Virtual Prototypes I) I have created the forms of thought. It was formed by constituting first the understandings of interviewed individuals and then outlined by them to different forms of thought. When a form of thought is a research result, it is on an even more general level than categorization. It is easier to accept it as a research outcome; it is a step in theory building. According to March and Smith (1995), one possible research output is to create a model (of the studied phenomena). A model can be viewed as a set of propositions or statements expressing relationships among constructs. The forms of thought represent this kind of result.

In addition, I also want to highlight the role of the researcher. The main idea of phenomenography is to capture informants' understandings (Marton and Booth 1997), however, it is impossible to do away with the researcher's role completely. During the analysis phenomenographers do not necessarily identify a unique set of categories from the same data. The categories identified in any study are to some extent dependent on the intent of the phenomenographer. So the phenomenographer's intent should be written down accordingly. My practical intent from the e-commerce perspective is to increase e-vendors' knowledge of consumers' technological understandings to develop e-commerce practices. This also relates to the evaluation of study (such as the principles by Klein and Myers 1999. See Section 4.2).

Even though the researcher is present, the phenomenographical work is repeatable. If two people were given some categories, and some quotes from data, those people would usually place the quotes into the same categories. The readers can determine for themselves whether they would place most of the quotes into the same categories as those into which the authors have placed them. (Richardson 1999, Pang 2003.) One key method with which to overcome with this challenge based on my experiences is to write the methodology carefully and accurately. And if possible the results should be published also in a more detailed form, for example, in working papers or project reports where anyone can double-check them when the length of publishes articles is limited (my results in a detailed form in Kaapu 2006, Kaapu and Tiainen 2007).

6 DISCUSSION

My aim has been to generate an understanding of how phenomenographical approach can be used to study users' interpretations. I have fulfilled this study purpose empirically by studying IS users' interpretations as a multilevel construct and illustrating what it takes for researchers to study it as such. In this chapter I present a discussion of the results that consist of the STOPS framework. I discuss also the limitations that may be present in this dissertation, and after each of them I state some implications for future research.

6.1 Pros and Cons of Phenomenography

The STOPS framework shows that phenomenography can focus to multilevel issues starting from the bottom (individual users' interpretations) and continue to creating collective levels of understandings (see Figure 5.1). However, in practice this kind of multilevel theorizing is challenging, and often users are studied in a way where collectives "use" IS (Burton-Jones and Gallivan 2007). Here I discuss the implications of using phenomenographical approach in a multilevel fashion – the researcher keeping an eye on the whole as well as its parts.

The phenomenographical approach is found promising for studying IS users' views on a phenomenon under social construction. With phenomenography there is a possibility to reach beyond models such as TAM (Davis et al. 1989) and seek ways how to capture users' interpretations of technology. This means that with phenomenography it is possible to create building blocks for further studies. However, this kind of approach requires that the researcher understands the meaning of the context (Marton and Booth 1997).

The meaning of the context can also be connected to the conceptions of cultural geography. For example, Internet Cafés include several landscapes of computing – i.e., landscapes of technology, online, and interpreting (Wakeford 1999). In my study, the landscapes of technology include, for example, the hardware of VEs and applications including the furniture VPs. Also the landscapes of interpreting are different in the test setups. For example, in the laboratory the context is connected to creating science and technology, and it makes technology-related talk understandable.

In the other situation the landscape of interpreting is a furniture fair. This context makes test users focus on furniture and interior, and prevents them from thinking about the presentation technology. A stand in a virtual fair hall for furniture was easier for evaluations. From the technological point-view, based on my study a portable light equipment in the fair (or similar places) can offer users better understanding of 3D VPs than laboratory equipment that led the users to think about the technology. In this

sense, phenomenography may offer knowledge that is inaccessible with other kinds of methodological approaches.

With IS users there is the possibility to combine participant observation and test uses in the study procedure as in this study. This can increase the contextuality. There is no reason why phenomenographical research should not involve participant observation (Marton 1988). The majority of phenomenographical researchers have not participated in the processes that constitute the focus of their inquiries (Richardson 1999). With IS users, the review did not reveal previous phenomenographical studies that report experiences when the researcher is observing the actual use (see Section 2.2).

Attempts have been made by phenomenographers to address this issue in fields other than IS by letting the participants do something tangible that forms a context and then discuss about this activity during the interview (Booth and Ingerman 2002). Also the idea of role-play has been used in the previous literature (Aubusson et al. 1997, Boustedt 2009). So the implication for phenomenographical IS user studies is that the research can be conducted only with interviews. Still, the use of participant observation can improve the reliability and accuracy of the study process. The challenge is that the test uses are usually led by the researcher and so the informant may be affected by the researcher. The aim in phenomenography is to understand informants' interpretations (Marton 1982). The future research might investigate how participant observation and test uses should be designed and implemented in phenomenographical studies.

Other challenges in conducting a multilevel phenomenographical study are related to how to move from one analysis level to another. The researcher has to create linkages between the users' different individual understandings and the levels of interpretations. At the same time, the researcher should avoid studying levels too far apart because that may lead to discontinuity between individual and collective levels. This is a complicated question since informants naturally have several approaches, some approaches being preferred to others. This means that an informant may be quoted in more than one of the formed categories.

Furthermore, the literature of phenomenographical approach gives little guidance on the analysis in practice (Marton 1982, Marton and Booth 1997). For example, there are no agreed principles for testing the validity of formed categorizations. Analysis without strict guidelines requires creativity, many trials, and suspicions towards own results. The STOPS framework helps in forming results since it illustrates the possible outcomes and the order in which the researcher can take the next step. This dissertation offers practical implications originating from the empirical cases; however, forming more precise guidelines needs further studies.

While I acknowledge these challenges, I believe that they represent research opportunities rather than problems to be avoided. In the STOPS framework the diversity of users' understandings can be reached in the first step. The fourth step, forms of thought, describes the construct, but the individual can use only a part of it. This way the phenomenographical approach offers a way to do research that leads to a more multifaceted view to users' interpretations beginning from the individuals level.

6.2 Limitations and Future Studies

Phenomenography is a very young approach (Marton 1982) and only recently adopted to other fields apart from education (Pang 2003). When I reviewed phenomenographical studies from the IS perspective (see Section 2.2) I found that the context of my study is new when proportioning it to IS studies. My dissertation does not include direct educational connections. When the context is connected to a rather new methodological approach (phenomenography) to study IS users' understandings, this means that the dissertation includes also limitations and implications for future studies.

The STOPS framework includes limitations that are related to the issues developed from Renström's (1988) model based on empirical studies in the context of studying IS users' understandings. The framework can be tested with more empirical studies and also by making a review of the existing phenomenographical literature. If it is possible to apply the results to STOPS, it strengthens the framework. Other issue is that if there are difficulties for applying the outcomes through the steps structure, their descriptions have to be clarified. If there are phenomenographical studies that represent some other kind of result it means that a framework has to be developed.

First, I used empirical material to answer the research question of how phenomenographical approach can be used in this context. I studied this in one context, e-commerce. It was selected for the context for several relevant reasons: the phenomenon 1) contains everyday actions, 2) is consequential to both scientific and practical discussions, 3) and is evolving. Selecting e-commerce for research context guided the understanding of e-commerce as a multidisciplinary concept by its nature (Ngai and Wat 2002) and as a pervasive phenomenon in modern society. However, also other kind of context would have been possible, such as e-government or e-health. In the future studies, some questions of these fields could be studied using phenomenography and then the results could be proportioned to the results of this dissertation. This kind of expansion in the use of the phenomenographical approach would not invalidate the work in this dissertation, instead, it might bring new features on how phenomenography can be used.

The second limitation relates also to the empirical context of my study cases: e-privacy and VPs of products. Instead of aiming to find all the understandings, I decided to seek understandings in respect to both scientific and practical discussions from the e-commerce viewpoint. Two most commonly cited reasons for not purchasing goods over the Internet are security and consumers' inability to judge the quality of products (e.g., Cassidy and Chae 2006, Hui et al. 2007). For my dissertation, the research setting of e-privacy and VPs complements the view of reaching the diversity of users' understandings. The theme with very new technology (presenting 3D VPs of products) offers an opportunity to be present in the first use situations and observe consumers' behaviour with less previous experiences of the presented technology than with an online privacy setting. However, the users' understandings of e-privacy and VPs of products are also very specific, and in the future studies the research questions could focus also to other themes in the context of

e-commerce. Also this could increase methodological knowledge of how phenomenography can be used.

Furthermore, the testing of STOPS framework could also be done based on the review of existing phenomenographical IS studies. However, the limitation for this procedure is that there are only a limited number of IS studies. The future studies should also update the development of phenomenographical research in the IS field and the ways of reaching users' perspective.

7 CONCLUSION

In my dissertation I used the phenomenographical research approach to study the diversity of IS users' understandings. This work highlights that using phenomenography provides an alternative way to explore questions about users' interpretations of technology. The current results serve to use and develop the phenomenographical approach.

The background of phenomenography is in the empirical studies of learning (Marton 1982). There has been some earlier phenomenographical research in the IS field and in the related disciplines, but the emphasis has been mainly educational (see literature review in Section 2.2). The experience of individuals using IS technologies has until now remained phenomenographically unexplored. Thus, my dissertation aims to provide answers for a new research field.

I sought the answer to the research questions empirically by examining users' interpretations. For this purpose, I used two cases: e-privacy and VPs. In the e-privacy case I conducted 22 qualitative interviews. Before VPs case I needed an understanding of users' behaviour patterns in VE to find out the implications for organizing user tests. So I conducted a user test with 40 participants. In the VPs case I conducted 33 user tests and qualitative interviews. This empirically collected material forms the base for my dissertation.

There is a need to see the aspects of users' understandings that go beyond the purely task-oriented and cognitive approaches (Hassenzahl and Tractinsky 2006). This is also the idea in using phenomenography to study users' interpretations. The phenomenographical approach allowed informants to tell about their experiences in their own words, and it is possible to spot the informants' expectations in their descriptions. In this way phenomenography merges research and praxis, and thus the informants' answers are not disconnected from the context.

Another viewpoint about how phenomenography can be used is due to that the phenomenographical approach gives tools for multilevel studies. The multilevel research refers to any research that "entails more than one level of conceptualization and analysis" (Kozlowski and Klein 2000, p. 79). Often users are studied as entities where collectives "use" IS (Burton-Jones and Gallivan 2007). Collectives such as nations do not use any system in reality.

Based on the results of this dissertation, I state that with phenomenography it is possible to make multilevel research and take individual interpretations to the collective level of understandings. I present this process as STOPS. The STOPS framework includes four stairs: 1) Reporting individuals' conceptions, 2) Presenting

classifications of individuals' conceptions, 3) Presenting categorizations using aspects of conceptions, and 4) Creating forms of thought. All of these steps can comprise relevant research results. A form of thought as research result is on an even more general level than categorization. It is easier to accept it as a research outcome, as it is a step in theory building. According to March and Smith (1995) one possible research output is to create a model (of the studied phenomena). A model can be viewed as a set of propositions or statements expressing relationships among constructs. The forms of thought (Step 4 in STOPS) represent this kind of result in a multilevel fashion.

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PART II

Article 1: E-Privacy I

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Article 2: E-Privacy II

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Article 3: Behaviour Patterns

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Article 4: Virtual Prototypes I

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Article 5: Virtual Prototypes II

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