Involvement and End-User Computing

An empirical investigation of the influence of involvement in the context of end-user computing

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ABSTRACT

It is generally agreed within information systems research that involvement in computer based information systems among professionals (e.g. engineers and economists) is critical to successful utilization of the technology. Usually this means that involvement leads to users that are satisfied with their technology. This study proposes that involvement in computers may influence professionals in a more comprehensive way than earlier assumed. Hence, the main purpose of this study is to investigate the effects of professionals' (i.e. end-users) involvement in computers.

The attempt in this dissertation to consider the involvement literature from a new approach starts with an examination of the concept of involvement per se, that is, the conceptual basis for the common definition of involvement within information systems research are examined and discussed. This examination leads to a redefinition of involvement and a detailed specification of the cognitive mechanisms behind the state of involvement. Thereafter the focus is on how involvement toward computers influences end-user behavior. This analysis leads to the identification of four potential outcomes of end-user involvement: *job-specific utilization*, *non-job specific utilization*, *support seeking* and the *providing of coworker assistance*. After identifying potential effects, the study develops a conceptual model that shows how *end-user involvement* is assumed to influence end-user behavior.

The model developed was empirically tested on a sample of administrative staff in a Norwegian oil company. The results from the test show that end-user involvement has substantial impact on the proposed behavioral variables (i.e. job-specific utilization, non-job specific utilization, support seeking and the providing of coworker assistance). Moreover, a test of managerial implications shows that the contribution of involvement is ambiguous when job performance is the criterion variable. The contribution of this research is discussed in the last part of the dissertation.

PREFACE

Am I satisfied after more than three years of reading and writing? I think this is the most important question at the time of completion. In spite of how important the question is, the answer is quite simple (yes I am!). I alone took the decision to aim at a Ph.D., but a number of people have invested a lot of their time and energy in making it possible for me to end up as a satisfied Ph.D. graduate. First of all I would like to thank the members of my committee, Professors Gunnar E. Christensen (chair), Kjell Grønhaug and Robert P. Bostrom, for their contribution to the completion of this dissertation. I owe a special thanks to Professor Gunnar E. Christensen for his support and encouragement through the entire process. His positive mind and patience every time I asked for advice made the collaboration very fruitful. Additionally, I am grateful to Professor Kjell Grønhaug for numerous comments, suggestions and discussions during the period of work on this dissertation. I would also like to thank Professor Robert P. Bostrom for reading and giving comments on the final draft of the dissertation.

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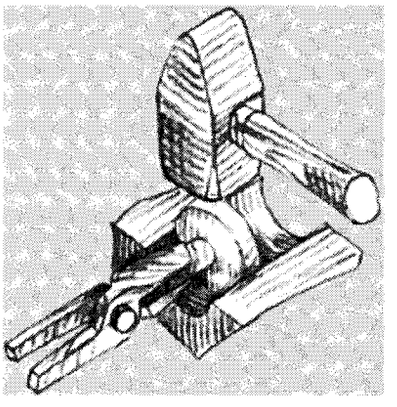
To the memory of my best friend, Trygve Opheim (1921 – 1996)



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CHAPTER 1 INTRODUCTION

From the start in the late 1970s, end-user computing has evolved tremendously, and the ratio of computers to office workers in the industrialized world is nowadays approaching an average of one to one. This growth in end-user computing is a global phenomenon, occurring in the United States and Asia as well as in Europe. This worldwide priority of PC's, various software and peripheral equipment in companies today have different causes, but the overriding belief is that office workers will become more productive when they get access to it. However, it is only partially true that technology in itself will result in productivity gains. It has been clearly demonstrated through a lot of research that human factors are a basic releaser of any gains. One of the key factors among individuals seems to be positive attitudes toward technology. Unfortunately, positive attitudes are not a matter of course in work environments. Quite the contrary, research has demonstrated that the users' attitudes usually range from enthusiastic to more suspicious feelings, and that the actual attitude in a particular situation has important consequences for the success of microcomputer usage.

Any attitude toward technology will typically be based more on one particular type of experience than another (e.g facts about computers or emotions toward computers; Zanna & Rempel 1988). Within the field of information systems (IS) this is manifest through the existence of a diversity of conceptualizations (e.g. perceived importance, perceived fun/enjoyment or perceived usefulness). One of the most controversial of these conceptualizations, the state of *user involvement,* has received considerable attention within IS research the last decade (Hwang & Thorn 1999). Following, Strassmann (1997:120) among others (e.g. Barki & Hartwick 1989, Blili et al. 1998) this particular psychological state is among the most important factors for the realization of benefits in personal computing:

> In the absence of customer *involvement*[1], the equipment will remain sitting on desks gathering dust. A great number of computers do exactly this; they are a person's assertion of office privileges. An expensive personal computer that is only rarely used for email messages adds little value to the effectiveness of business.

As Strassmann provocatively stresses in the quote, attention may be paid to the users'

[1] italicized by the author of the dissertation

involvement when managers wish to increase the value of their computer investments. The conventional wisdom is that user involvement is critical to both successful implementation and utilization. As such, involvement represents one of the more important mechanisms that drive user behavior.

The fact that involvement plays a critical role in individuals' decisions to utilize computer equipment, and hence, for the realization of benefits, has been known in information systems (IS) research for more than three decades (Barki & Hartwick 1989). However, this particular research issue has only been concerned with the adoption (or implementation) phase so far, and has to a large extent ignored the subsequent end-user computing phase. The latter phase, is the phase where computer equipment is utilized in the daily execution of job-tasks. Managers should therefore expect to gain profit from their computer equipment investments in this phase. In consequence, managers can't afford not to think about the impact of involvement for the realization of benefits in this phase. At the very least, they need to understand how involvement in connection with usage of computers influences their end-users' actions. For example, how does it affect the utilization of the computer? Does it only lead to purposeful utilization (i.e. doing the job) or does it also have some side effects (i.e. a lot of purposeless experimentation with software)? Although a number of studies have investigated the effects of involvement in connection with the adoption of computers (e.g., Barki & Hartwick 1994; Jackson et al. 1997), the knowledge about its effects is very limited. This concerns, as indicated earlier, especially effects in the end-user computing phase. The only study that has investigated effects of involvement in this phase is undertaken by Blili et al. (1998). Their focus is, however, analogous to the traditional focus within implementation studies, a focus where various user perceptions are regarded as the principal effect category (e.g., user satisfaction or perceived usefulness). This overstatement of perceptions as the principal effect category is remarkable, especially as long as involvement in other research fields (e.g., social psychology and consumer behavior) is regarded as a phenomenon that is likely to influence behavior (e.g., Crano 1995; Boninger et al. 1995). Hence, it seems like IS research has gone into a fixed rut. In consequence, this research field disregards what is obvious in other research fields, namely the insight that involvement may have notable behavioral consequences.

As shown above, current knowledge about involvement and its consequences may benefit from further research. Given the importance of the role of involvement in the literature and

practice, more knowledge about its effects is indeed needed. This obvious need for knowledge regards especially two aspects. First, there is a need for more knowledge about effects in the end-user computing phase in general. As stressed above, this is the phase where genuine benefits from involvement may be realized. Second, there is a need in the field for an understanding of the *behavioral* effects of involvement. Giving attention to changes in end-users behavior is probably the only way to examine the prevalent assumption in IS research (and practice) about involvement as an important success factor.

The present research will concentrate on behavioral effects, that is, effects that involvement may have on end-user behavior. The main reason for this delimitation is twofold. First and as argued above, IS research is in need of knowledge about behavioral effects. Second, knowledge about behavioral effects is expected to be of high relevance for managers, because it may give them insight into how their employees act when they get engaged in information technology. *Consequently, the purpose of this study is to identify, conceptualize and test important behavioral effects of involvement within the context of end-user computing.*

An indicated above, knowledge about the effects of involvement is important from a management perspective. Managers are recommended to implement participation, i.e., computer training (Kappelman 1996) or IS development participation (Hartwick & Barki 1994), as means to enhance the level of involvement among users. The assumption is that "the more training or the more sophisticated participation, the more enthusiastic user feelings toward the technology, and in consequence the more end-user computing success". It is not necessarily anything wrong with this assumption; the point is that managers need to know the consequences of what they are doing. They need to know how a user involvement action program may influence user behavior. Particularly, they may be interested in knowing if an attempt leads to what they perceive as proper use of the technology.

To accomplish the goal of this research, the dissertation starts with an analysis of the construct of involvement to explicitly define its boundaries and content (Chapter 2). This analysis attempts to review current approaches toward involvement within IS research, and affirms the conceptual status of the approach that is most suitable for further work. The conceptual analysis will be the starting point for the subsequent identification of effects. Without a clear conceptual understanding, it is extremely difficult (if at all possible) to make clear and substantial arguments about how and why involvement should affect end-user

action. To identify behavioral effects of involvement, a review of present effects, together with a description of end-user action, is imperative. These issues are addressed in Chapter 3, where the purpose is to identify and conceptualize important behavioral effects of end-user involvement. The final act in the conceptual part of this dissertation is to synthesize the chosen approach toward involvement and the identified effects into a conceptual model. This issue is addressed in Chapter 4, which closes with an explicit description of a set of hypotheses. The research method used in the study is presented in Chapter 5 and the results from the empirical study are reported in Chapter 6. The dissertation is concluded in Chapter 7 where the contribution of the study is discussed and implications suggested.

CHAPTER 2 THE NATURE OF INVOLVEMENT

As a starting point, involvement refers to a particular type of attitude toward technology. However, as stressed recently by Hwang & Thorn (1999), *involvement* may refer to behavior as well as a psychological state. To deal with the dimness of the nature of involvement, the purpose of this chapter is to obtain a clear and consistent understanding of the concept. Since the major research area of this work is information systems, the chapter will begin with a evaluation of the current conceptual status of involvement within IS research. Towards the end of this section (i.e. Section 2.1), it will be demonstrated that there exists a need for a more extensive conceptual review. This need will be fulfilled by a conceptual review within three different reference subjects of IS research; social psychology, consumer behavior and organizational behavior (i.e. Section 2.2). Section 2.1 and 2.2 constitute the foundation for a conceptual analysis of involvement (i.e. across the reviewed subjects). This analysis will be accomplished through Section 2.3. The subsequent section (i.e. Section 2.4) will bring the discussion back to the research field where it started, namely IS research; and discuss what the nature of involvement in the end-user context is. Eventually, the chapter will be summarized in Section 2.5.

2.1 The concept of involvement within IS research

Below, the conceptual content of involvement within IS research is discussed and analyzed. Two different approaches toward involvement are presented first (cf., 2.1.1). Later the suitability of one of these two approaches in the present study is argued for. Then the conceptual content of this particular approach is analyzed (cf., 2.1.2) and eventually the implications of this analysis for the present study are discussed (cf., 2.1.3).

2.1.1 The origin of the concept

The first involvement studies within implementation research emerged in the 1960s (Ives & Olson 1984). In this initial phase of research into involvement, all studies were concerned with involvement in the meaning of participation in system development. That is, they were concerned with involvement as a particular type of behavior, engaged in by users during the process of IS development. It was not until the end of the eighties that this unidimensional view on the concept of involvement went through a change. The origin of the change in the field was the paper "*Rethinking the Concept of User Involvement*", written by Barki & Hartwick (1989).

Barki & Hartwick's (1989) paper presented a strong case for a separation of the concepts *participation* and *involvement*. They describe participation as a set of behaviors or activities performed by users in the system development process (i.e. the original meaning of the concept *involvement*), and involvement as a subjective psychological state reflecting the importance and personal relevance of a system to the user. The most important argument they state for such a separation is that the concept of *involvement* will become more consistent with the conceptualizations of involvement in other subjects if it is separated from participation (e.g. organizational behavior and marketing)

Kappelman (1990) was the first researcher that followed up the new involvement approach that Barki & Hartwick (1989) proposed in their seminal paper. Hence, Kappelman builds directly on Barki & Hartwick's (1989) work, and further refines the proposed division between participation and involvement (se also Kappelman & McLean 1993, 1994). He suggests a further distinction between *task* and *product* in relation to both participation and

involvement. This distinction implicates a separation of two different types of participation, and further between two different types of involvement. First, he describes a difference between *process participation* (i.e. task) and *system use* (i.e. product). The former refers to what we already have referred to as "behavioral engagement in system development", and the latter to the behavioral engagement of users with an information system (e.g. a computer or a particular software). Second, he describes a difference between *user process involvement* (i.e. task) and *user system involvement* (i.e. product). The former refers to involvement toward development tasks and the latter toward the result of the development process.

Despite the attempt by Barki & Hartwick (1989), and later Kappelman (1990), to establish a conceptual separation of participation and involvement, it is still fairly common to use *user involvement* as a term with reference to participating behavior (e.g. Igbaria & Guimaraes 1994). An alternative way to solve this conceptual mix between a behavioral and a psychological state, is to refer to both as user involvement, but distinguish between the sub-components *situational involvement*[2] and *intrinsic involvement* (cf., Jackson et al. 1997). This distinction may be more suitable than the distinction between user participation and user involvement, because it creates no need to change a well-established tradition in the research field. It creates only a need to define precisely the type of user involvement under investigation.

Table 1: Types of user involvement within implementation research

User involvement	In the meaning:	Can further be divided into:
Situational involvement[2] (cf. user participation)	A behavior	I. Participation in the development process II. Participation in the meaning "system use"
Intrinsic involvement (cf. user involvement)	A psychological state	I. Involvement in the development tasks II. Involvement in the system

Table 1 shows the different meanings of the established term *user involvement* within implementation research. As can be seen from the table, it is possible to divide the term user involvement into two distinct sub-terms; i.e. situational and intrinsic involvement. These two

[2] It should be noted here that some marketing researchers refer to *situational involvement* as synonymous with a transitory psychological state (e.g. Bloch & Richins 1983; Richins & Root-Shaffer 1988), and hence, not to involvement toward a particular entity.

can further be divided into respective sub-terms, dependent on the phenomenon under investigation.

To put the different terms in Table 1 in line with the objective of the present study, it will be useful to recall from Chapter 1 that the main purpose of this dissertation is to investigate the effects of *involvement* in the *end-user computing phase*. Since the concepts in Table 1 have their origin within implementation research, it does not necessarily make sense to transfer these concepts directly to research in end-user computing. This is especially true of situational involvement that narrows into only one meaning when transferred to the end-user computing phase, namely *system use*. Hence, it merges into an already established research concept within end-user computing, and is therefore of little interest for genuine involvement research in this phase. Intrinsic involvement, on the other hand, gives meaning and represents a unique concept in the end-user computing phase (Blili et al 1998). Hence, it is user involvement in the meaning *intrinsic involvement*, which is investigated in this study.

As Table 1 shows, intrinsic involvement within implementation research is divided into two sub-terms: involvement toward development and involvement toward a system. An analogous division should be done within end-user computing between *involvement toward microcomputing* (i.e. task) and *involvement toward computers* (i.e. product). This distinction, which is analogous to the differentiation that Fishbein & Ajzen (1974) make between attitudes toward behaviors and attitudes toward objects (Kappelman & McLean 1993, 1994), will be further pursued in the present study.

2.1.2 The nature of intrinsic involvement

As mentioned in the previous section, Barki & Harwick (1989) initiated research on intrinsic involvement within the IS-field. In their seminal paper, they describe intrinsic involvement as a "*subjective psychological state of the individual*", and define it as "*the importance and personal relevance the user attach either to a particular system or to IS in general*" (Barki & Harwick 1989:59). This definition is characterized as consistent with work in other areas such as psychology, marketing and organizational behavior. Unfortunately, involvement is not discussed as a cognitive concept beyond this superficial level. For instance, nothing is mentioned in their paper about the psychological mechanisms behind the two beliefs that are

stressed as the core of the concept (i.e. importance and personal relevance). The only thing that they add to their conceptualization, through some subsequent papers, is that it is important to distinguish intrinsic involvement from the attitude concept (Barki & Hartwick 1994; Hartwick & Barki 1994), a difference which is described as going between an *affective evaluation* (e.g. good/bad) and a *belief* concerning two specific attributes (i.e. importance and personal relevance).

In contrast to Barki & Hartwick (1989; 1994) and Hartwick & Barki (1994), Kappelman (1990) describes intrinsic involvement as equivalent to job involvement (i.e. organizational behavior). The conceptual core in his study is founded on the classical work of Kanungo (1979; 1982), and involvement is described as "*a particular attitude characterized as a state of psychological identification with some object*" (Kappelman 1990:16). Further, involvement is stressed as a *motivational concept* and described as a *need-based* psychological state. In a subsequent paper (Kappelman & McLean 1993), the difference between satisfaction and involvement is emphasized. This difference is described as a distinction between an *affective state* and a *cognitive belief state*. Even if Kappelman (1990) and Kappelman & McLean (1993) apparently have a different theoretical basis than Barki & Hartwick (1989), we should notice that they also distinguish between the two different beliefs; namely *importance* and *personal relevance.*

As indicated throughout the previous sections, there are only a few researchers apart from Barki & Hartwick and Kappelman & McLean who have carried out research on intrinsic involvement within the IS-field (e.g. Jacson et al. 1997; Seddon & Kiew 1994). Nearly all research so far has a theoretical reference to the work of Barki & Hartwick (1989) and does not add anything of conceptual interest in addition to Barki & Hartwick's contributions. The only exception is the work of Blili et al. (1998) which describes involvement as a concept consisting of four different dimensions: *importance*, *pleasure*, *sign value* and *perceived risk.* However, they use Barki & Hartwick's definition as an initial position in their paper and do not discuss the contrast between this initial position and their final conceptualization of involvement (i.e. their usage of *importance, pleasure, sign value* and *perceived risk* versus Barki & Hartwick's focus on *importance* and *personal relevance*).

As this review of conceptual approache(s) to intrinsic involvement within IS research shows, little systematic effort has so far been devoted to conceptual discussions and clarifications. Both Barki & Hartwick (1989) and Kappelman (1990) avoid the discussion of cognitive mechanisms beyond the superficial level. The only conceptual issue they both stress, is that involvement "*refers to the extent to which a person believes that a system possesses two characteristics, importance and personal relevance*" (Hartwick & Barki 1994:442). However, in comparison with the definition of the well-known, and hence, more accepted IS-variable *perceived usefulness*, Hartwick & Barki's definition has to be characterized as insufficient. Davis (1989:320) defines perceived usefulness as "*the degree to which a person believes that using a particular system would enhance his or her job performance*". This is a much more specific and precise definition[3], because it accurately defines the content of the belief. In his definition, Davis stresses the relation between *a system* and the subsequent state of *job performance*, while Hartwick & Barki emphasize only that intrinsic involvement is a matter of two sub-beliefs (i.e. importance and personal relevance). Hence, the problem with Hartwick & Barki's definition is that it does not describe what the contents of these two different beliefs actually are. For instance, what does it mean that a "*system possesses the characteristic of importance*"? Does it mean that an end-user perceives the system as important because he feels that it is useful to solve tasks? Does it mean that an end-user perceives the system as important because he feels that it gives pleasure?

In addition to this conceptual obscurity regarding the two sub-beliefs *per se*, it is also unclear what the cognitive mechanisms behind these two sub-beliefs are. For instance, Kappelman (1990) describes involvement as a need-based belief. Presumably this means that the two sub-beliefs (i.e. importance and personal relevance) are somehow the result of a cognitive process that includes various needs. However, this is not an explicit statement in Kappelman's description of involvement, and the reader is left with questions about "what needs?", "how are they related to the two sub-beliefs?", and so on.

This analysis illustrates a problem in IS research on intrinsic involvement, namely that the conceptual content is too superficial. It consists only of an agreement about two sub-beliefs (i.e. importance and personal relevance), and it should be obvious that it is difficult to build a

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[3] For information about the logical distinction between the concept of perceived usefulness versus the concept of involvement – see Appendix A.

uniform theory tradition on this relatively diffuse basis. For instance, it is difficult to identify important consequences of intrinsic involvement when we only have an intuitive feeling of what this really means.

2.1.3 Summary and implications

As shown in Section 2.1.1, user involvement consists of two different approaches within implementation research, one behavioral and one psychological. The former approach is referred to as situational involvement, while the latter is referred to as intrinsic involvement. Situational involvement is analogous to the established concept of *system use* if we transfer it to end-user computing research, and consequently, it gives no additional meaning to this research area. Only intrinsic involvement makes sense as a genuine involvement approach in the end-user computing phase, and hence, this is the approach which is investigated in the present study.

As stressed in Section 2.1.2, the general opinion in the field is that intrinsic involvement consists of two distinct beliefs, that is, personal relevance and importance (Barki & Hartwick 1989; Hunton & Beeler 1997). Despite the agreement about these two beliefs in the IS-literature, there exists confusion regarding the conceptual content and the cognitive mechanisms behind the beliefs. This becomes especially evident if we make a comparison of definitions given in recent studies (e.g. Kappelman & McLean 1993 versus Barki & Hartwick 1994). In addition, a common phenomenon in the field is that researchers who emphasize the same conceptual core (i.e. perceived relevance and importance), or make use of the same measurement scales (i.e. usually based on Zaichkowsky 1985), often stress distinct interpretations of the cognitive mechanisms. Consequently, there is a considerable lack of conceptual understanding and clarity in the literature on intrinsic involvement.

The conclusion from the conceptual analysis in this section should influence the subsequent part of this chapter. The lack of conceptual clarity creates a need for an analysis of the conceptual content of intrinsic involvement. Without a clear conceptual content, it is extremely difficult, if at all possible, to fulfill one of the main objectives of this research, that is, to make clear and substantial arguments about how and why intrinsic involvement affects end-users' actions. Therefore, the purpose of the next section (i.e. Section 2.2) is to make the foundation for a clear and accurate conceptualization of intrinsic involvement.

2.2 A review of three references subjects

The previous section ended with the statement that there is a need for a clear and accurate conceptualization of involvement. The purpose of this section is to make the foundation for such a conceptualization. This will be done through a conceptual review of three reference areas for IS research: social psychology, consumer behavior and organizational behavior. Each of the reviews will start with a historical account of the conceptual development in the field, followed by a review of the existing conceptual approaches. The primary purpose of each review is to make the foundation for a subsequent conceptual analysis (the conceptual analysis is presented in Section 2.3).

2.2.1 Social psychology

The historical origin and the present state; The origin of involvement research, as a part of the behavioral sciences, can be traced back to social psychological research in the 1940s. At the time, Sherif and his colleagues (e.g. Sherif & Cantril 1947; Sherif & Hovland 1961) developed their *Social Judgment Theory*, which is a cognitive theory of persuasion. The motivational side of social judgment theory resides in its construct of *Ego-Involvement*. According to Sherif and his co-workers, ego-involvement refers to the relationship between an individual's self-concept and an issue or object. They defined ego-involvement as an attitude that "has the characteristic of belonging to *me*, as being part of *me*" (Sherif & Cantril 1947:93). Accordingly, they viewed such an attitude as inextricably linked to aspects of the self; in particular, to important group membership and identifications, and to related social and personal values. Because of this link to the self, they expected ego-involvement to have important motivational and affective consequences.

Since the introduction in the 1940s, social psychological researchers have used ego-involvement, or an adjusted variety, in theories and investigation of persuasive communication, impression formation and attitude change. Afterwards, this extension of the research areas has lead to different terms for nearly the same phenomenon (e.g. *issue involvement* versus *vested interest*; Crano 1995).

The approaches; Recently, Thomsen et al. (1995) introduced a review with focus on *personal involvement* which subsumes all the different approaches to involvement in social psychology. Involvement is described as a general motivational quality (e.g. it is applicable to domains other than attitudes) and Thomsen et al. point out that "Individuals are said to be personally involved with an issue, event, object, or person to the extent that they care about that entity and perceive it as important" (Thomsen et al. 1995:191). With this statement as the initial position, they generate six sources of involvement based on an extensive literature review, which are: *self-interest, values, group-interest, social-identification, self-presentation and self-esteem.* The communality between these six sources is described as their potential to activate the self-concept. The succeeding paragraph gives a brief summary of each source. It should be noted here that these six sources are not viewed as different involvement types, but as potential facets of a multidimensional conceptualization of involvement.

(1) *Self-interest-based involvement* is related to the material aspects of the self-concept (e.g. one's body or material possessions) and is based on the assumption that an entity will be important if it influences one's outcomes or important goals (e.g. examination results or a career). This conceptualization of involvement is in the literature alternatively called outcome-relevant (e.g. Johnson & Eagly 1989) and issue involvement (e.g, Petty & Cacioppo 1979).

(2) *Value-based involvement* is related to the spiritual part of the self-concept (e.g. one's values or political preferences) and is assumed to result from associations between an entity and important values, for instance in the manner that social issues (e.g. abortion or pollution control) are linked to major values. This source represents the classical conceptualization of involvement and is alternatively called ego-involvement (e.g. Sherif & Cantril 1947).

(3) *Group-interest-based involvement* is related to the social aspect of the self-concept (e.g. one's colleagues or offsprings) and can be viewed as a particular form of self-interest. The reason for this is that it deals with the association between an entity and its perceived implications for the outcomes of groups, that is, groups that are perceived as important to the individual.

(4) *Social-identification-based involvement* is also related to the self-concept and is assumed to result from associations between an entity and the individual's relationship, status, or role with respect to other individuals or groups.

(**5**) A closely related conceptualization is *Self-presentation-based involvement*, which deals with the association between an entity and how others view one. This source of involvement can be invoked by any individual(s) by whom a person may be evaluated or to whom he may be accountable. In contrast, social-identification involves reference group(s) that are important to the individual.

(**6**) At last in Thomsen et al.'s (1995) classification we have *Self-esteem-maintenance-based involvement*. This source is based on the assumption that an entity can be important to maintain, protect, or enhance one's self-esteem.

Four of these sources, namely self-interest, values, group-interest and social identification, represent motives for involvement with a particular entity (i.e. issue, people and objects). The remaining two, self-presentation and self-esteem-maintenance, constitute motives for involvement with a particular task or response. Another important point to note is that there is some disagreement about the distinctions between some of these sources. For instance, Petty & Cacioppo (1990) assert that there is no evident distinction between self-interest and value bases for involvement, and that we should regard both as a matter of personal importance and refer to it as *issue involvement*.

Even if Thomsen et al. (1995) introduce an extensive review of involvement, it is necessary to consider other contributors to get a more profound understanding of the different approaches to the involvement concept. One of the frequently quoted sources in the literature is Johnson & Eagly (1989). Generally, they define involvement as *"the motivational state induced by an association between an activated attitude and some aspect of the self-concept*" (Johnson & Eagly 1989:290). The definition stresses the proximity between an attitude and some aspect of the self-concept as the foundation for involvement (e.g. enduring values, concern about one's ability to attain desirable outcomes). Consequently, in the definition the psychological basis for involvement, in the form of attitudes and self-concept, becomes visible. It also appears indirectly that it is the intensity/strength in the psychological linkage between the attitude and the self-aspect (i.e. important values) which represents the level of involvement.

Another frequently quoted source in the literature is Petty & Cacioppo (1979). They define involvement as "*the extent to which the attitudinal issue under consideration is of personal importance*" (Petty & Cacioppo 1979:1915). According to this view, a phenomenon (usually a persuasive message) can be personally important because it is related to a variety of self-

relevant constructs such as values, goals, people, and objects (Petty & Cacioppo 1990). Hence, involvement is viewed as reflecting the degree to which a person devotes himself to the phenomenon. Expressed in another way, involvement refers to the strength or extent of the psychological linkage between an individual and a stimulus phenomenon. This view differs from the former on two points. First, it refers to the stimulus phenomenon and not to the phenomenon-related attitude. Second, as we have pointed out above, this view emphasizes that self-relevant constructs like values, goals, people, and objects do not clearly differ.

Summing up and concluding; The origin of the conceptualization of involvement in this field is Social Judgement Theory and this theory's appurtenant concept of ego-involvement (cf., Sherif & Cantril 1947). The crux in the conceptual basis is an assumed link between the stimulus phenomenon (or the phenomenon-related attitude) and one or several aspects of the self-concept. The self-concept is the most complex part of this conceptual basis, and Thomson et al (1995) describe six different aspects of it, which are: self-interest, values, group-interest, social identification, self-presentation and self-esteem-maintenance. Not surprisingly, the self-concept is the cause of a lot of the disagreement within this field. For example, Johnson & Eagly (1989) and Petty & Cacioppo (1990) have debated the question about choosing one or a set of distinct involvement concepts, based on the question about one or several dimensions of the self-concept. This question will be raised in the last sub-section.

2.2.2 Consumer behavior

The historical origin and the present state; Apart from a few exceptions (e.g. Krugman 1965; Engel & Light 1968), it was not until the late 1970s that the concept of involvement received wide attention in consumer research (Laaksonen 1994). The main focus at that time was on the nature of *low involvement*, but emphasis soon shifted to defining and measuring the concept of involvement itself. After a short start-up period, the number of studies, areas of application, and theoretical conceptualizations increased rapidly. This heterogeneity both in areas and conceptualizations resulted in a lot of different definitions of involvement. As a consequence, the status today is that there are a lot of pot-pourri definitions in this area (Laaksonen 1994), which means that a mixture of different previous definitions have emerged in the field. The status today is that there is at present no conceptual agreement on the basic nature of involvement in consumer research.

As already indicated, there are a variety of specific areas of application for the involvement concept in consumer research (e.g. advertisements, advertising media, brand choice, information processing, products and purchase decisions). There is, of course, a substantial conceptual overlap between these different areas. Our main focus in this section will be on product involvement. This topic is among the most comprehensive in consumer research and its research object has common qualities with the object under investigation in this study. The focus in the present study is on involvement toward computers and this is of course related to involvement toward products.

The approaches; Laaksonen (1994) presented a conceptual analysis of approaches to involvement within the field of consumer behavior. Founded on the literature on involvement within social psychology and marketing, she generated three different approaches to product involvement, namely, the *cognitively-based*, the *individual-state* and the *response-based* approach. While the first two are cognitively-based approaches, the last one is a behavioral approach.

Laaksonen's (1994) classification approach is quite distinct from Thomsen et al.'s (1995) approach (presented in the previous section). While Thomsen et al. (1995) base their classification on different sources of involvement, Laaksonen (1994) bases her classification on the distinction in abstraction levels between different conceptualizations of involvement. Hence, Laaksonen's (1994) three approaches should not be viewed as different facets of a multidimensional conceptualization but as different types of involvement *per se*. The following paragraph gives a brief summary of the two cognitively-based approaches.

(1) *Cognitively based involvement* views two different cognitive elements as the bases for experienced involvement, an object-related structure (e.g. an attitude) and a higher-order structure (i.e. values, needs or objectives). It is the relation between the object-related and the higher-order structure that determines the level of product involvement. Hence, the core element in this approach is personal relevance, which derives from the relative importance of the object-related structure within the higher-order structure. For example, some computer attributes (i.e. the object-related structure) can activate self-knowledge (i.e. the higher-order structure) and trigger the level of involvement (e.g. it would be fun to use this application).

(2) *Individual-state involvement* treats involvement as the motivational state of an individual, determined either by the objective and/or individual characteristics in a situation. Within this approach, involvement can be regarded as either a temporal or as an enduring state phenomenon. The specific content varies a lot (e.g. interest, emotional attachment, arousal, drive, activation and/or motivation). However, in spite of this heterogeneity in the conceptualization, the common denominator is involvement as the "motivational state" of an individual.

The common denominator of these two approaches is that they view involvement as a matter of *intensity* in cognition or emotions. However, they differ substantially with regard to the source of the state of involvement, that is, the mechanism behind the *intensity* of the involvement. The cognitively-based involvement refers to a *cognitive element*, while the individual-state involvement refers to a *motivational state*. The cognitive element represents the most abstract conceptualization of these two. In addition, these two approaches differ also with regard to the permanence of involvement. The cognitively-based involvement refers to a *long-lasting* state, while the individual-state involvement refers to a *short-lived* and/or a *long-lasting* state. Consequently, there is a substantial difference between these two approaches and, hence, they are not compatible.

Laaksonen's (1994) classification is on a very abstract level. By abstracting the extremely heterogeneous involvement literature in consumer behavior into three different approaches, Laaksonen (1994) disregards the richness of details in the research area. This is noticeable when it comes to different dimensions, aspects or facets, which the literature is crowded with (e.g. hedonic, sign, importance, self-expression and personal relevance; see Day et al. 1995 or Mittal 1995). For example, Mittal (1995) and Kapferer & Laurent (1993; see also Laurent & Kapferer 1985) represent two different approaches in this "dimension" debate (see also Celsi et al. 1992 and Zaichowski 1987). Mittal is an advocate for a unidimensional approach to involvemet (i.e. involvement as *personal importance*), while Kapferer & Laurent (1993) advocate a multidimensional approach (i.e. involvement as *personal interest, hedonic value, sign value, perceived importance and perceived risk*). However, Laaksonen's (1994) criticism of this debate is that the literature is too much focused on measurement and, hence, it does not adequately address the substantial nature of involvement.

Summing up and concluding; Three different conceptualizations of product involvement have evolved in marketing. Laaksonen (1994) denominates these as cognitively based, individual-state and response-based involvement. In agreement with the delimitation in Section 2.1, it is only the first two approaches that are of interest here. The differences between these two are considerable and they represent mutually excluding conceptualizations. The most important difference between them is that they represent different abstraction levels and that they approach the question of the cognitive mechanism behind the state of involvement in a different manner. The cognitively based involvement refers to a *cognitive element*, while the individual-state involvement refers to a *motivational state*. It should be remarked here, that there exist certain other involvement reviews in consumer research (e.g. Day et al. 1995; Zaichkowsky 1986), but these are very restricted in scope, compared with Laaksonen (1994). Nevertheless, we will come back to some of these in our subsequent discussion of the conceptualization of end-user involvement.

2.2.3 Organizational behavior

The historical origin and the present state; The job involvement construct in organizational behavior (or occupational psychology) was introduced by Lodahl & Kejner (1965). They defined job involvement in terms of two dimensions: a job performance and self-esteem relationship (i.e. a performance - self-esteem contingency); and a component of self-image related to the job (i.e. the identification with the work). Following Lodahl & Kejner's (1965) seminal article, hundreds of empirical studies emerged with the purpose of identifying possible antecedents and consequences of job involvement. The reason for this intense research response was that job involvement was (and is) considered as the key to activate employee motivation (Brown 1996).

Throughout the years, many different terms have been used to describe job involvement; e.g. *central life interests, work role involvement, ego-involved performance* and *occupational involvement* (Rabinowitz & Hall 1977). Despite the number of different labels, there is a surveyable set of conceptualizations in the area. The conceptual status of job involvement is, however, identical with the conceptual status of involvement within the previously reviewed fields (cf. Section 2.2.1 and 2.2.2). Hence, there is no common agreement within the field about the nature of job involvement (Morrow 1993).

The approaches; Recently, Brown (1996) presented a meta-analysis and review of organizational research on job involvement. In his article, he does not introduce any classification or organized approach to the different conceptual traditions in the research area, he just describes the different conceptual contributions that exist. However, it is possible to extract three main approaches[4] from his description:

(1) *Performance - self-esteem contingency*; As indicated in the introduction, this approach is related to the extent to which job performance affects a person's self-esteem.

(2) *Job identification*; As also indicated earlier, this is related to the extent to which a person identifies psychologically with his or her work. This approach is also called "work as a central life interest" (Saleh & Hosek 1976).

(3) *Performance - self-concept consistency*; This approach has a common basis with both prior approaches, and can be considered as a mix of these two. The distinctive character of this approach is that it focuses on the consistency between the actual job performance and the self-concept.

The three approaches above might seem like variations of the same theme. All have a link to the notion *self-concept*, whether it is a specific part of it or its entirety. However, there is a considerable difference if we focus just on the first two approaches. Here we have a difference between the distinct character of the concepts: *affect* and *identification*. The former of these implies that when the worker's self is tied to performance and also affected by performance, then she/he is involved. The latter implies only the first condition, namely a tie between the worker's self and his/her performance (or more exactly his work).

Among the three approaches above, the *identification* approach represents the most common conceptualization today (se also Brown & Leigh 1996 and Riipinen 1997). The reason that the *affect* approach is not equally popular, is that it does not satisfactorily demonstrate discriminant validity if compared to the conceptualization of *internal* motivation (Lawler & Hall 1970; Rabinowitz & Hall 1977). The validity problem of this approach resulted in Lawler & Hall's (1970) recommendation of the identification approach. Kanungo (1982)

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[4] Disregarding "*Active participation in the job*", which is a behavioral approach related to the person's participation in his or her own work.

followed their advice and developed the most acknowledged conceptualization of job involvement of today (Brown 1996). He defines job involvement as "*a cognitive or belief state of psychological identification*" (Kanungo 1982:342). He argues that a person's psychological identification with the job depends on both need saliency and perceptions about the job's potential for satisfying salient needs. Further, he also argues that this conceptualization is distinct from various positive job attitudes and feelings of job satisfaction. The argument goes like this: *highly involved employees may at certain times feel a high degree of satisfaction with their work and at other times and under other conditions feel deep dissatisfaction.* Hence, job involvement conceptualizes how *personally important* the job is for an employee, not how satisfied he is with his job at present.

Summing up and concluding; Three different conceptualizations of job involvement have evolved in organizational behavior. These can be denominated as the *affect-*, *identification-* and *consistency* approaches. The latter is a mix of the affect- and identification approach, and hence, this approach represents the real conceptual distinction in the area. Even if there is no common agreement about the conceptualization of job involvement, it is possible to see a tendency in that the identification approach represents the most acknowledged approach so far (Brown 1996). This approach is demonstrated to be distinct from the concepts of internal motivation, job satisfaction and other job-related attitudes (Kanungo 1982). The conceptual core of this approach is that it captures how personally important the job is for an employee, or how strongly he identifies with his work.

2.3 Comparison and integration of approaches

At present, all cognitive conceptualizations in each of the three fields reviewed in this chapter represent adaptations based on Sherif & Cantril (1947) social judgement theory. This is also true for the approach(es) adopted to IS research by Barki & Hartwick and Kappelman (1990). However, even if all approaches to involvement have the same origin, they represent different conceptualizations of involvement. The reason for this is that each field has its own and distinctive research traditions, and hence, has developed its distinctive approach(es) to involvement in connection with this.

Table 2: Different approaches to involvement

Field	Name	Definition	Comments
IS research	Intrinsic involvement	The importance and personal relevance the user attaches either to a particular system or IS in general (Barki & Hartwick 1989:59)	There exists one main approach in this field and some different sub-variations within this (e.g. Kappelman 1990; Blili et al. 1998)
Social psychology	Personal involvement	Individuals are said to be personally involved with an issue, event, object, or person to the extent that they care about that entity and perceive it as important (Thomsen et al. 1995:191)	Personal involvement is a general approach that consists of six sub-categories that usually are treated as separate approaches in the literature (e.g. issue-, ego- and outcome-relevant involvement)
Consumer behavior	Cognitively-based involvement	Involvement as referring to the perceived personal relevance of an object to an individual (Laaksonen 1994:25)	Both cognitively-based and individual-state involvement represent general categories with different sub-variations within each. E.g. the latter can be divided into one enduring and one temporal approach.
	Individual-state involvement	Involvement refers to the motivational state of an individual (Laaksonen 1994:38)	
Organizational behavior	The affect approach	The extent to which job performance affects a person's self-esteem (Brown 1996:236)	The affect- and identification approaches represent two concrete and quite different approaches in the field. There also exists a third approach, but this is a mix of the two that are mentioned here.
	The identification approach	The extent to which a person identifies psychologically with his or her work or the importance of work (Brown 1996:236)	

Table 2 summarizes the different approaches reviewed in this section, including the IS-review from Section 2. As our review and the table above indicate, there are both conceptual differences and similarities between the different research areas. Organizational behavior and, particularly, consumer behavior represent the most heterogeneous traditions, while IS research and social psychology is much more homogeneous in its conceptualization of involvement.

Utilizing Laaksonen's (1994) classification, it is possible to distinguish between two main categories across these four fields; one *cognitively-based* and one *individual-state based* (see Section 3.1.2 for more details about these two). The conceptualization of involvement within IS research and social psychology, in addition to the *identification approach* within organizational behavior, fits directly into the attributes of the cognitively-based category. This is because all these conceptualizations are founded on the idea about perceived personal relevance or importance. Hence, they represent a conceptualization of involvement where the self-concept is the most important element. The remaining conceptualization in Table 2, i.e. the affect approach within organizational behavior fits directly into the attributes of the individual-state category. This is mainly because this approach is argued to be a motivational-state approach within organizational behavior (cf., Section 3.1.3).

If we compare these two approaches (i.e. *cognitively-based* and *individual-state*), it becomes evident that the cognitively-based approach is the most suitable approach for the conceptualization of involvement. The main reason for this is that the only alternative (i.e. individual-state) is encumbered with considerable conceptual weaknesses. Laaksonen (1994) has argued that the individual-state approach generally is weak in relation to two types of criteria for evaluating the theoretical quality of a concept; the *detail level in the conceptualization* and the *level of mutually contradictory propositions* or *logical gaps* in the conceptual formation. In addition, Rabinowitz & Hall (1977) have argued that the individual-state approach represents a conceptual overlap with the traditional conceptualization of intrinsic motivation within psychology. It should be noted that the cognitively-based approach also has its conceptual weaknesses, especially with a view to providing a parsimonious meaning of involvement (Laaksonen 1994). However, there are at least two good reasons for preferring this approach in the further conceptualization of involvement. First, this approach is considered as the most peculiar, promising and suitable conceptualization of involvement (Laaksonen 1994; Rabinowitz & Hall 1977). Second, it is the most common and acknowledged conceptualization across the four research subjects that were reviewed in this chapter. Clearly, it is only the cognitively-based approach that will be brought further and discussed in the continuation of this dissertation.

That one particular type of conceptualization from each of the four research subjects can be characterized as cognitively-based, does not mean that these four conceptualizations are identical. On the contrary, they all represent different versions of cognitively-based

involvement. The reason for the difference is that each research discipline has made its own small adjustments over the years. From a general point of view it is, however, possible to identify three important and common qualities of a cognitively-based approach.

- The assumption about the duration of the state of involvement.
- The self-concept as the crux of the matter in the meaning of the concept.
- The assumption about involvement as a rather intense or strong psychological state.

In connection with these qualities, it is particularly the content of the self-concept and the assumption about the intensity of this psychological state that denote some differences between the reviewed fields. However, the purpose of the following text is to describe the general characteristics of the three qualities mentioned above, with a foundation in the reviewed fields. The differences between the fields will be touched on to the extent that they enrich this field of study.

The duration; The psychological state of involvement can be regarded as a temporary state, an enduring state, or a state caused by both temporary and enduring elements (e.g. Celsi & Olson 1988; Richins & Bloch 1992). The important contrast goes between the emergence of a psychological state in a specific situation, and the more general, long-term concern with an object. As indicated above, it is the latter conceptualization of involvement, which is most customary and widespread within the three fields reviewed in this chapter. The enduring element is usually treated as a stable cognitive phenomenon within all the fields. More specifically, it is usually treated as a self-concept or a part of the self-concept (e.g. a higher-order mental structure of self-knowledge). However, this is the next issue to be taken up here.

The self-concept; To be personally involved with an entity, usually means (within a cognitively-based approach) that the entity impinges on, reflects, or is otherwise associated with some aspect of the self-concept. This is the reason why researchers in organizational behavior emphasize "*psychological identification with one's job*" (e.g. Kanungo 1982), or that researchers in social psychology and consumer behavior emphasize "*personal relevance*" (Higie & Feick 1989; Liberman & Chaiken 1996), as the crux of the understanding of the involvement concept. Accordingly, if expressions such as "identification" and "personal" are stressed in the literature, this shows us that the self-concept plays an important role in the conceptualization.

There are several aspects of the self-concept that are mentioned in the literature (e.g. self-image, identity, goals, needs, interests, and so on). In the three different fields that are reviewed in Section 2.2, it is values, motives or needs, which are among the most frequently mentioned aspects. Hence, when an entity is perceived as personally relevant, it is because there is an association between the entity (or an entity-related cognitive structure) and some important values, motives or needs. This means that, the degree of involvement is a function of the association between the entity and essential aspects of the self. Further, the stronger the association is between the entity, or the entity-related cognitive structure, and the self-concept, the more *intense* (or strong) is the state of experienced relevance (Laaksonen 1994). That the state is intense per se (i.e. high degree) is one thing, quite a different thing is involvement as an intense psychological phenomenon if compared with other psychological concepts. This is the next issue to be taken up here.

The intense nature; All the three fields reviewed here, describe involvement as an intense psychological phenomenon. This appears from the way the literature refers to the concept in comparison with other important concepts in the fields. First, in organizational behavior this is stressed through the description of involvement as opposed to alienation (Brown 1996). Hence, in the one aspect is it possible for an employee to identify psychologically with the job (i.e. an association between the job and the self), and in the other aspect it is also possible for him to be psychologically separated from his job (i.e. a separation between the job and the self). Second, in social psychology intensity is stressed through the description of involvement as belonging to the group of "strong" or "important" attitude concepts (e.g. Crano 1995; Boninger et al. 1995). This is a group of attitude concepts that is described in terms of three different qualities, namely persistence, resistance and something that is likely to be manifested behaviorally (Crano 1995:131). Third, in consumer behavior the intensity of the concept is stressed through the assumption of involvement as a "heightened psychological state" in comparison with other concepts (Mittal 1989:697; Schneider & Rodgers 1996:249).

This assumption about the "psychologically intense nature" of the involvement concept has its roots in the use of the notion *personal relevance* (i.e. relevant in relation to the self). However, in social psychology and consumer behavior it has been argued that *personal relevance* should be expelled in favor of *personal importance* (Mittal 1995; Petty & Cacioppo 1990; Schneder & Rodgers 1996). The argumentation goes like this: a lot of things can be

personally relevant, without being personally important (Mittal 1995). For example, an end-user may experience the computer as personally relevant because the use of it is related to some second-order values (e.g. pleasure or self-gratification); but this does not necessarily mean that the computer is experienced as personally important. To be important to him, it may be related to his first-order values (e.g. his need to impress others or his need for acceptance). Consequently, we should regard relevance as a more general experience than importance, and as a consequence, relevance would appear to be an unlikely candidate for intense forms of involvement. Clearly stated, *relevance* simply means whether something is associated with the self, not how *important* it is in relation to the self.

Summary; In the introduction, it was argued for the suitability of a cognitively-based approach. The arguments were that this is the most widespread and conceptually valid approach. Further, we introduced three important qualities of cognitively-based involvement; duration, self-concept and intensity. The general characteristics of these three qualities are:

- Duration; The conceptualization of involvement is based on an enduring phenomenon (i.e. the self-concept). In consequence, the state of involvement itself is to be regarded as an enduring phenomenon.
- Self-concept; The conceptualization of involvement is rooted in the idea about a person's self-concept, which usually refers to important values, motives and needs.
- Intensity; The conceptualization is also rooted in the idea about involvement as a strong or intense psychological state. In consequence, it is argued that "the perception of personal importance" is a more adequate description than "the perception of personal relevance".

These three qualities represent the basic pillar in our conceptualization of involvement. Hence, these qualities will be brought further to the next section where the purpose is to describe the nature of involvement in the end-user context.

2.4 Conceptualizing involvement in the context of end-user computing

Three basic elements in our conceptualization of involvement were described towards the end of the prior section. Within the conceptual delimitation that these elements constitute, the next step in fully defining involvement (or what I prefer to call *end-user involvement* from now on) is to focus attention on two questions. First, what is the exterior nature of involvement within the end-user context (i.e. which entities are the cognitive elements of involvement related to in the external world)? Second, what is the intrinsic (or cognitive) nature of involvement within the end-user context (i.e. what are the cognitive mechanisms and how do they turn out in this particular context)? Answering these questions will give a detailed and complete picture of what is meant by the concept *end-user involvement.*

2.4.1 The extrinsic nature of end-user involvement

The first step in more fully defining involvement in the end-user context is to focus attention on the exterior nature of involvement. This implies that two different questions have to be raised in this section. First, what is the general entity class that the psychological state of involvement is directed toward in the end-user computing context (e.g. the computer per se or the act of utilizing the computer)? Second, regarding the decision about the entity class, does involvement operate on multiple levels or is it a one level concept (e.g. assumed software as entity class - toward a specific type of software or software in general)?

As demonstrated through Section 2.1 (i.e. regarding the implementation phase), it is possible to imagine that the state of involvement can be directed toward a lot of different entities. For example, it can be directed toward *the process* of system development or *the results* of the same process. We also indicated in Section 2.1 that it is possible to distinguish between involvement toward *task* versus involvement toward *object* (Kappelman 1995), a distinction that can be attributed to Fishbein & Ajzen's (1974) proposed separation between attitudes *toward behaviors* and attitudes *toward objects.* Utilizing this separation in connection with the present analysis, an end-user's involvement in the technology would be considered as an attitude toward an object, and involvement concerning the use of the technology would be considered an attitude concerning a behavior. However, Fishbein & Ajzen (1974) have argued and empirically shown that attitudes toward objects do not strongly predict specific behaviors

toward such objects. Instead, it is the attitude concerning the specific behavior that is said to determine whether or not that particular behavior is performed. To explain this difference, Ajzen & Fishbein (1977) introduce the notion of correspondence. They note that behaviors are specific in terms of both the action and the target of the action. Attitudes toward objects are specific with respect to the target of the action, but do not specify the action that is to be performed. Since there is only partial correspondence of action and target, a weak relationship can be expected between an object attitude and the performance of a particular behavior. On the other hand, attitudes toward behaviors are specific with respect to both action and target. Since there is complete correspondence of action and target, a strong relationship can be expected between the attitude toward behavior and the performance of a particular behavior. In connection with end-user involvement, this suggests that involvement toward the technology will be of no notable importance for end-user behavior. On the other hand, involvement toward the act of using the technology should be expected to influence end-user behavior in a significant manner. Consequently, in the continuation the term *end-user involvement* will be used and refer to a particular type of behavior in the context of end-user computing; namely "*the act of using the technology*".

In the introduction the question about which levels involvement can operate on was asked. Hence, does "*the act of using the technology*" refer to a specific act (i.e. using a word processor) or does it refer to the general act of using the technology (i.e. using the computer as a tool)? With reference to an analogous clarification within *computer self-efficacy* research (Markas et al. 1998), it is assumed here that end-user involvement can conceptualize both application specific acts (i.e. the act of surfing at the Internet), as well as more general computer-related acts (i.e. the act of working in front of a computer). The application specific end-user involvement refers to an end-user's perception about how personally important he believes that the act of utilizing this particular application is. On the other hand, general end-user involvement refers to an end-user's perception about how personally important he believes that the act of utilizing a computer is. As it appears from this distinction, general end-user involvement is more a product of a lifetime of related experiences (e.g. different applications, different computer systems, etc.), while specific end-user involvement is based primarily on the experience with a particular application. Hence, general end-user involvement can be thought of as a collection of all specific end-user involvements accumulated over time.

In agreement with prior clarification of the involvement concept, it becomes evident that the focus here should be on general end-user involvement. The opposite choice, i.e. specific end-user involvement dos not fit well with the conceptualization of involvement as a personal and enduring interest in using information technology *per se*. For example, an end-user may perceive the act of using statistical software as important for him because he is engaged in statistics, and not because he has a genuine interest in information technology. It is the end-user that perceives the "act of using the technology" as personally important in general who has a real and enduring interest in information technology. Hence, it is general end-user involvement that is most in accordance with the prior conceptualization, and hence, the concept of end-user involvement will refer to this particular level in the continuation.

Two choices are made here regarding the extrinsic nature of involvement. First, the psychological state of involvement refers to a behavior; i.e. the "act of using the technology". Second, this particular type of behavior refers to the general level of using the computer, and hence, not to behavior in connection with a specific software. These two choices make it possible to go further and describe the intrinsic (or cognitive) nature of involvement in details.

2.4.2 The intrinsic nature of end-user involvement

End-user involvement, conceptualized with foundation in the delimitations from Section 2.3, is composed of three main cognitive elements. First, *self-concept*, which is the crux of the matter in the understanding of involvement. Second, *act-related cognitive structure* (c.f. "the act of using the computer"-related cognitive structure), which is the element in this connection which is in touch with real life. Third, *personal importance*, which is the core of experienced end-user involvement, and hence, is constituted by the two prior elements. Each of these three cognitive elements will be further described in the continuation.

The self-concept; This is also named a higher-order structure or a self-structure in the literature (Laaksonen 1994). The concrete content of this structure is, for instance, regarded as a kind of self-knowledge (Celsi & Olson 1988). As mentioned earlier, this structure or self-knowledge is often assumed to be composed of values, motives or needs. However, as Petty & Cacioppo (1990) emphasize, it is not necessary to stress the different elements (i.e. values, needs and motives) in this structure, and further, distinguish between different forms of

involvement (e.g. value- versus need-based). As they argue, it is not these elements per se that are important, but that something (e.g. using the computer) is perceived as *important* to *my* goal of impressing others, *my* apprehension of important possessions, or *my* value of meaningful work. Hence, the most critical aspect of end-user involvement is that the "act of using the computer" is perceived as important *to the self*, not whether the "act of using the computer" implies different values, goals, needs, and so forth.

A consequence of regarding the self-concept as synonymous with self-knowledge is that it should be regarded as learned (Celsi & Olson 1988). The basic part (i.e. basic values, goals and needs) is learned through childhood and adolescence and remains relatively stable over time (e.g. Demo 1992; Cheek & Horgan 1983), while self-knowledge regarding the job, family and spare time may change over time with one's advancements and with changes in one's personal status (Breakwell 1992). Hence, each end-user may have his/her own particular self-knowledge (or self-concept) in connection with the "act of using the computer". However, learned self-knowledge in this connection may typically be:

- The need to impress others (e.g. through new technology, because it will demonstrate that one is up-to-date, competent and innovative).
- The value that it is important to economize ones action (e.g. through the utilization of available technology, because it will make one more efficient and economize ones limited time and energy).
- The goal that "*I want to be an expert in a valuable area*" (e.g. through the mastery of new technology, because this will give one the prospective possibility to advance in the job market).
- The value that it is important to surround oneself with advanced equipment (e.g. the latest news in technology, because it gives one an aura of being future-oriented and successful); and so on.

As these examples show, self-knowledge is a very general type of knowledge and can in principle be related to the "act of using a car", as well as the "act of using the computer". Hence, self-knowledge *per se* is not sufficient for the presence of the state of end-user involvement. In addition to self-knowledge the existence of an act-related cognitive structure is necessary.

The act-related cognitive structure; This structure is the practical or concrete element in the cognitive nature of involvement. It is usually presented in the literature as either a structural characteristic of an attitude or as a belief. However, this difference should not be regarded as important, because both these phenomena can be studied from the point of view of a cognitive structure (Laaksonen 1994). Hence, considered as a belief, this cognitive structure consists of "act-related" knowledge. Among end-users the "act-related" knowledge in connection with computers may typically be:

- Using the computer gives access to precise and reliable data.
- Working on the computer represents a concrete and efficient act.
- Utilizing the Internet gives access credible and up-to-date information.
- Applying various functions in software is synonymous with a continuous learning process; and so on.

As these examples show, this belief structure consists of knowledge (or propositions) related to the "act of using the computer". It is when this belief structure is associated with the self-knowledge (or self-concept) that the state of end-user involvement exists. Further, it is this association (i.e. between the act-related cognitive structure and the self-concept) that is denominated as *personal importance*.

Perceived personal importance; As already stressed in the prior section, personal importance is the crux of the matter in end-user involvement. To perceive the "act of using the computer" as personally important is synonymous with being highly psychologically involved in the use of the computer. Further, this means that an end-user has a belief (an act-related cognitive structure) that is associated with his/her self-concept. More precisely, personal importance expresses to what degree there is an association between the act-related belief structure and the end-user's self-concept.

2.5 Summary

Throughout this chapter, the focus has been on the conceptual content of involvement. Section 2.1 presented a conceptual review of the IS literature on involvement. The review demonstrated that there is a lack of conceptual understanding and clarity in the literature. Particularly, this become evident in connection with two common sub-beliefs, personal relevance and importance, which constitute the conceptual content of involvement in IS

research. The cognitive mechanisms behind these beliefs have never been discussed or explicitly described in the literature (i.e. to the authors' knowledge). To comply with the evident need for more conceptual clarity, three reference subjects were reviewed through Section 2.2. The purpose of this review was to provide the foundation for a conceptual analysis. This analysis was performed through Section 2.3. The analysis was initiated by an interdisciplinary comparison of different cognitive approaches toward involvement. The analysis demonstrated that a cognitively-based approach is the most accepted and promising approach from a conceptual point of view. The choice of a cognitively-based approach implies that involvement has three important qualities; it is an enduring phenomenon, it is rooted on the idea about a self-concept, and it is a rather strong or intense psychological state. These three qualities were further described as basic pillars in the conceptualization of involvement, and hence, constituted the conceptual delimitation for the definition of *end-user involvement* through Section 2.4. End-user involvement was in this section described along two proportions; the exterior and the intrinsic nature of the concept. Two choices were made regarding the extrinsic nature of involvement. First, the psychological state of involvement refers to a particular type of behavior in the context of end-user computing; i.e. "the act of using the technology". Second, this particular type of behavior refers to "the act of using" computers in general, and hence, not to "the act of using" a particular type of software. These two choices regarding the exterior nature of involvement made it possible to describe the intrinsic (or cognitive) nature of end-user involvement in detail. Three cognitive mechanisms were described through the next section; the self-concept (e.g. the need to impress others), the act-related cognitive structure (e.g. the belief that utilizing the Internet gives access to a lot of credible and up to date information), and perceived personal importance (i.e. the element that expresses to what degree there is an association between the act-related structure and the self-concept). Among these three cognitive mechanisms, the core of end-user involvement is the third concept; *perceived personal importance*. Accordingly, it is the experience of "the act of using the technology" as personally important that will be pursued in the operationalization of the concept of end-user involvement (cf. Section 5.4). The implication of this is that that we make no evident distinction between, e.g, self-interest and value bases for involvement and hence, that we regard both as a matter of personal importance (cf. Petty & Cacioppo 1990).

CHAPTER 3 IDENTIFYING EFFECTS OF END-USER INVOLVEMENT

Through this chapter we should bear in mind that the overriding purpose of the work is to identify, conceptualize and test important behavioral effects of end-user involvement. This chapter seeks to comply with the first two of these three aspects, namely the identification and conceptualization of the effects. The purpose of Section 3.1 is to review important effects within IS research and the three reference disciplines (social psychology, marketing and organizational behavior). It will be closed with a discussion of how we can utilize the present knowledge within the disciplines in connection with the identification of the effects of end-user involvement. Thereafter, in Section 3.2 the identification of effects *per se* will be accomplished. Finally, the identified effects are conceptualized in Section 3.3.

3.1 Effects of involvement within various research fields

This section consists of three sub-sections. In the first (3.1.1), the effects of involvement within IS research will be reviewed. Section 3.1.2 reviews the effects of involvement within three different reference disciplines of IS research. Each of these two sections will be closed with a discussion of the present status regarding effects of involvement in general. Finally, in Section 3.1.3 we discuss how the present knowledge about effects could be utilized in the identification of effects within the context of end-user computing.

3.1.1 IS research and effects of involvement

Through this section the effects of intrinsic involvement within IS research will be described. It will be initiated with a description of empirical studies and closed with a discussion of the present status regarding effects of involvement within the research area.

Empirical studies; In their seminal paper, Barki & Hartwick (1989) argued for system usage and user satisfaction as the substantial effects of involvement. Even if they did not test this proposition empirically, they prepared the foundation for subsequent involvement research in the field. The following text describes studies that followed up Barki & Hartwick's (1989) initial proposition. Nearly all these studies stem from implementation research except one that stems from end-user computing research.

Kappelman (1990) carries out the first empirical involvement study. In his dissertation he investigates the respective roles of user participation and user involvement. He proposes three research questions in the dissertation: (1) Is user involvement a mediator between participation and IS-success (i.e. overall user satisfaction)? (2) Is user attitude, with respect to the organization (i.e. organizational commitment and job involvement), a moderator between participation and involvement? (3) Is there a difference between user system involvement and user process involvement? Through a cross-sectional design and a subsequent path analysis, he obtains support for all his research questions. Consequently, in his study Kappelman supported Barki & Hartwick's (1989) main assumption about involvement as an important IS

variable per se. In addition, he also confirmed that user satisfaction is an important consequence of user involvement[5].

Kappelman (1996) investigates the same research questions as Kappelman (1990). The main difference between the two studies is that Kappelman (1990) focuses on user participation *per se*, while Kappelman (1996) has his focus on computer training as a form of user participation. Not surprisingly, the results from Kappelman (1996) are in the main features identical with Kappelman (1990).

After their conceptual paper, Barki & Hartwick followed up with two empirical studies (Barki & Hartwick 1994; Hartwick & Barki 1994). However, only one of these studies gives additional information about the effects of involvement, namely Hartwick & Barki 1994. In this study, the assumption about user involvement as an intervening variable between user participation and system use is investigated. The theory of reasoned action (Fishbein & Ajzen 1975) is utilized as a theoretical frame, and a longitudinal design is applied, with a subsequent structural equation approach. Through the study Barki & Hartwick obtain support for the view that user involvement should be regarded as a mediator between user participation (i.e. antecedent) and system use (i.e. the effect variable).

In addition to the specialized involvement studies above, there are two implementation studies in the field that include involvement as a secondary variable. First, a study by Seddon & Kiew (1994) adds user involvement as a variable in their test of DeLone & McLean's (1992) model of IS-success. They propose that intrinsic involvement is an important antecedent of two success indicators in this model; i.e. perceived usefulness and user satisfaction. They attain empirical support for the former of these two. Second, Jackson et al. (1997) include intrinsic involvement in their test of Davis et al.'s (1989) Technology Acceptance Model. Their study demonstrates that intrinsic involvement may play an important role in shaping various user perceptions (i.e. user attitude, perceived usefulness and intention to use).

As mentioned at the beginning of this section, there is only one genuine *end-user involvement* study in the field. It is a study by Blili et al. (1998) where the relationship between end-user involvement and two end-user outcomes is studied; i.e. *end-user computing competence* and

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[5] The results from this research are published in e.g. Kappelman & McLean (1993) and Kappelman (1995).

end-user computing success. The latter of these two outcomes is divided into *user satisfaction* and *perceived impacts of end-user computing*. A cross-sectional study is applied, with a subsequent structural equation approach. Blili et al. obtain support for all their hypotheses about the effects of involvement.

The present status; As this brief review shows, a number of effects are demonstrated to be valid through different studies; e.g. perceived usefulness, user attitude, user satisfaction and computer competence. These effects can be classified into two main variable categories: one *IS-success* category and one *end-user qualities* category. The IS-success category includes variables such as user satisfaction, system usage, user attitude, perceived usefulness and perceived impacts. All these variables are proxies for benefits of usage, and hence, are very common variables within implementation research. The end-user quality category includes at present solely one variable, that is, end-user computing competence. Only one variable as the basis for establishing a category may be too narrow. However, at present there exists only one study with focus on end-user involvement, and hence, the end-user qualities category may be seen more as a prospective category than an established category. An inevitable conclusion is that the IS-success effects constitute the predominant effect category within IS research, and that end-user effects are virtually absent within the field at present.

3.1.2 Behavioral effects within reference areas

Effects of involvement within social psychology, consumer behavior and organizational behavior are described through this section. Not surprisingly, there exists a huge amount of research on involvement within these fields. The purpose of this section is not to give a detailed description of the various studies, quite contrary, only a brief outline is given, and based on this outline some general variable categories are generated. To further reduce the complexity of the review in this section, two demarcations are made. The first is in accordance with a previous one (cf. Section 2.3), that is, only the effects related to *cognitive involvement* will be reviewed here (i.e. alternatively enduring involvement). Second, in agreement with the problem statement in the present work the focus will mainly be on behavioral effects.

Behavioral effects within the reference disciplines; The behavioral effects of intrinsic involvement in social psychology are usually some sort of information behavior or communication behavior[6]. For example, research in domains such as persuasion (e.g. Petty & Cacioppo 1990) and impression formation (e.g. Ruscher & Fiske 1990), demonstrates that involvement affects the *intensity* of information processing, that is, the effort (i.e. time and energy) subjects are willing to expend in processing information related to messages or toward other persons. This intensity in processing e.g. issue relevant thoughts, is generally supposed to be a mediating variable between involvement and resistance, extremity, persistence or stability in attitudes (Thomsen et al. 1995). However, the conclusion is that *information behavior* (e.g. thinking and speaking) is the predominant behavioral effect category within social psychology.

Information behavior or communication behavior is also the predominant behavioral effect category in consumer research. A relationship between intrinsic involvement and specific effects within this category is supported through a lot of pragmatic studies. For example, intrinsic involvement toward products (typically cars) is demonstrated to influence: (a) *information search behavior* (Bloch 1981; Tigert et al. 1976), (b) *information provision behavior* (Holbrook 1987; Richins & Bloch 1986) and (c) *word-of-mouth behavior* (Richins & Root-Shaffer 1988)[7]. However, not all the behavioral effects in this field are related to some sort of information or communication behavior. There exist some studies in the field that have investigated behavioral effects of a more distinctive character; e.g. *frequency of product usage* (Mittal & Lee 1989), *innovative behavior* (Venkatraman 1988), *adoption of new products* (Foxall & Bhate 1993), and *voting behavior* (Burton & Netemeyer 1992). Hence, consumer research seems to have a more extended view on behavioral effects than research within social psychology.

It should be noted here that two studies in consumer research have investigated the effects of intrinsic involvement toward computers. Bloch et al. (1986) investigated the effect of involvement toward computers on ongoing search after product information. They demonstrate a relationship ($r = 0.67$, $p < 0.001$) between intrinsic involvement toward

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[6] It should be noted that the main part of the effects in social psychology is cognitive (e.g. attitudinal persistence and stability, complexity of thought). For an overview see Thomsen et al (1995).

[7] These effects do not constitute mutually exclusive categories, the overlap between them is considerable.

computers and ongoing search (i.e. frequency of store browsing, amount of catalog/book/ browsing, amount of magazine reading, and frequency of product discussion). They also demonstrate that high searchers are heavy spenders on computers, and that they are attentive to new product developments, and finally, that they are providers of product information to others. The second one, a study by Higie & Feick (1989) investigates the effect of involvement toward computers on information search, information provision and opinion leadership. They demonstrate a positive relationship (an r between 0.40 and 0.46, $p < 0{,}001$) between intrinsic involvement towards computers and the three outcomes. Hence, both these studies demonstrate that intrinsic involvement toward computers may have considerable effect on people's information behavior.

Information behavior is not a present effect in organizational research on job involvement. However, there exist a number of other behavioral effects in the field. The most predominant of these are *effort* (i.e. the amount of time and energy committed to work activities; Brown & Leigh 1996; Kahn 1990), *job performance* (Brown & Leight 1996), *absenteeism* (Blau 1986), *turnover* (Blau & Boal 1987).

The present status; As this brief review demonstrates, a lot of behavioral effects are demonstrated as valid within the reference disciplines (e.g. information search, provision of information and job effort). From a general point of view, the effects across these three disciplines can be classified into two common categories, one regarding information behavior and one regarding more context specific behavioral outcomes. The *information behavior category* includes variables such as information search, word-of-mouth, information processing and information provision. The *behavioral outcome category* includes context specific variables like innovative behavior (i.e. consumer behavior) and job performance (i.e. organizational behavior). As the review clearly demonstrates, the information behavior category represents the predominant effect category across the three reference disciplines.

3.1.3 Comparison and delimitation of effects

The prior reviews illustrate that there are both considerable differences and similarities across the four research fields. The purpose of this section is to uncover aspects across these four fields that can serve as guidelines for the identification of end-user involvement effects. Table

3 summarizes the prior reviews, and hence, gives an outline of the effect categories and variables that the analysis in this section is based on.

Table 3: Different effect categories within involvement research

Field	Effect categories	Variables	Comments
IS research	IS-success	E.g. user satisfaction, perceived usefulness, perceived impact, user attitude, system usage	IS-success is a category for variables (i.e. usually perceptions) that are intended to measure how involvement influences benefits from use (e.g. user satisfaction).
	End-user qualities	End-user computer competence	End-user qualities is a category for variables that are intended to measure how involvement influences end-user characteristics (e.g. computer competence)
Social psychology	Information behavior	E.g. message thoughts, recall of message information, argument strength, attention toward and judgments about targets	Information behavior is a category that is intended to measure how involvement influences the effort that subjects attach toward information processing (e.g. issue relevant thoughts)
Consumer behavior	Information behavior	E.g. information seeking, information sharing, time spent deliberating alternatives	Information behavior is a category that is intended to measure how involvement influences the effort that consumers invest in information search or information provision (e.g. when purchasing a car)
	Behavioral outcomes	E.g. innovative behavior, frequency of product usage, voting behavior	Behavioral outcomes are a category that is intended to measure how involvement influences consumers' action (e.g. their innovative behavior or their brand choice)
Organizational behavior	Behavioral outcomes	E.g. effort, job performance, absenteeism, turnover, stress	Behavioral outcome is a category that is intended to measure how involvement influences various types of work-outcomes (e.g. effort or job performance)

Comparing the different variables across the fields in Table 3 makes it evident that each effect is very unique. Usually it has its own distinctive features, and hence, is strongly connected to a context, entity and research topic. In consequence, it may be problematic to transfer an effect directly from one field to another. If this wasn't the case, it should have been quite easy to replicate the computer-related studies from consumer behavior in an end-user setting (cf. Section 3.1.2). This is of course not possible without a complicated adaptation process. The

two consumer behavior studies are performed in a purchase setting (cf. advertisement or purchase decisions), which is a setting quite distant from an end-user setting (cf. the utilization of a computer while executing a professional job). However, that it may be problematic to transfer specific effects across different fields, does not imply that it is problematic to utilize the different effect categories (from Table 3) across the fields. Such a transfer of categories can make it easier to identify the context-specific, and hence, most appropriate effects.

As Table 3 demonstrates, all three reference disciplines have common categories, that is, consumer behavior has one common category with social psychology and one with organizational behavior. The exception in this connection is IS research, which has its own particular categories. The important question here is what we can learn from this distinction in connection with the identification of the effects of end-user involvement. An evident insight is that there may be a potential to transfer effect variables or effect categories from the reference disciplines to IS research. However, instead of transferring a variable or a category from one field to another, it may be more appropriate to use the categories from the reference disciplines as guidelines in the identification of more context-specific end-user behavior effects. Hence, categories such as information behavior and behavioral outcomes may not help us to directly point out specific effects, but they may help us to validate the relevance of potential candidates.

The discussion above gives us two important guidelines for further work. First, instead of transferring effects directly from other fields, the effects of end-user involvement should primarily be identified within the context of end-user computing. As we have seen, prior involvement research demonstrates clearly that *the effects which survive in the long run within the reviewed disciplines, are usually effects which are very context, entity and problem specific*. Second, two general categories can be utilized as guidelines in the identification of effects, namely information behavior and behavioral outcomes. To utilize these two categories is also in accordance with the problem statement; cf. to identify the *behavioral* effects of involvement within the context of end-user computing.

3.2 Identifying effects in the context of end-user computing

As stressed earlier, two general guidelines from the previous section should govern the identification of effect variables in this section. First, the identified effects should be *context* and *entity* specific. Second, the two categories information behavior and behavioral outcomes should serve as general guidelines for the identification of the effects. In order to follow the former it is necessary to give a description of the phenomenon end-user computing. Hence, this section will be initiated with a brief description of end-user computing as an organizational phenomenon. The purpose of this description is to identify some basic behavioral activities of end-user computing that may be influenced by the psychological state of end-user involvement.

End-user computing is nothing exceptional or rare. It is one of the most common and widespread phenomena in our organizations today. As the authors in a special issue on end-user computing say: *"We are entering an age when every business transaction begins and ends with a computer operated, of course, by an end user"* (Igbaria & Guthrie 1998:3). Hence, the term *end-user computing* describes white-collar workers utilizing the computer as a tool in connection with their work activities. The only demarcation of importance in this connection is to exclude IS-professionals from this group of computer users (e.g. systems developers or members of MIS staff).

A standard procedure in every article regarding end-user computing is to state the simple facts above, but unfortunately it is quite unusual to discuss the nature of end-user computing any further. That is, it is quite unusual to discuss which activities represent the most general and basic activities across different organizations and types of end-users. However, to the author's knowledge, there exist three articles that have explicitly described some phenomenas as the *basic elements* of end-user computing. Table 4 gives a systematic overview of these, and shows the elements that the various authors describe as basic in connection with end-user computing.

Table 4: Basic elements of end-user computing

Author(s)	The tool-related element	The support-related element	The role specific element
Larsen (1991)	hands-on use	use of support functions	delegation of computer tasks
Brancheau & Brown (1993)	tool utilization	EUC support options	development process
Speier & Brown (1997)	user application characteristics	end-user support usage	end-user awareness of policies

The most common elements across these three authors are located in the two columns called the *tool-related element* and the *support-related element.* Labeled as *activities* (or behavior), these two groups of elements can be referred to as *tool utilization* and *support behavior.* From a general view, these two behaviors represent the most widespread and basic activities in end-user computing. This means that they are common for all categories of users that are practicing end-user computing.

As opposed to tool utilization and support behavior, the role specific element in Table 4 represents the end-user type (e.g. managers) or problem statement specific element that these authors have included in their model. Accordingly, it is tool utilization and support behavior that represent the most general behavioral elements, and hence, the elements that will be further conceptualized in the continuation of this work.

The first element in Table 4, i.e. *tool utilization*, is what end-user computing in a wider sense is about, namely the utilization of different applications in connection with various job related tasks (i.e. word processing, spreadsheet, desktop publishing, and so on). It is, therefore, for obvious reasons natural to regard tool utilization as a sub activity in the job situation. It follows from this that computer utilization is one activity among others that an employee may prefer to commit his time and energy to. Since job effort (i.e. the allocation of time and energy toward job activities) is regarded as an important effect of job involvement, it is

reasonable to regard tool utilization as a potential effect of end-user involvement (i.e. the allocation of time and energy toward tool utilization). This assumption also has support from an analogous effect within consumer behavior, namely *frequency of product usage* (cf. Mittal & Lee 1989). Accordingly, tool utilization fits directly into the category of behavioral outcomes (cf. Section 3.1.3), and additionally, it has a lot in common with at least two different effects within this category (cf. job effort and frequency of product usage).

The second element in Table 4, *support behavior* follows naturally from tool utilization, that is, the need for help to solve an emergent problem or the need for more information about functions or facilities. Support behavior has two different aspects: First, the end-user's seeking of help, advice or guidance in connection with his usage of the technology. An example of this may be the use of a help-desk to get more information about a function in a word processor. Second, the providing of computer-related information to coworkers, that is, a situation where the end-user operates as an assistant for others. An example of is when an end-user provides a colleague of him with advice about the usage of a function in a word processor. Support behavior described this way can be regarded as a particular form of information or communication behavior. Hence, this element is related to the category of information behavior in the previous section. In addition, it is analogous to a lot of concrete effects within this category (e.g. information search and information provision; Higie & Feick 1989).

3.3 Conceptualization of identified effects

In the previous section, two basic behavioral activities of end-user computing were identified, i.e. the end-users tool utilization and their support behavior. In order to make use of these two concepts in the subsequent chapters there is a need to define their conceptual content further. Hence, this section begins with a conceptualization of tool utilization and ends with a conceptualization of support behavior.

3.3.1 Tool utilization

Three qualities of tool utilization will be described in this section. The first regards the core of the concept, namely what the "usage of personal computers in the work context" means. The second quality regards the question of what utilization (or usage) represents as a variable in the IS research (i.e. a success indicator or a behavior). Third, the relationship between tool utilization and the purpose of various applications in the context of work will eventually be discussed.

A matter of usage; In the organizational environments of end-user computing, the computer is an individual tool that the worker employs to record, store, look up, analyze and manipulate data. Hence, the computer is, in effect, a powerful pencil, eraser, calculator, filing system, communication device, and so on (Regan & O'Connor 1994). In more specific terms, the computer provides the white-collar worker with a lot of functions through its different applications. It is the usage of these applications, with their different functions, which is the crux of *tool utilization*. For example, using a financial management package frequently involves access to accounting, inventory and financial analysis functions. Hence, tool utilization can be described as a matter of usage, that is, the usage of hardware and software in relation to solve different tasks or problems.

Tool utilization versus IS-success; Utilization, also named *system* or *IT usage* (e.g. Seddon 1997; Straub et al. 1995), is one of the most frequently applied concepts of IS-success. It is a widespread belief among IS researchers that tool utilization affects white-collar performance (e.g. Davis 1989; Thompson et al. 1994). In the extension of this it is assumed that utilization is a necessary, albeit insufficient, requisite for deriving the benefits of IT. The essence of this

perspective lies in the statement that "unused systems are failures" (Seddon 1997). Since the opposite of failure is success, there is further assumed that utilization (i.e. extensive degree of) is equal to success. However, as Seddon (1997) has pointed out, this is definitely not an obvious conclusion. In his criticism of the common belief in "equality between utilization and success", he claims that utilization basically has three different meanings. First, as we already have indicated, utilization can be seen as a proxy for the *benefits* from using the technology. When this is the case, it is assumed by the researcher that: (a) the adoption of a computer is a rational decision, based on expectations of some benefits, and (b) that there is a direct relationship between the utilization of the computer and the assumed benefits. Second, utilization can be assumed as a pointer for *future* utilization. Utilization in this meaning, is an indicator for the future, that is, an indicator of a prospective potential that is not full-grown so far (i.e. comprehensive utilization). Hence, this conceptualization represents a contrast to the conceptualization of usage as an indicator of IS-success *per se*, because the core of this conceptualization is utilization as a *behavior* and not as an IS-success pointer. According to Seddon, utilization as an indicator of future usage, is what researchers really mean when they investigate the relationship between attitudes and usage (e.g. Davis et al. 1989; Thompson et al. 1994). Third, usage can be assumed as a behavior *per se* or a behavioral state for the time being. In the extension of this is it possible to view utilization as a behavior that is a necessary, but not a sufficient, precursor of individual or organizational impact. Hence, tool utilization in this sense, is not seen as an indicator of IS-success, only as a pure behavior. It is the individual or organizational impact (if any), hence, the real consequences of utilization, that is to be measured to demonstrate IS-success.

It is this last-mentioned conceptualization of the term tool utilization that is seen as the most adequate for the present study. The main reason for this is that it may be incorrect to perceive tool utilization *per se* as an indicator of success in the usage-phase (i.e. in contrast to the implementation phase). For instance, some of the utilization may be related to purposeless usage. Clearly, tool utilization in the present study is conceptualized as a behavior, not as a success measure.

Purposeful versus purposeless usage; Organizational theory of prosocial behavior (e.g. Organ 1988; Van Dyne et al. 1995) makes it possible to distinguish between two types of work behavior; *job-specific* and *nonjob-specific*. The former refers to behavior that is associated with the accomplishment of tasks that constitute the core of a job. The latter (i.e.

nonjob-specific usage) refers to behavior that does not directly advance the core of the job (e.g. helping others and spontaneous participation in various social activities). It may be easy to perceive nonjob-specific behavior as an ineffective or dysfunctional behavior. However, this behavior may have the potential to add value to a work environment (e.g. contribute to team building, facilitate communication), satisfying individual curiosity and the desire to explore (Guthrie & Gray 1996).

The distinction made above between job-specific and nonjob-specific work can be related to two types of tool utilization. First, a type of utilization behavior that is strongly related to task accomplishment – called *task-specific utilization* in the continuation. This is the kind of computer utilization that is assumed to be the most predominant in connection with end-user computing. IS researchers usually assign this meaning to all kinds of utilization without questioning it any further. Thompson et al. (1991) conceptualize utilization in this manner when they describe it as a matter of intensity (i.e. minutes per day), diversity (i.e. number of packages) and frequency (i.e. how frequently it is used). Hence, they assume utilization implicitly as a matter of task-specific utilization. Second, we have tool utilization as a type of behavior that goes beyond ordinary task accomplishment - called *non-task specific utilization* in the continuation. For example, utilization that is related to overexposure of document form, playing computer games, execution of personal work and sending personal e-mails (Guthrie & Gray 1996). However, it is difficult to sort out behavior on a concrete level that fits directly into each of these two different categories of utilization. To overexpose document form may be a good example of this. In one aspect it is a kind of task accomplishment, in another aspect may it be a type of behavior that goes beyond task accomplishment. In order to make the distinction between task-spesific and non-task specific clearer, we will make a distinction here between utilization in connection with concrete job-tasks (i.e. communication and decision analysis) and utilization as the exploration of facilities and functions in connection with various types of software. The latter refers to a type of experimental behavior, while the former refers to a more purposeful behavior, that is, given that "doing the job" is equivalent with performing work tasks. Hence, non-task specific utilization understood this way is about trying out everything, just to see what it does, or trying it out to make it work. In its essence it can be defined as unproductive time spent by users tinkering with software. Task-specific utilization is regarded as a more economical activity and can be defined as productive time spent by users solving their job-tasks.

Summing up; Tool utilization is a matter of usage, that is, the usage of hardware and software in connection with the execution of a job. It is here regarded as a pure behavior, and not as an indicator of successful usage of the computer. In consequence, it is divided into two different sub-categories. The first of these is task-specific tool utilization, which is related to the execution of the core tasks in a job. The second is non-task specific tool utilization, which is related to the usage of the computer that does not directly advance the core of the job.

3.3.2 Support behavior

As indicated in Section 4.2.1, support behavior consists of two different aspects. The first aspect regards an end-user's demand for help, advice or guidance when problems arise in connection with his use of the technology. The second aspect regards his role as a provider of help, advice or guidance to his coworkers. This Subection is introduced with a general description of support, namely what the "usage of end-user support in the work context" means from an end-user perspective. The section continues with a description of the sources of support that an end-user may choose among when a problem emerges when he utilizes his technology. Eventually, the discussion will be brought back to the two different aspects of support behavior, namely the distinction between seeking support and providing support.

A matter of solving problems; End-user support is usually analyzed from two different but strongly related approaches in the IS literature. In one aspect support is regarded as a question about an institutionalized means of supporting end-user computing activities – frequently named as information center (IC) research (e.g. Magal 1991; Essex et al. 1998). In the other aspect support is regarded as a question about support needed by end users or support preferred by end-users – frequently named as end-user support research (e.g. Bowman et al. 1993; Mirani & King 1994). Not surprisingly, it is the latter perspective that is in accordance with our conceptualization of support, that is, the conceptualization of support from an end-user perspective.

The question of importance is related to which support services end-users usually are exposed to within the organizational context. The literature is ambiguous on this issue and from a broad perspective one may say that the concept of support includes two main aspects: *control* (e.g. standards for data backup and standardization of hardware and software to be used) and *support* (e.g. user training and assistance on software products). Mirani & King (1994) are

representative of such a perspective when they include nine different sub-aspects in their description of support (i.e. provided by the IC): application development support, standards and guidelines, data provision support, operational support, purchasing-related support, variety of software support, staff characteristics support, post-development support, and backups/security. However, such an all-embracing perspective intends to describe all potential services delivered from an IC, and thus, it may not be representative of describing support from other sources in the end-user context (e.g. colleagues and help-facilities). A more suitable perspective may be to see support just as a matter of problem solving. The advantage of such a perspective is that it is valid for all types of sources within the end-user context. However, it excludes e.g. user training and education from the support concept, and demarcates support to be a matter of "here and now" assistance. More specifically, one may say that end-users frequently have questions about and problems with the tasks they have learned to perform using the technology. The help they need in dealing with questions and problems on an ongoing basis comes in the form of support. As such, support can be seen as a type of ad hoc consulting. The key characteristic of support as problem solving is that it is an on-going phenomenon (George et al. 1990), the only thing that may change in the course of time is which source(s) that is preferred. The next issue to be taken up regards the diversity of sources of support in the end-user context.

A typology of support sources; As indicated above, most end-users need a considerable amount of information in order to solve emergent problems when they utilize a computer. A lot of research has shown that they meet this demand through the usage of multiple internal and/or external sources (e.g. George et al 1990; Rockart & Flannery 1983). However, as Brancheau & Wetherbe (1985), Lee (1986) and Speier & Brown (1997) have pointed out, it is the usage of internal (i.e. within the organization) sources which is most predominant in the context of end-user computing. Corresponding findings in IT-diffusion research support this assumption (Brancheau & Wetherbe 1990; Larsen 1993). In consequence of these findings, only internal sources will be appreciated as important here, that is, the sources that exist within the organizational context.

Unfortunately, there exists no common classification of support sources in IS research, only some study specific descriptions of sources (e.g. Brancheau & Wetherbe 1985; Larsen 1991). However, from a general point of view, it is possible to classify potential sources after *type* and degree of *formalization*. Type of source is here seen as related to how *personal* (e.g. IS-

staff and coworkers) versus *impersonal* a particular source is (e.g. manuals and on-line help instructions), and formalization is seen as related to how *informal* (i.e. coworkers) versus *formal* a source is (i.e. institutionalized). Table 5 shows the relationship between these two different dimensions.

Table 5: Support sources in the organizational context of end-user computing

		Degree of formalization	
		Informal	**Formal**
Type of Source	**Personal**	*Coworker support and the use of a "trial and error" strategy*	*IS-professional*
	Impersonal	*Self-acquired documentation*	*Institutionalized documentation*

As Table 5 demonstrates, the division goes between informal versus formal sources and personal versus impersonal sources. Assistance provided by coworkers, which is provided on an informal and voluntary basis (or so-called underground support), is represented in the upper left-hand corner. In addition, self-support as a form of "trial and error" activity is also represented in the same rectangle. Institutionalized support or consultation provided as a part of an IS-professional's job is represented in the upper right-hand corner. The usage of self-acquired documentation is localized in the lower left-hand corner (e.g. computer journals, computer books). The table is accomplished through the localization of institutionalized documentation in the lower right-hand corner (e.g. software manuals, on-line help instructions). In the text below follows an account of the conceptual content of the three different phenomena that are localized in Table 5; namely *consultation* (i.e. coworker and IS-professional support), *documentation* (i.e. self-acquired and institutionalized documentation), and the use of a *"trial and error"* strategy.

Consultation; The key characteristic of consultation is that it is a type of inter-human ad hoc help in relation to problem solving (George et al. 1990). Utilizing theory on social support and helping relationship in organizational behavior (Burleson et al. 1994:xii), the act of consultation can be conceptualized as "an interactional or communicative process" occurring between the end-user (i.e. as a recipient) and a coworker or an IS-professional (Brancheau & Wetherbe 1985). Although a variety of terms are used, research on social support and helping relationships has converged on two major categories of consultation relationship: *action facilitating* and *nurturing* (Cutrona & Suhr 1992). In the present study we disregard nurturing as a relevant category, because it deals with interactions or communicative processes where the purpose is to comfort, console or calm the recipient (i.e. pure emotional support). The focus here is on support, in the meaning of advice, help, guidance or assistance, that is, interactions or communicative processes that are related to present problem solving tasks, together with future usage of a computer. Hence, action-facilitating consultation is the most suitable category for the purpose of this study.

As indicated, action-facilitating consultation deals with interaction where the intention is to assist the recipient to solve or eliminate an emergent problem (e.g. a non- running Excel-macro) or to provide him with information that may be suitable for his future usage of the computer (e.g. information about facilities in a new version of word processing). Included in action-facilitating consultation is both the subcategory *informational* and *tangible* consultation. Information includes advice (e.g. I think you should use the spelling function in Word); factual input (e.g. if you don't use the chkdsk-utility quickly, you will lose a lot of files); and feedback on actions (e.g. you shouldn't have saved your documents on only one floppy disk). Tangible aid includes offers to provide needed goods (e.g. floppy disks, manuals, software) and services (e.g. formatting a floppy disk, making a back up, making up a directory structure).

Documentation; In contrast to consultation, which is a specific form of human interaction, documentation exists as a form of interaction between end-users and a certain technology. However, use of documentation as a source has some features common with consultation, that is, it is an ad hoc and on-going interaction process. The evident distinction between these two regards the usage of documentation as a source of seeking self-help, and consultation as a source of seeking/receiving help from others. Documentation as a source consists of written

and/or visual information about the application software, how it works, and how to use it (e.g. manuals and on-line help instructions; Torkzadeh & Doll 1993).

Trial and error; In contrast to both consultation and documentation, "trial and error" is more a process of information generation than a process of pure information search. The concept is closely related to what Magal (1991) and Essex et al. (1998) have called user *self-sufficiency*, and where important dimensions are *feeling of control, independence from the IC, understanding of IT* and *the ability to develop a small system.* However, the difference may be that user self-sufficiency describes some qualities of an end-user (cf. feeling of control), while "trial and error" describes a situation of independence from consultation and documentation. Moreover, "trial and error" describes the situation where the user prefers to use an experimental strategy to solve a problem, that is, instead of searching after information from IS-professionals, coworkers, manuals, etc.

Seeking versus providing; As stressed above, when end-users search computer-related information, they are likely to both utilize personal (i.e. consultation or self-support) and impersonal sources (i.e. documentation). From these categories they search for and/or generate information about issues like: How to delete a file; How to maintenance a catalog or a file structure; How to utilize a function in a software; and so on (Speier & Brown 1997). Utilizing theory from consumer research (e.g. Beatty & Smith 1987; Bloch et al. 1986), the end-user's motive for searching after and/or generate this particular information can be attributed to two different aspects. The first is to enhance the quality of the ongoing problem solving activity with the computer. The second aspect is to acquire a bank of computer-related information potentially useful in the future (either for personal use or for dissemination to others). In practice, it may prove difficult to separate these two aspects from each other, and they are therefore treated as sub-dimensions of one general motive here.

It ensues from the description above that end-user's motive for being engaged in search has a potential to increase their computer expertise. A growth in expertise may be seen as the main benefit of ongoing search after computer-related information. More specifically, the benefit of search is that it makes an end-user feel well informed, enhances his computer care, adds to his feelings of self-actualization, and improves the quality of his personal computer usage. Further, these specific benefits are driven by the importance an end-user gives to computers in

general (cf. Moorthy et al. 1997), and hence, end-users involvement is likely to be an important antecedent of search after computer-related information.

As indicated above, a result of extensive search for information may be an "information-bank" that may constitute a potential source for dissemination to peers (cf. Bloch et al. 1986). A number of studies have demonstrated the existence of such a phenomenon in the context of end-user computing (George et al. 1990; Larsen 1993; Lee 1986; Speier & Brown 1997). Accordingly, these studies have demonstrated that the existence of end-users in the provider-role is a widespread and important phenomenon within end-user contexts.

The role as a provider of computer related information to colleagues has two important aspects. The first regards providers and their motive and benefits in connection with the role as providers and the second regards the recipients and their motive to search from this particular source. First, an important assumption in prosocial theory is that providers are not only pragmatic, but also expressive of their values and self-identity (e.g.; Bandura 1986; Shamir 1991). Hence, if computers are perceived as personally important for an end-user, he can as a provider, gain personal benefits from helping colleagues with computer related problems. More specifically, a consultation has the potential to increase the provider's self-image as a computer-expert and strengthen his role as a provider of computer related information. Second, a recipient asking the provider, usually initiates consultations among colleagues at work (nearly 75 to 90 percent; cf. Bruke et al. 1976; Kaplan & Cowen 1981). The recipient may be motivated by the low probability of being refused help, and hence, loss of his self-esteem (Clark et al. 1974; Shapiro 1983). In addition, research in the IS-field has indicated colleagues may be likely to provide more "just-in-time" and problem sensitive information, if compared with IS-professionals (i.e. the information center; cf. George et al 1990).

Summing up; Support behavior was defined as a matter of problem solving and has two different aspects: One that regards the end-users' support behavior *per se* and one that regards the sources of support in the end-user context. Support behavior can be divided into two different types of behavior: First the end-user's search for computer related information, and second end-users in the role as providers of computer related information. The different sources of support within an organizational context can be divided into three potential sources: Consultation, documentation and a "trial and error" strategy.

The end-user's motive for searching after and/or generate computer related information is connected to the desire to enhance the quality of problem solving and to their aim of being a computer expert. It is possible to consider them both as the main benefits from ongoing search after computer-related information. Further, these benefits are here hypothesized to be driven by the importance that end-users attach to "the act of using the computer" in general. That is, they are driven by the end-user's level of involvement.

An end-user's motive for going into the role as a provider for the coworkers is connected to his self-image as a computer expert. As a provider he can gain personal benefits, that is, a consultation has the potential to increase his self-image as a computer expert and strengthen his role as a provider of computer related information. However, it is usually the recipient that initiates a consultation. His motive for searching from this particular source lies in the low probability of being refused help, and the probability of "just-in-time" and problem sensitive information. The consultation is from the provider's standpoint hypothesized to be driven by the importance that he gives to "the act of using the computer". Hence, it is his high degree of end-user involvement that drives him into the role as a provider.

The potential sources to search from in an end-user context are divided into three general categories, that is, consultation, documentation and a "trial and error" strategy. Both the two first sources have an informal and a formal aspect. The "trial and error" strategy is a pure informal source. Consultation can be sought from both coworkers (i.e. informal) and IS-professionals (i.e. formal). Documentation can be self-acquired (i.e. informal) or institutionalized (i.e. formal). Consultation was conceptualized as an action-facilitating phenomenon. This means that it deals with both informational (i.e. advice, factual input and feedback) and tangible consultation (i.e. provision of goods and services). Documentation was conceptualized as a source that consists of written and/or visual information about computers.

CHAPTER 4 RESEARCH MODEL AND HYPOTHESES

This part of the dissertation consists of two sections. In Section 4.1 the research model is presented and in Section 4.2 the accompanying hypotheses are presented.

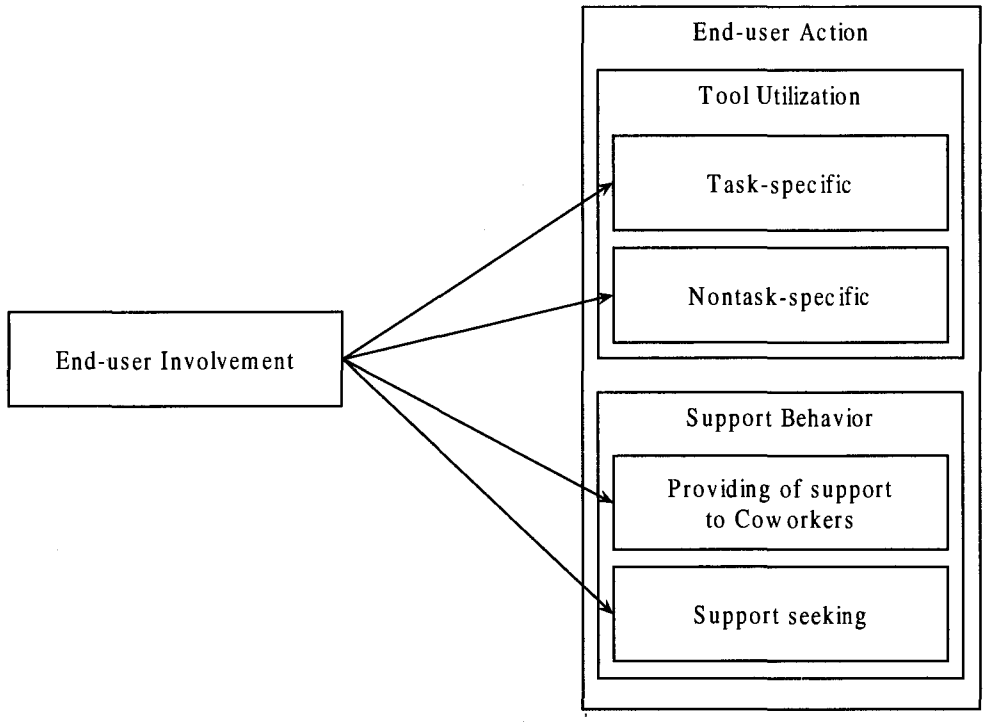
4.1 Research model

As stressed in Chapter 1, end-user involvement and the contributions of end-user involvement to end-user behavior are curiously understudied in the IS-field. The only treatment of the topic has assumed the theory formulation of "greater end-user involvement leads to greater end-user computing success" (Blili et al 1998). The same proposition also prevails within the implementation research on user involvement (Hwang & Thorn 1998). The main idea behind the present work is that this common theory formulation may be too narrow to comprehend the true nature of end-user involvement in a work setting. As a result, it is argued for end-user involvement as more a two-edged sword than a unidirectional success concept. For example, on the one hand involvement may lead to a type of task-specific utilization that usually is associated with "doing the job"; on the other hand it may lead to a type of experimentation that often is associated with "futzing and tweaking". The main point here is that end-user involvement is expected to influence end-users' behavior in a much more comprehensive way than proposed by the present IS-success literature.

In Chapter 3, two aspects of end-user behavior were identified and argued to be important outcomes of end-user involvement. The first aspect deals with the end-users' level of tool-utilization, which regards their usage of software packages in a work situation. If some of the end-users perceive "the act of using the technology" as personally important then they are expected to expend a lot of time and energy in the utilization of different types of software. The second aspect deals with the end-users' support behavior, which regards their computer-related information behavior within the context of work. Hence, end-users who perceive "the act of using the technology" as personally important are expected to expend a lot of time and energy on computer-related information behavior.

Both tool utilization and support behavior were further divided into respective sub-elements through Section 3.1. First, tool utilization was divided into a task-specific and a non-task specific element. The former refers to tool utilization in connection with the execution of different job tasks, while the latter refers to the exploration of functions and facilities in connection with available software packages. Second, support behavior was divided into seeking and providing. The former refers to the end-user's own acquisition of computer-related information, while the latter refers to the end-user's communication of computer-related information to others.

Figure 1: The effects of end-user involvement



The elements of end-user behavior that are described above, and shown on the right side in Figure 1, are assumed to represent basic behavioral elements in end-user computing. All these elements are expected to be influenced by end-user involvement in the same manner. Stated differently, the more end-users perceive the "the act of using the technology" as important, the more time and effort they are likely to commit to personal computing activities. End-users' available time and energy at work is regarded as a bounded resource. There are a lot of things (e.g., work tasks or professional subjects) an end user can allocate his time and effort to but only a few of them may be perceived as personally important. Therefore, it is proposed that:

End-user involvement is positively associated with the effort end-users invest in personal computing activities.

This is the main proposition behind the variables and relations shown in Figure 1. To test it empirically, it is necessary to divide this general proposition into hypotheses related to the different sub-activities of personal computing.

4.2 Hypotheses

The purpose of this section is to present the hypotheses that follow from Figure 2. The first of these concerns the end-users' tool utilization and the second their support behavior.

The effect on tool utilization; Supposing that computer usage is voluntary in a work context, then the end-users can choose their own level of utilization (i.e., the number of software packages and the amount of time in front of the screen), that is, the usage of a technology is here assumed to always have a more or less optional character. Even if others (e.g. the IS-professionals) enforce the initial adoption of a software package, it is up to the user to decide the exact level of utilization of this package in his particular job. For example, he has to decide which tasks to support with the software or the level of functions or facilities to utilize. Consequently, tool utilization in the meaning task-specific and non-task specific utilization is normally a voluntary choice.

The force behind effort that end-users mobilize toward utilizing a computer is the psychological state of end-user involvement. More exactly, if an end-user perceives computing as personally important, he will choose to commit time and energy toward the utilization of the available technology. As demonstrated in Chapter 2, this has for a long time been regarded as an important effect of involvement in IS research (Jackson et al. 1997; Barki & Hartwich 1989; Hartwich & Barki 1994).

As stressed previously, to perceive a computer as personally important is not a calculative usefulness-belief, based on an assumption about the usefulness of the software packages in the work context. Quite the contrary, this belief is based on the perceived personal value of computers (i.e., how important are computers for the attainment of *my* goals and values). Therefore, it is not expected here that the psychological state of end-user involvement influences the *direction* of the usage, that is, how purposeful the utilization is. The psychological state is only supposed to influence the *intensity* of utilization *per se*, that is, how much time the computer is used and the quantity of the usage. The inevitable consequence of this is that both task-specific (i.e. where task usefulness is expected to be present) and non-task specific utilization (i.e., where usefulness is rather dubious) are expected to be influenced by the level of end-user involvement in the same way. More precisely, this means that an end-user with high involvement will actively look for

possibilities to utilize available software in connection with his different job tasks (i.e task-specific utilization). In addition, it also means that an involved end-user will look for, and hence explore, functions and facilities within available software packages that it may be possible to utilize (i.e. non-task specific utilization). Accordingly, the following two hypotheses can be proposed:

H1: *The level of end-user involvement correlates positively with the level of task-specific tool utilization.*

H2: *The level of end-user involvement correlates positively with the level of non-task specific tool utilization.*

The effect on support behavior; Support as defined here is a matter of seeking or providing computer related information in connection with the utilization of software packages. The time and energy an end-user allocates to information search, alternatively providing information to peers, is assumed to be driven by the relation between computers (i.e., a computer related cognitive structure) and his self-concept (i.e., personal goals and values). This is also the basic assumption in the psychological theory of search (see Moorthy et al. 1997), and hence, the initial position for the proposed effect on support behavior here.

The most straightforward prediction of the psychological theory of search is that end-user involvement influences the amount of information end-users seek in connection with their software utilization. Hence, it can be asserted that end-user involvement determines the *intensity* in search activities (i.e. how much time and energy is committed toward search activities), and further, the total amount of information that is acquired. Therefore, end-users that are highly involved in "the act of using the technology" are also expected to have a greater need for support than others do (i.e. ceteris paribus). However, support behavior is not necessarily only a question about the quantity of acquired information, it may also be a question about the usage of various sources. As stressed through Section 3.3.2, end users can choose among a lot of potential sources when they need information regarding e.g. how to solve a problem. They can for example choose among software manuals, the help-desk, coworkers and the help-menu. In addition, they can also choose to generate the necessary information through a "trial and error" strategy. If we recall here that end-user involvement is equivalent with perceiving "the act of using the technology" as personally important, it

becomes evident that the usage of a help-menu or performing a "trial and error" strategy may be of significance for an end-user with high involvement. The rationale behind this approach is that an end-user with high involvement prefers to utilize the technology when he solves problems instead of asking colleagues or IS-professionals. Hence, the reason is simply that he likes to tamper with the technology when there is an opportunity to do so. This approach also has a quantity aspect, but it regards the quantity of information acquired from particular sources. Consequently, the fundamental difference here goes between two arguments, one regarding the effect on the total amount of information, and one regarding the effect on the amount of information from a particular type of sources (i.e. technology related sources). In short, this can be stated as the difference between end-user involvement determining *intensity* in search (i.e. amount) versus determining *direction* of search (i.e. types of sources).

As indicated above, a rationale regarding an effect on the end-user's choice between sources seems more valid in connection with end-user involvement than a rationale regarding an effect on the total amount of information that is searched. Hence, it seems reasonable to assume that a high level of involvement makes end-users independent of personal sources (i.e. help-desk and coworkers), because users with high involvement prefer to utilize the technology when they are in need of support. That is, involved end-users prefer to seek necessary support through technology related sources (i.e. using the help-menu or performing a "trial or error" strategy). This implies that they become self-supporting, because they do not load others with extra work when they seek support. Accordingly, we propose:

H3: *The level of end-user involvement correlates positively with being self-supporting through the utilization of technology-related sources when seeking support.*

End-user involvement is not only expected to influence support seeking, it is also expected to affect the extent to which an end-user takes the role as a provider of assistance to his coworkers. The role as a provider of computer related information has two important aspects in an end-user context. One of these regard providers and their benefits of a consultation and one regard the recipients and their motive to search consultation from an involved coworker.

First, involvement toward "the act of using computers" is expected to drive end-users that provide consultation to others. The reason is, end-users that perceive computers as personally important, are motivated to engage in their coworkers' computing activities to e.g. increase

their self-identity. Hence, when computers are experienced as important for the end-users' self-concept, they can as providers, gain personal benefits from helping coworkers with computer related problems. They may see an opportunity to express their values and self-identity, increase their self-image as computer expertise, and this will strengthen their role as providers of support (e.g., Bandura 1986, Shamir 1991).

Second, the provider role can also be seen from the recipient's aspect. A recipient asking the provider initiates nearly all consultations in a work context (i.e., 75 to 90 percent; e.g., Bruke et al. 1976; Kaplan & Cowen 1981). The main argument for this is that a coworker is motivated to seek assistance from someone whom he has a close relationship to (i.e., strong tie), and that he experiences as a user who is engaged and interested in computers. Hence, the point here is that an end-user with high involvement is likely to be in the role as a provider of computer-related information to his coworkers. This effect of end-user involvement on provider behavior is supported through studies in consumer behavior (cf. opinion leadership; e.g., Richins & Root-Shaffer 1988; Venkatraman 1988). Accordingly, we propose:

H4: *The level of end-user involvement correlates positively with the extent of computer related assistance provided to coworkers.*

CHAPTER 5 METHOD

This chapter provides a description of the research design and data collection procedures employed to empirically test the hypotheses. In Section 5.1, considerations regarding the choice of research design are addressed. Section 5.2 includes a discussion and description of the empirical setting. In Section 5.3, the sample frame and the sample procedures of the study are addressed. Issues with respect to measurement are considered in Section 5.4. Section 5.5 provides considerations with respect to control variables. Finally, data collection issues are addressed in Section 5.6.

5.1 Research design

This study's primary purpose is to test the four hypotheses presented in Section 4.2. An important question as far as the proposed hypotheses are concerned is whether they imply causal relationships. The necessary conditions for causality are isolation, association, and directionality (Bollen 1989). *Isolation* concerns the ability to ensure the absence of spurious and masked associations between the variables that are proposed through the hypotheses. *Association* concerns the ability to demonstrate covariation between an independent construct (cause) and the dependent variable (effect). Finally, *directionality* concerns the ability to demonstrate the temporal precedence of the cause (i.e., to demonstrate that the cause precedes the effect in time). The hypotheses are formulated as covariation hypotheses and, as such, do not imply complete causal relationships. The main reason for this lies in the property-disposition nature of the variables in Figure 1 (cf. Section 4.1). We should bear in mind from Section 2.4.1 that end-user involvement is defined as an enduring psychological state, and further, that this state comes into being as a result of different application specific end-user involvements accumulated over time. End-user involvement conceptualized as a general psychological state, points more in the direction of a psychological property than as an isolatable stimulus. The same is true for the dependent variables in the model such as e.g. coworker assistance, which is a social pattern that is presumed to establish itself over time. End-users usually utilize a number of different software packages and need to socialize themselves within an organizational context to identify "who can give assistance on which package". As such, all the relationships in the research model have more the qualities of property-disposition relationships than as stimulus-response relationships. Accordingly, the nature of the relationships makes it difficult to meet the third causality requirement, that is, the ability to demonstrate the temporal precedence of the cause. This further implies that manipulation of the variables within a limited time perspective is seen as inadequate, and hence, pure experimental testing of the model is excluded as a possible option.

Two kinds of designs are relevant when pure experimental testing is inadequate: correlation design (or cross-sectional study) and some quasi-experimental designs (e.g. panels and time-series designs). The best alternative is panels and time-series design to simultaneously accomplish the causal requirements of isolation (e.g. through control group) and direction of influence (through two or more observation periods). However, the use of panels and time-series design presupposes introduction of an treatment, and as indicated above, this may be

unavailable in the case of end-user involvement. Even if it were possible through the effectuation of e.g. a new software portfolio in an organization (changing from Microsoft to Lotus products), it would have been a very resource-demanding process, especially with a view to the time scope of data collection and cost associated with a change of software products. Consequently, the introduction of a end-user involvement treatment or a so-called before and after measurement of the dependent variables is seen as unavailable, and hence, quasi-experimental designs in the meaning panels and time-series designs is excluded as a possible option.

The remaining and realistic alternative is a correlation design, and as indicated above, this design has a serious limitation with respect to the establishment of direction of influence. However, the direction is not of crucial importance for two reasons. First, it can be argued that direction is the least important criterion of causality since the two other (isolation and covariation) must be satisfied first[8] (Bollen 1989). Second, the involvement literature does not dispute the direction of influence for such hypotheses as are presented in this study. The chosen design also has limitations with respect to isolation if compared with experimental designs (cf. control group and randomized sample). However, with a sample from a homogeneous population and with inclusion of control variables it is possible to meet this requirement in a satisfactory way. The third causality requirement, i.e. covariation or association, can be easily satisfied through the identification of a setting with mature end-users. End-users within a mature IT setting are expected to have a stabilized psychological relationship with the technology, and hence, variance in end-user involvement is expected to be present within such a context. Accordingly, it should be possible to meet the causality requirements in an adequate way through a correlation design.

In spite of the limitations discussed due to causality requirements, the chosen design also has several advantages. First, a correlation design enables the specification of the value mapping between constructs (e.g. γ_{11}) and for determining variance explained (e.g. $\gamma^{S2}{}_{11}$; $1\text{-}\xi^{S}{}_{1}$) (McGrath 1982). In the same manner, it also makes it easier to account for random and systematic measurement errors through the use of reflective measurement models and e.g. structural equation modeling (Jöreskog & Sörbom 1982). Thus, it is possible to avoid errors

[8] Direction of influence is only of interest after a parameter estimate has been identified (covariance) and when a parameter satisfies the requirement of isolation. Before such conditions are established the question of directionality is absurd.

that may lead to biased and attenuated covariation coefficients. Second, a correlation design has the potential to be effectuated as a field study where realism in the meaning "realism of context" is high and hence, it is usually thought to enhance the external validity of the findings (e.g. Cook & Campbell 1979).

Summing up and concluding; As not all three conditions of causality can be established satisfactorily by the chosen research design, only association rather than causation can be inferred from the empirical study (Schumacker & Lomax 1996). The main reason for this was argued to be the difficulty involved in encountering the requirement of temporal precedence. Thus, the chosen design is not alone sufficient to establish causality. However, the temporal precedence is *a priori* established through theory. Moreover, the hypotheses are formulated as covariation and, as such, do not imply temporal precedence (cf. Chapter 4). Both the requirements of association and isolation may be established satisfactorily through ensuring variance (i.e. selecting an IT mature organization), aiming at a homogeneous population and including control variables. Accordingly, if the theory is empirically supported, we find it reasonable to argue that the requirements of causality are, at least to some extent, established.

5.2 Empirical setting

As argued in the previous section, the empirical study can be classified as hypothesis testing. Internal validity should have priority over external validity when conducting hypothesis testing (e.g. Cook & Campbell 1979). By selecting one organization, one accounts for the potential impact of organizational factors, and thus, internal validity is improved. Additionally, the choice of one single organization may decrease the amount of error variance, and hence, the statistical power will be improved. As a general theory of end-user involvement, the study's theory should hold for end-user contexts in general. A theory claimed to be general can be rejected if it is falsified for any subgroup of end-user contexts (Calder, Phillips & Tybout 1981). Even if the theory is supported in the study, however, establishing external validity can only be done through several studies in different end-user contexts (Salipante et al. 1982).

The chosen organization is the Norwegian Oil Company, Statoil, with approximately 17 000 employees. The company aims at being a leader in utilizing IT within all types of work

processes, and hence, has invested a lot of resources in its application portfolio and IT infrastructure the last decade. As an example, Statoil was among the firsts companies in Norway that bought and deployed home computers throughout the entire organization, some 15.000 in total. Every home computer is connected to the Internet at the expense of Statoil - in return employees accepted a mandatory CD-ROM based learning program.

Statoil's application portfolio consists of collaboration technology (e.g. Lotus Notes and Intranet), IT for knowledge management (named FAROS) and a lot of office products (e.g. WordPro, Lotus 123 and Freelance Graphics). The application portfolio for administrative work is standardized across all business units within Statoil and is distributed from centralized servers. In principle, nothing is saved on an end-user's personal computer. Of course, there exist end-users with particular application needs, but this is the exceptional case.

Statoil's IT organization consists of one centralized department and one local department within each of five different business units in the corporation. Every local IT department is organized as an independent profit center and each is benchmarked against the others. From the end-users' point of view, it is the help-desk which represents the visible part of the IT department. The desk is contacted by telephone and is organized around 4 problem areas (i.e. Tele and IT-supported conference room, Notes products, UNIX, other issues - including password and logon). Normally, an end-user has no documentation available in his office.

The standardized IT infrastructure consisting of a common IT- politics, IT-department, help-desk, application portfolio and so on, is a circumstance that makes it possible to describe Statoil as a relatively homogeneous setting. Stated in another way, organizational factors that may have a potential to lead to spurious or masked influence in the research model are invariable in this particular setting. Therefore it is reasonable to expect slight or no impact from organizational factors, and hence, internal validity is improved through the choice of this particular setting. Additionally, the homogeneous IT infrastructure within Statoil also decreases the potential for error variance, and hence, this will improve the statistical power when the research model is tested.

As demonstrated above, Statoil can be characterized as an IT-mature organization. Personal Computers have been used since the beginning of the 1980s, and today, the ratio of computer to administrative employees is one to one. Accordingly, there are reasons to believe that this

is an organization where the average end-user has been exposed to participation[9] in various forms (i.e. computer training and IS development participation), in addition to different types of hardware and software. Consequently, sufficient variance is expected in the independent variable end-user involvement. In addition, a mature end-user context also promises sufficient variance in both utilization and support patterns.

5.3 Sample frame, procedures and size

As mentioned above, Statoil employs approximately 17 000 people. Due to the enormous variation in job types within Statoil, the sampling frame should not include all these people. Choosing a subgroup of employees, i.e. a relative homogeneous sample frame, has two important benefits. On the one hand it reduces the possibility of factors outside the model to improving the statistical power of the test through less random error variance. On the other hand it improves the internal validity through isolation of third variables that might affect the relationship among the variables in the model (Cook & Campbell 1979).

To perform the criterion of homogeneity, "administrative workers" within Statoil is defined as an initial sampling frame. IT/IS professionals are excluded from the frame because the literature on end-user computing usually does not view them as genuine end-users. In addition, managers are also excluded from the frame due to a high pressure of work, and hence, the probability of a low response rate. These exclusions result in a sampling frame made up by professionals (i.e., engineers and economists) and secretaries.

A simple random sampling procedure is applied to select the respondents for the study (see Frankfort-Nachmias & Nachmias 1992:177). This procedure ensures that every respondent within the sampling frame has equal and known probability of being included in the sample. This was done through the random selection procedure of a personal administrative system for Statoil.

The sample size has to be decided. According to Bollen (1989:268) "no hard and fast rule" exists to determine the sample size. However, the appropriate size will depend on the type of

[9] Usually seen as the main antecedent of involvement in the literature (cf. Chapter 2).

statistical method to be used as well as the available number of respondents. When conducting theory testing of models with more than one dependent variable, structural equation modeling (SEM) has advantages over canonical correlations (see e.g. Jöreskog & Sörbom 1982, Bollen 1989). Thus, SEM is the best method for testing the measurement and structural model of the study. Simulations with SEM provide indications that the sample size should be above 100 cases to give reliable test statistics. The guideline is that the higher n, the more risky the test of the entire model. A risky test is associated with a small confidence interval associated with the test statistics (i.e. χ^2) for the hypothesized model, and thus greater likelihood of rejecting the entire theory (H0). Moreover the greater the number of free parameter in a model, the greater sample size (n) is needed (Bollen 1989). Kline (1998) suggests a minimum of 5:1 ratio between sample size and the number of free parameters to be estimated. In addition, he says that 20:1 is a desirable goal and that 10:1 may be a realistic target. With a model of approximately 20 indicators, 5 variables and 4 paths (i.e. minimum 30 parameters) a sample of minimum 300 may be in accordance with the "realistic" target.

5.4 Measurement

The theoretical construct is the starting point of all measurement, and hence, the objective of measurement is to link theoretical construct to observed variables in a valid manner. With this as the initial position, Bollen (1989) describes four steps that should be included in a measurement process: (1) give the construct meaning (i.e. define the construct), (2) identify the dimensions and latent variables to represent them, (3) form measures, and (4) specify the relation between the measures and the latent variable(s). The first two steps in this process were accomplished through Chapter 2 (end-user involvement) and Chapter 3 (utilization and support behavior). Accordingly, the purpose of this section is to form measures and specify the relation between measures and the latent variable. To fulfill this purpose, the study will aspire to meet Churchill's (1979) recommendation to adopt and adapt measures used and validated in other studies. However, due to the fact that measurements scales for all concepts within IS research are not established an original development of measures is necessary. The challenge is to find appropriate measures in the reference disciplines, to adapt them to the empirical context, and to enable subsequent construct validity assessment. The chosen measures are reported below and the complete list is presented in Appendix B.

End-user involvement is defined as experiencing the "act of using the computer" as personally important. There exist two different measures of involvement within IS research. None of them is found to be suitable for this study. The first was adopted from the marketing researcher Zaichowsky (1985) and introduced to IS researchers by Barki & Hartwick (1994). It is a unipolar scale intended to measure two different aspects of involvement: *importance and personal relevance*. Since this study intends only to measure one of these two aspects (i.e. *personal importance*), Barki & Hartwick's scale is not seen as suitable. The second scale was developed by the marketing researchers Kapferer & Laurent (1993), and adopted into IS research by Blili et al. (1998). The scale is bipolar and intends to measure five different dimensions of involvement: *interest, pleasure, sign, risk importance and risk probability.* Since this scale is founded on a multidimensional conceptualization of involvement, while the present study builds on a unidimensional conceptualization, the scale is not seen as suitable. However, Schneider & Rodgers (1996) have developed a consumer involvement scale, based on a pure *personal importance* conceptualization, that could be used as a model for an analogous end-user involvement scale. Based on this scale seven items were generated which stress personal importance through statements like "it means a lot to me", "it is very important to me" and "it is of significant value to me". In order to further stress personal importance it was decided to include the "value, motive and need" aspect (cf. Section 2.4.2) through statements like "because it increases my possibilities to do it well later", "to reach my personal goals" and "if I am going to feel comfortable". Hence, each item is formulated as a *means-target* statement, e.g. *"It is important for me to work regularly with information technology, because I then learn something that promotes my personal goals"*. Each of the seven items is measured using a 7-point scale, ranging from "a poor description" to "an excellent description".

Task-specific utilization is defined as tool utilization in connection with different job tasks. Based on three earlier studies[10] Igbaria & Iivari (1998) developed a utilization measure consisting of four dimensions: actual daily use (time), frequency of use, use of different packages and the use for different business tasks. The last dimension consists of eleven items (e.g. using the computer to communicate with others, using the computer to control and guide activities) which was evaluated to be consistent with the conceptualization of *task-specific*

[10] i.e. Cheney & Dickson 1982, Igbaria & Huff 1989 and Srinivasan 1985.

utilization. Each of the eleven items is measured using a 7-point scale, ranging from "a poor description" to "an excellent description".

Non-task specific utilization is defined as tool utilization that is distinct from the execution of specific job tasks. There does not exist any measurement scale for this concept within IS research, nor in other research fields. However, as argued through Section 3.3.1 the main element in this connection is software exploration, that is, the experimentation with functions, menus and facilities in available software. Based on this, four indicators are formulated: (1) I experiment a lot with different functions of the software packages that I use, (2) I try frequently new-to-me functions in the software packages that I use, (3) I invest frequently a lot of hard work in experimenting with better and more appropriate layout when I write a document in WordPro, (4) I experiment regularly with different menu selections within the different software packages that I use. Each of the four items is measured using a 7-point scale, ranging from "a poor description" to "an excellent description".

Self-support is defined as the end-user's independence from IT experts for advice or support. Three different instruments exist within IS research that measure independence from the information system function (Bergeron et al. 1990, Magal 1991, Rivard & Huff 1988). However, the focus across these three scales differs somewhat. Bergeron et al. (1990) name the variable as *user autonomy* and measure two aspects: control over development and the ability to master applications. Magal (1991) names the variable as *user self-sufficiency* and measures five aspects: understanding of IC, feeling of participation, feeling of control, etc. Rivard & Huff (1988) label the variable as *satisfaction with independence from DP* (data processing staff) and measures five aspects: I value independence, DP is very bureaucratic, I can use the computer when I want, etc. As this brief description of the measurement scales shows, all three scales are focused toward general independence from IC/DP. None of these scales are directly focused toward independence from IT experts for advice or support. Consequently, none of these three scales are found to be appropriate for the present study.

A scale made up by two dimensions is developed for the purpose of measuring independence from IT experts for advice or support. The first dimension is problem focused (technical vs. software) and the second is support-source focused (IT expert vs. the help-menu in the software). Semi-structured interviews with end-users, together with interviews with IS-staff, generated descriptions of common support problems within Statoil's end-user context (cf.

Section 5.6). In addition, the interviews identified four common support sources: Statoil's help-desk, colleagues, help-menu and "trial and error". Hence, each of the eleven problem-focused items is measured using a 4-point scale, ranging from "help-desk" to "trial and error".

Colleague support is defined as the providing of computer related advice, support or assistance to colleagues in the work-context. There does not exist any measurement scale for this concept within IS research. However, there exist measurement scales within reference disciplines that are close to the definition of colleague support given here (e.g. Anderson & Williams 1996, Podsakoff et al. 1990). A scale is adopted from Flynn et al. (1996) and adjusted to the end-user context. Six indicators are formulated: *My colleagues* (1) ...ask me sometimes for help in connection with their PC usage, (2) ...ask me sometimes about advice in connection with their usage of one or more applications, (3) ...consult me frequently in connection with technical questions about PC usage, (4) ...utilize me sometimes as a adviser in connection with their PC usage, (5) ...perceive me as an adequate information source in connection with their usage of various applications, (6) ...come frequently to me for assistance in connection with their PC usage. Each of the six items is measured using a 7-point scale, ranging from "a poor description" to "an excellent description".

In addition to the five variables in the research model, six variables measuring - (1) position, (2) leadership responsibility, (3) age, (4) gender, (5) PC-experience and (6) educational level - are included in the questionnaire (see Section *5.5 Control variables*).

The various measures reported above are polished through semi-structured interviews and a subsequent pre-test among ten end-users in Statoil (cf. *Appendix E*). The semi-structured interviews resulted in knowledge about Statoil's IT- practice, the portfolio of applications and the end-users support preferences. Especially the scale that measures how "self-supported" the end-users are, is a product of these interviews. The pre-test resulted in minor adjustments of some of the indicators in the various measurement scales. Finally, the indicators are additionally refined through discussions with researchers that know the different concepts and variables. Accordingly, this comprehensive process has contributed to the accomplishment of a satisfactory face and content validity of the measures. The items are presented in Appendix A. The final measures are in Norwegian and are included in the original questionnaire presented in Appendix D.

All the measures reported above are seen as reflective. Hence, each indicator in a measure is assumed to be an effect of the latent variable (Bollen & Lennox 1991). Formally stated, $y_1 = \lambda_{11}\eta_1 + \varepsilon_1$, where y_1 is one of the indicators of the latent variable, η_1, where the relationship between the indicator and the latent variable is represented by a coefficient, λ_{11}. The error term of y_1 is represented by ε_1. When multiple indicators are applied, the latent variable is expected to explain and account for the covariations among the indicators. Consequently, the reason why the indicators are correlated is due to an underlying and hence, common cause (i.e. the latent variable). This approach is labeled *classical test theory* and is accompanied by good procedures of validity and reliability assessments (Churchill 1979, Bollen & Lennox 1991).

5.5 Control variables

As argued in Chapter 5.1, including control variables is important to meet the requirement of isolation. The literature on involvement is, unfortunately, of little help in the identification of potential control variables. It seems like a common weakness of the studies using involvement as an independent variable is a lack of control over factors that are outside the research model but might have affected some of the variables in the model. These factors may not be included in a research design because of the difficulties in identifying them. However, without controlling the effects of as many of factors other than research variables as possible, it may be hard to detect pure effects of involvement on end-user action. In order to identify factors that may affect the main research variables, reference is made to prior studies regarding attitudes, tool utilization and support behavior. Consequently, some demographic and background characteristic variables that have been suggested as determinants of attitudes and usage behavior are included in this study.

Experience with computers has served as a correlate to a variety of computer-related outcomes. Martin (1988) found in a study of adoption of advanced manufacturing technology that employees who had worked with computers had more favorable attitudes toward complex uses of computers than those whom had not. Although computer experience influence attitudes as shown by Martin (1988), it would be surprising if a correlation was not observed between experience with personal computers (past behavior) and current utilization. Such an assumption has support in a study by Lee (1986). He demonstrated that prior experience with

computers was correlated with the number of different application that a user utilizes. In addition, Thompson et al (1994) demonstrated that computer experience might influence both attitudes and utilization at the same time in a study of Triandis (1971) theory of behavior. With regard to support behavior, it seems like the relationship between experience and support behavior has not been investigated in the IS field. However, Mirani & King (1994) found support in a study of end-user computing support that support needed by end-users correlated with sophistication level (i.e. a variable that may have some qualities common with experience). Accordingly, it seems reasonable to select computer experience as a control variable.

While some previous IS research has considered gender differences, these differences were mostly examined outside the specific context of end-user computing. However, a number of empirical studies on the use of computers by students reveal gender-related differences. Bannert & Arbinger (1996), for instance, demonstrated in a study of secondary school students that gender was correlated to differences in attitudes toward computers and actual use of computers. Morover, Shashaani (1993) found in a study of 202 college students that females were less interested in computers and in consequence that they were low-frequency users. These results suggest that differences occur between the sexes in computer-related circumstances that, by logical extension, could affect both involvement and utilization in the context of work. Concerning any possible influence on support behavior, it is only Bowman et al. (1993) to the author's knowledge that have investigated this subject. They demonstrated in a study of end-user support that gender influenced choice of assistance. Hence, it seems reasonable to select gender as a control variable.

Both age and education have served as correlates to a variety of computer-related outcomes. Brancheau & Wetherbe (1990) found in a study of diffusion theory in the context of end-user computing that both age (low) and education (high) were correlated with early adoption of software. In an analogous study Larsen (1993) was able to support one of these findings, the positive correlation between education level and early adoption. These results suggest that age and education influence user behavior in end-user contexts that, by logical extension, could affect both involvement and utilization in the end-user context. As regards support behavior there is only one study, i.e. Bowman et al. (1993), that has investigated the relation between age, education level and support behavior. They obtained no support for a relation between age, education and the type of support preferred. However, since age and educational level

seem to influence user behavior from a general point of view, they will both be included in this study as control variables.

The final control variable that will be included in this study regards the number of software packages utilized by end-users. This variable is usually treated by IS researchers as a dependent variable or as a component within a dependent variable (Thompson et al. 1991). However, it may be reasonable to argue that "number of packages" can explain the level of both task-specific and non-task specific utilization. Moreover, it can be argued that "number of packages influence support behavior, particularly with a view to the assistance that a coworker may provide to his coworkers. That is, the more packages one uses, the more experienced one is in the use of packages, the more assistance one may provide to coworkers.

In summary, the control variables included in the research design are computer experience, gender, educational level, age and number of packages. All these are regarded as variables that have a potential to influence both the level of end-user involvement and end-user action in the same manner.

5.6 Data Collection

The purpose of the data collection is to collect valid data regarding the measures included in the hypothesized model. Information about the constructs was gathered through primary data. Survey data through the application of a structured mail questionnaire were applied as the main data collecting technique. A five-stage procedure was applied for questionnaire development and data collection. First, a draft for the questionnaire was developed, based on an adaptation of existing scales. A meeting with IT-managers and consultants in Statoil, where the draft was presented, identified a need for further refinement of the various measurement scales. Second, with the purpose to fit the scales closer to the end-user context in Statoil, it was decided to carry out semi-structured interviews with 10 end-users. An IT-manager in Statoil identified interview objects that were assumed to be well informed about IT and of verbal nature. Each of the ten interviews lasted from 1,5 to 2 hours. Third, based on systematized information from the interviews some of the scales in the questionnaire were further refined. Especially the Self-supporting scale was refined, due to the contextual nature of support sources and problems that emerge in conjunction with the usage of the technology.

Fourth, a refined version of the questionnaire was mailed to all the interview objects for comments on the various scales. All ten copies were returned, and the comments resulted in further improvements of the scales. Fifth, based on the sample characterization described in Section 5.3, a specialized unit for questionnaire distribution in Statoil selected 500 end-users as respondents for the final questionnaire. All questionnaires were mailed to the respondents in February 1999 and resulted in a preliminary response rate of 50% after 14 days. All respondents received a reminder after 14 days and this resulted in a final response rate of 66%. Table 6 shows the descriptive statistics for the final sample.

Table 6: Descriptive statistics for the final sample

Distributed questionnaires	500
Returned questionnaires	328 (66%)
Women	30%
Men	70%
Age (%):	
< 25	1
25 – 35	29
36 – 45	36
46 – 55	24
> 55	10
Type of education (%):	
Primary school	1.5
College	13
University (≤ 2 years)	13
University (> 2 years)	31
Master degree	34
Doctor's degree	7.5
Job type (%):	
Skilled work	74
Administrative work	16
Other	10
Average computer experience	11 years

CHAPTER 6 ANALYSIS AND FINDINGS

This chapter contains the data analyses of the study. Section 6.1 provides a report of the descriptive statistics and an accompanying discussion. Section 6.2 is concerned with an assessment of the measurement model and the respecifications done to meet the requirements of a satisfactory measurement model. The section also deals with an analysis of convergent validity, discriminant validity and reliability. The hypothesized model and hypotheses are tested in Section 6.3. The test is divided into three parts, one test of the baseline model, one test of the baseline model including control variables, and finally, one exploratory test of managerial implications where job performance is included as a criterion variable. The chapter concludes with Section 6.3 where the main findings are summarized.

6.1 Descriptive statistics

A key assumption of structural equation modeling (SEM) is that items should posess adequate distributional characteristics. The distributional aspects of the items are captured in the reported values for skewness and kurtosis (cf. Table 7). Extreme values of skewness and kurtosis lead to unreliable standard errors as well as unreliable model fit (Jöreskog & Sörbom 1996). According to Kline (1998), items with absolute values of univariate skewness greater than 3.0 seem to be described as "extremely" skewed in the SEM literature. There appear to be fewer consensuses about kurtosis, however; absolute values of the univariate kurtosis from 8.0 to over 20.0 have been described as "extreme" kurtosis (Kline 1998). A conservative compromise, then, seems to be that absolute skewness value greater than 1.5 and absolute kurtosis value greater than 4.0 may suggest a reliability problem. If possible, items that are highly non-normal should therefore be deleted from inclusion in further analyses.

Univariate skewness and kurtosis seem not to impose specific problems in the sample. In terms of absolute values, 27 out of 39 items have both skewness and kurtosis values less than 1. The remaining items have skewness values less than 1.5 and kurtosis values less than 2.0. In general, most of these nonconforming items are platykurtic with negative kurtosis values down to –1.86 (cf. Self-support scale, item 7). However, 70% of the items have unproblematic univariate distributional characteristics, and the remaining 30% seem not to impose specific problems.

In addition to normality assessment, the inspection of missing values is also a crucial aspect of data screening (Kline 1998). In the sample 272 of the 328 cases are complete (i.e. 83% are complete). Additionally 25 cases have one variable with missing data. The most problematic item is number 8 within the *Task-specific utilization* scale that has 7% missing cases. The remaining items have missing data for between 0 (i.e. 17 items) and 4% (i.e. 2 items). Unfortunately, there is no clear guideline about how much missing data is too much. For instance, Cohen & Cohen (1983) suggested that 5% or even 10% missing data on a particular item is not large, but that the seriousness of greater proportions is more ambiguous. Obviously, the usefulness of an item with the majority of its scores missing may be suspect. However, as the reported values indicate, missing values for any of the items in the sample do not appear to be a significant problem in the present sample.

Overall, the data are assumed to be missing by random, and hence, this makes three ways to deal with missing observations: listwise deletion, pairwise deletion and estimation (Kline 1998). Listwise deletion has the advantage that all analyses are conducted with the same cases, but usually to the costs of a small effective sample size. Both pairwise deletion and estimation have the advantage of a relatively higher effective sample size. However, there are no clear guidelines in the literature regarding the selection among these different techniques, it seems to be a matter of taste. Since the amount of missing values is relatively small in the present sample, and a high effective sample is superior over a small one when SEM analysis is conducted, it seems reasonable to choose pairwise deletion for the further analysis.

Table 7: Descriptive statistics[11]

	Mean	Std.dev.	Skewness	Kurtosis	N
End-user involvement:					
Item 1	4.482	1.561	-0.304	-0.653	328
Item 2	3.513	1.583	0.191	-0.869	328
Item 3	3.285	1.621	0.369	-0.767	328
Item 4	3.768	1.677	0.073	-0.956	328
Item 5	3.930	1.646	0.047	-0.851	328
Item 6	5.184	1.433	-0.627	-0.232	328
Item 7	4.943	1.399	-0.472	-0.344	327
Task-specific utilization:					
Item 1	4.246	1.653	-0.303	-0.391	325
Item 2	3.838	1.592	-0.135	-0.578	322
Item 3	3.864	1.512	-0.245	-0.625	320
Item 4	3.557	1.585	0.032	-0.728	317
Item 5	3.921	1.635	-0.269	-0.755	317
Item 6	3.965	1.625	-0.347	-0.703	314
Item 7	3.754	1.591	-0.161	-0.652	316
Item 8	3.083	1.733	-0.752	0.460	305
Item 9	4.482	1.757	-0.531	-0.524	323
Item 10	4.412	1.822	-0.354	-0.888	323
Item 11	3.794	1.740	-0.008	-0.854	320
Non-task specific utilization:					
Item 1	3.719	1.761	0.166	-1.031	327
Item 2	3.509	1.706	0.248	-1.041	327
Item 3	3.491	1.737	0.300	-0.997	327
Item 4	3.268	1.638	-0.549	0.553	328
Coworker assistance:					
Item 1	4.325	1.781	-0.164	-1.070	327
Item 2	4.478	1.699	-0.302	-0.869	327
Item 3	3.162	1.737	-0.728	0.531	327
Item 4	3.614	1.835	0.216	-1.018	327
Item 5	3.763	1.890	0.152	-1.143	326
Item 6	3.289	1.885	0.487	-0.919	327

[11] Self-support is measured using a 4-point scale while the remaining variables are measured using a 7-point scale.

Self-support:					
Item 1	2.899	0.986	-0.130	-1.410	327
Item 2	2.917	0.970	-0.066	-1.524	319
Item 3	2.868	1.198	-0.301	-1.532	321
Item 4	1.645	1.099	1.484	0.540	323
Item 5	2.789	0.890	0.200	-1.317	323
Item 6	1.768	1.021	1.281	0.427	322
Item 7	2.425	1.398	0.145	-1.863	323
Item 8	3.000	0.924	-0.473	-0.814	313
Item 9	3.329	0.935	-1.028	-0.336	322
Item 10	2.728	0.941	0.121	-1.206	320
Item 11	2.285	1.192	0.441	-1.348	322

6.2 Measurement model

The two-step modeling approach, emphasizing the analysis of two conceptually distinct models, measurement and structural, is employed for this study. The overall rule for such an approach is that the measurement model should obtain satisfactory fit to the data before the structural model is assessed. Jöreskog & Sörbom (1993:113) give the rationale for such a rule when they state:

> *The test of the structural model, i.e. the testing of the initially specified theory, may be meaningless unless it is first established that the measurement model holds. If the chosen indicators for a construct do not measure that construct, the specified theory must be modified before it can be tested. Therefore, the measurement model should be tested before the structural relationships are tested.*

Test strategy; As indicated above, a test of measurement models begins with the specification of how the latent variables are measured in terms of the observed variables and their data (i.e. a covariance structure), and hence, is a test of to which degree the latent variables are reflected by the measures. The validity of the measurement model is here validated by confirmatory factor analysis using LISREL 8.30. A very common procedure for the validity process is applied: (1) specify the a priori measurement model; (2) fit this model to sample data; (3) evaluate the model in terms of goodness of fit and parameter estimates; and (4) respecify or modify the model to improve its fit to the data (Segars 1994).

There are a number of measures generated by LISREL to evaluate the goodness of fit of the measurement model. The most popular index is perhaps the *Chi-square statistics*. This test

measures the distance between the sample covariance matrix and the fitted covariance matrix (Jöreskog & Sörbom 1993). However, the use of the chi-square value is questionable here since it has a tendency to be significant in large samples (i.e. samples above 200). An alternative is to use the *Normed Chi-square*, which is the ratio of the Chi-square divided by the degrees of freedom. This index provides two ways to assess inappropriate models: (1) a model that may be "overfitted" thereby capitalizing on change, which is typified by values less than 1, and (2) models that are not yet truly representative of the observed data and thus need improvement, having values greater than an upper threshold, either 2 or 3 (Hair et al. 1995).

Beyond reporting the chi-square value it is also very common to report *Root mean square error of approximation* (RMSEA), *Comparative fit index* (CFI) and *Non normed fit index* (NNFI). RMSEA is a test of the likelihood of the model (i.e. theory) to be an acceptable approximation of the data (i.e. the real world phenomenon). For example, if the RMSEA equals 0.0 then there is no discrepancy between the estimated and the observed covariances (i.e. perfect fit). A value of less than 0.05 indicates a close fit of the model and a value between 0.05 and 0.08 indicates an acceptable value (Browne & Cudeck 1993). Both the CFI and the NNFI test indicate the proportion in the improvement of the overall fit of the theoretical model relative to a null model (Kline 1998). For example, if the CFI equals 0.80 then the overall fit of the theoretical model is 80% better than that of the null model estimated with the same sample data. A value higher than 0.90 on CFI and NNFI indicates a close fit of the model. Accordingly, the four fit indices are used in the evaluation of the measurement model and the respecified models in the study.

Model assessment; The *a priori* measurement model includes all initial measures used in the data collection. All latent constructs and paths were allowed to freely correlate with each other. Such an absence of structural constraints enables the test of the measurement model, since lack of fit can only come from the relations among the measures and the latent variables and from the relations among the measures' error terms (cf. Jöreskog & Sörbom 1993).

The test of the *a priori* measurement model (cf. Model 1 in Table 8) shows that it does not satisfactorily fit the data. The normed chi-square has a ratio above 2, which is above the rule of thumb for acceptable fit. RMSEA also indicates that the fit is not satisfactory and is more than the proposed cut-off value for close fit of 0.05. For NNFI and CFI, the values are below

0.9, which also indicates a marginal fit. To identify the measurement model that has a more adequate fit to the data some respecifications needs to be made. The most unproblematic strategy is to delete items with low factor loading because such items do not sufficiently reflect the intended construct (Anderson & Gerbing 1988). Hence, excluding the items with low factor loading represents the first respecification. Two items have factor loadings below 0.4 – Self-support item 4 (i.e. 0.38) and 6 (i.e. o.38). They represent 2 out of 11 items in the Self-support scale, and hence, the construct does not lose any substantial meaning when we delete these two. The respecifications are included in Model 2. The model receives no notable fit improvement from the a priori model, quite contrary, both the Normed Chi-Square and the RMSEA values drop slightly.

A further search for a measurement model that fits the data, makes it necessary to utilize the standardized residuals and modification indices in LISREL. Using LISREL's definition (Jöreskog & Sörbom 1993), a residual is an observed minus fitted covariance and a standardized residual is a residual divided by its estimated standard error. A large positive/negative residual indicates that the model is underspecified/overestimated and the model should be modified by adding paths between variables or by separating them from each other (Segars 1994). A modification index is a measure that estimates how much chi-square is expected to decrease if its corresponding parameter is set free and the model is reestimated. Both the standardized residuals and the modification index show that it may be favorable to delete 8 out of 37 item in model 2 to achieve a satisfactory fit. Hence, the following items are excluded (cf. Table 7): number 1, 10 and 11 in the *Task-specific* scale (i.e. 3 out of 11 items), number 1 in *Coworker assistance* scale (i.e. 1 out of 6 items), number 3 in the *Non-task specific scale* (i.e. 1 out of 4 items) and number 3, 4 and 7 in the *End-user involvement* scale (i.e. 3 out of 7 item). All these items are out due to relatively high residuals and corresponding indication of chi-square decrease in the modification index. For some of these items, there are clearly noticeable and substantial reasons to leave them out. For example, item 3 in the *Non-task specific* scale is problematic because it may be an outsider within the scale (c.f. *I place a lot of diligence in experimentation to find an appropriate layout when I write a WorPro/Ami Pro document*). The remaining items in the *Non-task specific* scale regards experimentation with functions in software, and hence, item 3 does not fit well into the conceptual domain. Another example is item 3 within the End-user scale (i.e. *To reach my personal goals, it is of great importance to me to be well informed about the latest news within PC-equipment and*

software). This item may serve more as an element of *information search* than as an element related to the "act of using" the technology, and it is reasonable to execlude it from the scale.

The next respecified model, Model 3, obtains a significantly improved fit to the data. All fit indices are above the suggested cut-off values for satisfactory fit. The P-value for chi-square is not significant, but since this measure of fit is known to be very sample sensitive, a non-significant chi-square value should not be of too much concern, especially not when the Normed Chi-square shows a value between 1 and 2. The RMSEA-value is 0.04 (p = 0.99), which is below the cut-off for close fit. The NNFI and CFI values are 0.96 each, which are above the 0.90 requirement. Since the model has significant factor loadings for all of the indicants, no cross-loadings, and no justified correlated error terms, the measures in the model have a satisfactory unidimensionality (cf. Kumar & Dillon 1987). Accordingly, Model 3 meets the initial requirement of an adequate measurement model, that is, it meets the requirement of convergent validity. However, before the model can be applied in the structural analysis it should be evaluated in elucidation of its discriminant validity and reliability.

Table 8: Fit indices of measurement models

Model	Goodness-of-fit	Specifications
Model 1	Chi-Square = 1627.84 (p=0.0) Degrees of Freedom = 692 Normed C-S = 2.35 RMSEA = 0.065, p(close fit) = 0.00 NNFI = 0.88 CFI = 0.89	A priori measurement model
Model 2	Chi-Square = 1489.14 (p=0.0) Degrees of Freedom = 619 Normed C-S = 2.41 RMSEA = 0.067, p(close fit) = 0.00 NNFI = 0.88 CFI = 0.89	Item 4 and 6 in Self-support scale are out due to low factor loadings.
Model 3	Chi-Square = 531.16 (p=0.0) Degrees of Freedom = 340 Normed C-S = 1.56 RMSEA = 0.039, p(close fit) = 1.00 NNFI = 0.96 CFI = 0.96	The following items are out due to correlated error terms: - 1, 10 & 11 in Task-specific - 4 in Coworker assistance - 3 in Task-specific - 3, 4 & 7 in End-user involv.

Discriminant validity; The traditional methodological complement to convergent validity is dicriminant validity, which represents the extent to which measures of a given construct differ from measures of other constructs in the same model. In a SEM context, one criterion for adequate discriminant validity is that a latent construct should share more variance with its measures than it shares with other constructs in a given model. To assess this particular type of validity, Fornell & Larcker (1981) suggest the use of *average variance extracted.* This measure should be greater than the variance shared between the construct and other constructs in the model (i.e. the squared correlation between two constructs).

Table 9: Test of discriminant validity for the measurement model

	End-user Involvem.		Task-spec. utilization		Non-task specific utilization		Coworker assistance		Self-support		Average variance extract.
End-user Involvem.	1.0	-	0.34 (0.06)	0.12	0.58 (0.04)	0.34	0.55 (0.04)	0.30	0.38 (0.06)	0.14	0.59
Task-spec. Utilization	0.34[a] (0.06)[b]	0.12[c]	1.0	-	0.35 (0.05)	0.12	0.38 (0.05)	0.14	0.24 (0.06)	0.06	0.53
Non-task Specific Utilization	0.58 (0.04)	0.34	0.35 (0.05)	0.12	1.0	-	0.63 (0.04)	0.40	0.52 (0.05)	0.27	0.77
Coworker Assistance	0.56 (0.04)	0.31	0.39 (0.05)	0.15	0.63 (0.04)	0.40	1.0	-	0.46 (0.05)	0.21	0.77
Self-support	0.38 (0.06)	0.14	0.24 (0.06)	0.06	0.52 (0.05)	0.27	0.45 (0.05)	0.20	1.0	-	0.31

[a]: correlation
[b]: standard error
[c]: squared correlation

Table 9 shows the correlations among the different constructs in the measurement model with accompanying standard errors[12], in addition to the squared correlation (cf. italic typeface). The column far on the right hand in Table 9 shows the average variance extracted for each construct.

[12] Using the 95% -confidence interval around the correlation estimates for each of the constructs can make another test of discriminant validity. If none of the confidence intervals include 1.0, no pairs of the constructs are perfectly correlated within the range of random sampling error. In such cases, discriminant validity can be claimed (Anderson & Gerbing 1988; Bagozzi & Yi 1988). None of the correlations in Table 9 ± two standard errors include 1, and thus, the discriminant validity seems to be adequate.

A comparison of the average variance extracted for e.g. coworker assistance (0.77) against the squared correlation of all other constructs (0.31, 0.15, 0.40, 0.21) indicates adequate discriminant validity, because each squared correlation is lower than the average variance extracted. This is also the case for the remaining variables in Table 9, and thus, discriminant validity of the constructs is claimed to be satisfactory. The next step is to evaluate the reliability of the measures.

Reliability; The reliability of the research instruments can be assessed by three measures: item reliability, composite reliability and average variance extracted (Bagozzi & Yi 1988). Item reliability indicates the amount of variance in an item due to the underlying construct rather than to error and is obtained by squaring the factor loading. An item-reliability at 0.50, a significant T-value, or the presence of both these conditions is considered to be evidence of reliability. Composite reliability is a measure of the internal consistency of the construct indicators, depicting the degree to which they indicate the common latent construct. Nunnally (1978) suggested a minimum of 0.70 for evidence of "modest" reliability. Finally, the average variance extracted measures the amount of variance that is captured by the construct in relation to the amount of variance due to measurement error. If the average variance extracted is less than 0.50, then the variance due to measurement error is greater than the variance due to the construct, and hence, the reliability of the construct is questionable. Table 10 presents the results of these three tests, in addition to factor loadings and accompanying T-values.

Table 10: Reliability information and test of convergent validity for the measurement model

	Factor loading	T-value	Error term	T-value	Item reliability[13]	Average variance extracted[14]	Composite Reliability[15]
End-user involvement:							
Item 1	0.80	16.41	0.36	9.19	0.64	0.59	0.85
Item 2	0.74	14.67	0.46	10.39	0.54		
Item 5	0.81	16.71	0.34	8.93	0.66		
Item 6	0.72	14.12	0.49	10.67	0.51		
Task-specific utilization:							
Item 2	0.61	11.78	0.63	12.13	0.37	0.53	0.90
Item 3	0.76	15.71	0.43	11.28	0.57		
Item 4	0.73	15.06	0.46	11.47	0.54		
Item 5	0.84	18.27	0.30	10.13	0.70		
Item 6	0.87	19.26	0.25	9.40	0.75		
Item 7	0.81	17.37	0.34	10.62	0.66		
Item 8	0.53	9.91	0.72	12.36	0.28		
Item 9	0.61	11.79	0.63	12.13	0.37		
Non-task specific utilization:							
Item 1	0.90	20.44	0.19	7.81	0.81	0.77	0.91
Item 2	0.91	20.95	0.17	7.02	0.83		
Item 4	0.82	17.78	0.32	10.50	0.68		
Coworker assistance:							
Item 2	0.87	19.64	0.24	10.17	0.76	0.77	0.93
Item 3	0.82	17.92	0 32	11.09	0.67		
Item 4	0.89	20.28	0.21	9.64	0.79		
Item 5	0.93	21.92	0.14	7.49	0.86		
Self-support:							
Item 1	0.62	11.38	0.62	11.08	0.38	0.31	0.80
Item 2	0.73	13.95	0.47	9.71	0.53		
Item 3	0.40	6.91	0.84	12.26	0.16		
Item 5	0.61	11.04	0.63	11.21	0.37		
Item 7	0.50	8.81	0.75	11.88	0.25		
Item 8	0.53	9.53	0.71	11.70	0.29		
Item 9	0.53	9.51	0.71	11.70	0.29		
Item 10	0.49	8.62	0.76	11.93	0.24		
Item 11	0.52	9.18	0.73	11.79	0.27		

Eleven of the 29 item reliabilities were lower than the 0.50 cut-off value, although all paths had significant T-values. Especially the *Self-support* construct did not pass the 0.50 test. However, even if nearly all item of the Self-support scale fail on the ideal cut-off value one should be careful to maintain this value rigorously. In practice, it is common to find that several measures of an estimated model have squared factor loadings below the 0.50 threshold

[13] λ_{yi}^2

[14] $\sum \lambda_{yi}^2 / (\sum \lambda_{yi}^2 + \sum \text{var}(\varepsilon))$

[15] $(\sum \lambda_{yi})^2 / ((\sum \lambda_{yi})^2 + \sum \text{var}(\varepsilon))$

(Hulland 1999). Particularly when new items or newly developed scales are employed, a more suitable cut-off value may be 0.16 or 0.25. This is a threshold commonly used for factor analysis results, where the cut-off value for factor loadings as a rule is 0.40 or 0.50 (Hulland 1999). Additionally, the composite reliability tends to increase, and hence, measurement error decreases as the number of items in a combination increases (Churchill 1979). The latter is evident if we regard the composite reliability value for the *Self-support* construct, which is considerably above the 0.70 cut-off value. It is also important to mark that lack of high reliability is to a great extent accounted for when using structural equation modeling (Jöreskog & Sörbom 1982). Therefore, all items for the *Self-support* scale are (cf. Table 10), despite "modest" item reliability, included in the model to maintain the domain width of the construct.

The composite reliability in the measurement model varies from 0.80 to 0.93, and hence, is considerably above the 0.70 threshold. Broadly speaking, the constructs seem to have adequate reliability, and the model is satisfactory in dimensionality since all factors are significant.

Concluding comments; The above consideration leads us to conclude that the measurement model is adequate. The model seems to be valid, both in terms of unidimensionality, reliability as well as construct validity given the assessment presented above. The fact that no crossloadings or correlated error terms were necessary to obtain adequate model fit provides us with greater confidence in the forthcoming structural analysis. Thus, the model has satisfactory support for a theoretically driven unidimensional constructs solution. Hence, we avoid the conflict between preferences for interpretability versus goodness of fit, a conflict which scholars frequently here encountered (Browne & Cudeck 1993).

6.3 Structural analysis

The results from the test of the proposed research model (cf. Chapter 4) are presented in this section. As indicated in the prior sections, structural equation modeling (SEM) will be used to test the entire model (theory) and its accompanying hypotheses. The reason for choosing a SEM approach is tripartite. First, SEM combines the measurement model and the structural model into the same analysis, and therefore, avoids the interpretation of structural parameters for a model with unknown construct validity and reliability, which can give inaccurate

estimates and lead to misleading conclusions. The measurement model of this study has a concept with questionable reliability (cf. Section 6.2). Although it is a widely held belief that random measurement error leads to attenuation (i.e. underestimation of structural parameters), and hence, to a conservative test of the hypothesis, such an effect is only true in the case of bivariate regression. However, estimating several parameters simultaneously for å model with multiple constructs, the direction of random measurement bias is a function of the amount and direction of correlates among the constructs (Bollen 1989). Consequently, the estimation of structural effects for constructs with measurement error is usually assumed to be less biased when using SEM. Second, SEM gives us information when interdependence or simultaneous causation among the observed response variables is present (Jöreskog & Sörbom 1982). The proposed research model (cf. Chapter 4) includes four endogenous constructs. These four constructs may be interrelated, even if such interdependency is not hypothesized here. Since SEM is an analysis of the model *per se*, in addition to each hypothesis, it has power to unmask hidden relationships. Hence, in SEM, possible relationships between the various constructs is not only dependent on the exogenous constructs in the model, but also on which endogenous constructs are present in the set of equations. Third, SEM provides an assessment accompanied by statistical tests of the overall model fit as well as for each of the free parameters. As emphasized by Jöreskog & Sörbom (1993), interpreting "significant" parameters from a model with unknown fit can be misleading. A lot of factors can lead to significant paths (Meehl 1990), and thus, the entire theory should hold first.

Model fit and test of hypothesis; The results from the model of direct effects are shown in Table 11. All five goodness-of-fit indices report values within the suggested margins for satisfactory fit. Additionally, all hypothesized paths in the structure model have significant T-values. The path coefficients in Table 11 are all significant ($P<0.001$) and have a range from medium (i.e. 0.39) to great magnitude (i.e. 0.66), and hence, show that end-user involvement has a notable impact on all the endogenous variables in the model. More specifically, end-user involvement has a significant and positive impact on task-specific utilization (0.49, $P<0.001$). This finding supports hypothesis 1. End-user involvement has a significant and considerable impact on non-task specific utilization (0.66, $P<0.001$) and is consistent with what was expected form hypothesis 2. The impact of end-user involvement on coworker assistance is considerable (0.64, $P<0.001$) and supports hypothesis 3. Finally, end-user involvement has a positive impact on how self-supporting a end-user is (0.47, $P<0.001$), and hence, hypothesis 4 is supported.

Table 11: Structural model of the effects of end-user involvement

Goodness-of-fit indices:

Chi-Square = 677.43 (p=0.0)
Degrees of Freedom = 376
Normed C-S = 1,80
RMSEA = 0.050, p(close fit) = 0.47
NNFI = 0.94
CFI = 0.94

	End-user involvement	Squared Structural Correlation
Task-Specific utilization	0.39[a] (6.31)[b]	0.15
Non-task specific utilization	0.66 (10.06)	0.44
Coworker assistance	0.64 (10.03)	0.41
Self-support	0.47 (6.89)	0.22

[a]: Standardized regression coefficient
[b]: T-values

Including control variables; Partial correlation is chosen as a filter technique to identify control variables with a real effect in the baseline model (cf. Ganster et al. 1983, Judd et al. 1991). As its name suggests, the technique of partial correlation means partialing out the effect of a third variable, e.g. age, from both end-user involvement and e.g. task-specific utilization and reestimating their association. Hence, the technique is well suited to identify both spurious and suppressed effects in the baseline model. The procedure is to compare *Pearson Correlation* coefficients for all original relationships in the structural model with their respective *Partial Correlation* coefficients. If a Partial coefficient is lower than its corresponding Pearson coefficient, this may indicate a spurious observed relation. If a Partial coefficient on the other hand is higher, this may indicate a suppressed relation. However, the principal purpose here is to uncover potential spurious relations. Information about measurement of the five control variables and their descriptive statistics are shown in Appendix B (i.e. measurement) and Appendix C (i.e. statistics).

Table 12: Identification of potential spurious relationships

	Task-specific Utilization	Non-task specific Utilization	Coworker Assistance	Self-support
Pearson coefficients:	0.345*	0.523*	0.496*	0.322*
Partial coefficients:				
Number of packages	*0.309**	*0.483**	*0.440**	*0.301**
Age	0.335*	*0.479**	*0.446**	*0.258**
Gender	0.343*	0.514*	0.483*	*0.342**
PC'experience	0.353*	0.522*	0.494*	0.330*
Education	0.355*	0.516*	0.487*	0.316*

*P<0.001

The first numeric row in Table 12 shows the Pearson Correlation coefficient for the observed relation between end-user involvement and each of the endogenous variables in the baseline model. There do not exist any instructions in the literature for how much a Partial coefficient has to differ from a Person coefficient before it is a substantial difference. However, a cut-off value at +/-0.020 seems to be a conservative requirement, and hence, three variables and eight values in Table 12 show a difference within the limits of this requirement (cf. numbers in italics). The three identified variables and their accompanying paths were further included in the SEM analysis, and Table 13 shows the results from this test.

Table 13: Baseline structural model with control variables

Goodness-of-fit indicies:	Change in Goodness-of-fit indicies:
Chi-Square = 713.79 (p=0.0)	
Degrees of Freedom = 422	
Normed C-S = 1.69	Normed C-S = 6% (improved)
RMSEA = 0.046, p(close fit) = 0.89	RMSEA = 9% (improved)
NNFI = 0.93	NNFI = 0% (no change)
CFI = 0.94	CFI = 0% (no change)

	End-user involvement	Change in standardized regression coefficient	Number of packages	Age	Gender	Squared Structural Correlation	Change in Squared Structural Correlation
Task-Specific utilization	0.34[a] (5.32)[b]	13% (reduced)	0.15 (2.38)	-	-	0.16	7% (improved)
Non-task spec. Utilization	0.58 (8.78)	12% (reduced)	0.11 (1.98)	-0.11 (-2.01)	-	0.44	0% (no change)
Coworker Assistance	0.55 (8.59)	14% (reduced)	0.19 (3.60)	-0.09 (-1.63)	-	0.44	5% (improved)
Self-support	0.36 (5.19)	23% (reduced)	0.03 (0.49)[c]	-0.31 (-4.49)	-0.05 (-0.84)[c]	0.29	32% (improved)

[a]: Standardized regression coefficient
[b]: T-values
[c]: Non-significant T-values

As the table shows, the inclusion of the control variables does not change the overall pattern observed in the baseline model and the fit indices show only minor or no changes at all. In addition, all the parameter estimates are still significant. However, each of the standardized regression coefficients shows a change that is above 10%. The most substantial change is in the effect on *self-support* where the standardized regression coefficient drops with nearly a quarter of its original magnitude. In spite of such a decrease in the standardized regression coefficients, the baseline model and each of the hypotheses are still supported, and thus, the original relationship may be viewed as non-spurious (Judd et al. 1991). Still, some of the control variables partial out some of the effect of end-user involvement. The post hoc explanations of the influence of the control variables on the magnitude of the parameter estimates of the hypothesized model are not sharp and clear. However, several possible explanations exist, and we will return to these in Chapter 7.

Exploratory test of managerial implications; An empirical test of the relationship between the four dependent variables and perceived job-performance[16] is provided below. As argued in Chapter 1, managers cannot afford not to think about the realization of benefits for the company when they implement e.g. user participation as a technique to increase the level of end-user involvement in general. One way to investigate the impact of end-user involvement is to test how the behavioral effects of involvement are related to perceived job-performance. The results from such a test are reported in Table 14.

Table 14: Baseline structural model with control variables and job-performance

Goodness-of-fit indicies:

Chi-Square = 803.43 (p=0.0)
Degrees of Freedom = 511
Normed C-S = 1.57
RMSEA = 0.041, p(close fit) = 1.00
NNFI = 0.94
CFI = 0.95

	End-user involv.	Number of packages	Age	Gender	Task-Specific utiliz.	Non-task spec. Utiliz.	Coworker Assist.	Self-supp.	Squared Structural Correlation
Task-Specific utiliz.	0.34[a] (5.34)[b]	0.15 (2.44)	-	-					0.17
Non-task spec. Utiliz.	0.58 (8.79)	0.11 (2.00)	-0.11 (-2.01)	-					0.44
Coworker Assist.	0.55 (8.58)	0.19 (3.59)	-0.09 (-1.64)	-					0.43
Self-supp.	0.36 (5.19)	0.03 (0.49)[c]	-0.31 (-4.49)	-0.05 (-0.83)[c]					0.29
Perceived Job-perf.					0.48 (7.34)	0.13 (1.94)	-0.12 (1.88)	0.00 (0.00)[c]	0.25

[a]: Standardized regression coefficient
[b]: T-values
[c]: Non-significant T-values

All five goodness-of-fit indices report values within the suggested margins for satisfactory fit. Hence, the model's ability to account for the observed correlates increases when performance is included, although the model itself becomes more restricted. Additionally, the path coefficients for the baseline model, including control variables, are equal to the coefficients in

[16] Information about measurement, descriptive statistics, validity and reliability of job performance is shown in Appendix B (i.e. measurement) and Appendix C (i.e. statistics).

Table 14. The exploratory part of the test shows that three out of four end-user behavior variables are related to perceived job-performance. More specifically, task-specific utilization has a significant and considerable effect on perceived job-performance (0.48, P<0.001). Non-task specific utilization has a significant but modest effect on perceived job-performance (0.13, P<0.05). Coworker assistance has a significant and negative relationship with perceived job-performance (-0.12, P<0.05), and hence, this finding indicates that coworker assistance may have a negative impact on job-performance. Finally, self-support seems not to have any impact at all on job performance. The findings from this exploratory analysis will be further discussed in Chapter 7.

6.4 Summary

In Chapter 4, the hypothesized model of the effects of end-user involvement was presented. The model contains 4 hypotheses. Table 15 lists these hypotheses with accompanying results from the empirical study. The results reported in the table are adjusted for the effects of the control variables.

Table 15: Summary of hypotheses test

Constructs	Hypothesized relationships	Findings[a]	Significance level[b]
H1: End-user involvement → Task-specific utilization	+	0.34	p<0.001
H2: End-user involvement → Non-task specific utilization	+	0.58	p<0.001
H3: End-user involvement → Coworker assistance	+	0.55	p<0.001
H4: End-user involvement → Self-support	+	0.36	p<0.001

[a]: Standardized regression coefficients
[b]: One-tailed test

The results from the SEM analysis showed that all four hypotheses were supported at a p<0.001 level. In addition to a test of the baseline model, an exploratory test of the managerial

implications of end-user involvement was undertaken in Section 6.2. The results from this test indicate that both task-specific and non-task specific utilization may have a positive effect on the end-user's job performance. Moreover, the test also indicates that coworker assistance may have a negative effect on the end-user's job-performance. The next chapter includes a discussion of these findings and their possible implications. The limitations of the study are also considered.

CHAPTER 7 DISCUSSION AND IMPLICATIONS

The main objective of this study was to identify, conceptualize and test important behavioral effects of involvement within the context of end-user computing. To attain this objective, the study was designed to accomplish three goals. The first goal was to analyze the involvement construct in order to conceptualize end-user involvement, and hence, describe its psychological mechanisms precisely. This contribution is discussed in Section 7.1. A second goal of the study was to identify important behavioral effects of end-user involvement. Section 7.2 addresses the contribution of this research to accomplish this goal. The third and final goal was to perform an empirical test of a set of hypotheses regarding how end-user involvement influences the identified behavioral effects. This contribution is a natural continuation from the identification of effects, and hence, it is discussed in the end of Section 7.2. Section 7.3 discusses implications for managers and practice. Finally, Section 7.4 considers limitations and future research and Section 7.5 presents concluding remarks.

7.1 The concept of end-user involvement

The starting point of this study was to revisit and analyze the involvement concept within IS research. The initial analysis made in Chapter 2 revealed that the conceptualization of user involvement was insufficient. It was argued that this especially was due to a very incomplete description of the cognitive mechanisms behind the state of involvement. The most conceptually valid basis for the conceptualization of involvement was argued to be a cognitively based approach (cf. Laaksonen 1994). This resulted in a characterization of involvement as:

- an enduring phenomenon
- a phenomenon where the self-concept plays an important role
- a psychological state that is strong or intense of nature

Based on these three characteristics, end-user involvement was defined as "experiencing using the technology as personally important". It was further argued that this particular psychological state is based on three cognitive elements: the *self concept* (e.g. the value: "it is important to economize one's action"), an *act-related cognitive structure* (e.g. a belief: "the use of a computer represents a very efficient act"), and the *experience of personal importance* (e.g. the computer is important because it gives me unique possibilities to economize my action). The crux of the matter here is that the "experiencing something personally important" is a result of the strength of the association between the self-concept and the act-related cognitive structure.

The conceptualization of end-user involvement as described above is an important contribution to the IS literature where psychological involvement has been treated simply as a matter of "importance and personal relevance" (e.g. Barki & Hartwick 1994, Kappelman 1990). The conceptual analysis in the present work makes a contrast to prior conceptualizations in the field because it refers clearly to: (1) the theoretical basis for the conceptualization (i.e. a cognitively-based approach); (2) the behavioral phenomenon that the state of end-user involvement deals with (i.e. the act of using the technology); (3) the cognitive mechanisms behind this particular involvement state (i.e. an act-related cognitive structure and the self-concept; the relationship between them determines the level of personal

importance). In contrast to prior conceptualizations this in-depth description of the conceptual basis of involvement has two important benefits. First, it makes it possible to make detailed arguments about why and how end-user involvement affects the end-user's action. This benefit was realized through the motivation of the hypothesized relationships in the proposed research model (cf. Section 4.2). Second, it makes it more evident how involvement should be measured, and hence, the construct validity may increase (or it may be easier to re-examine it). This benefit was realized through the proposed measurement scale of end-user involvement (cf. Section 5.4), which demonstrated satisfactory psychometric qualities (cf. Section 6.2).

The perceived personal importance aspect of end-user involvement was measured through a set of means-target statements; for example "It is important for me to work actively with information technology, because I then learn something that promotes my personal goals". As this example demonstrates, the scale stresses the connection between the "act of using the technology" and the self-concept (i.e. personal goals or values). Therefore, there are good reasons to assume an adequate relation between the theoretical definition of the concept and its measurement. Additionally, the scale also revealed satisfactory discriminant validity as well as unidimensionality through the empirical test. This development and the validation of a measure of end-user involvement represent an important step in the development of theories about end-user involvement because: (1) there is an explicit link to the theoretical definition of the construct, and (2) it is demonstrated to have satisfactory psychometrical properties. Of course, the validity of a measure cannot be truly established on the basis of a single study. Validation of measures is an ongoing process, which requires the assessment of measurement properties over a variety of studies in similar and different contexts. However, the use of the structural equation modeling approach represents the most comprehensive assessment of validity that could be made based on existing knowledge.

7.2 The behavioral effects of end-user involvement

Previous research has investigated effects of involvement from an IS-success perspective. It was argued that this has resulted in a tradition where user perceptions are regarded as the principal effect category (e.g. user satisfaction or perceived usefulness). Such a perspective may be extended to account for the fact that the effects of involvement have two potential limitations. First, it results in a practice where behavioral effects of involvement are entirely absent in IS research. Second, it neglects the possibility that involvement may cause different behavioral responses, where not all of them necessarily contribute positively to firm performance. The contribution from the present study in connection with these two circumstances is discussed below.

The starting point for the identification of behavioral effects was a description of two basic behavioral elements in end-user computing; tool utilization and support behavior. These two elements represent categories of behavior that are assumed to be common among end-users across different contexts. However, the contribution of the present study especially concerns the way these distinct behaviors are conceptualized. Tool utilization is usually conceptualized as a unidimensional phenomenon in the IS-literature, even if there are good reasons to treat it differently. As argued in Section 3.3.1, tool utilization may have a double character. It is reasonable to assume that it consists of both a task-specific (i.e. doing the job) and a non-task specific (i.e. trying out software functions) element. Support behavior was also conceptualized as a construct that consists of two different aspects; i.e. providing support to coworkers and support seeking. Although these two support behaviors represent important variables in connection with end-user computing, the IS-literature is still scarce on research on both of them.

In Section 4.2, it was argued that End-user involvement significantly influences all the identified behaviors (i.e. task-specific utilization, non-task specific utilization, the providing of support and support seeking). A core point in this connection was that involvement doesn't represent a calculative usefulness-belief, in the meaning "all effects are important for optimal job performance". Quite contrary, to perceive "the act of using the computer" as personally important means that it is experienced as important relative to one's personal goals and values. Of course, there may not be any divergence between personal goals and organizational goals,

but the important point here is that the opposite may as well be the case. It is the self-concept that gives the state of end-user involvement this two-pronged potential. That is, end-user involvement may result in unwanted as well as wanted behavior. Exactly which behavior is wanted or unwanted is dependent on the actual stakeholder(s) view, in whose interests the behavior is evaluated (cf. Seddon et al. 1998). For example, comprehensive coworker support can be evaluated as a dysfunctional behavior from a cost-benefit perspective, especially when professionals (e.g. economists or lawyers) provide it (Kirwin 1995). However, the insight that end-user involvement may represent an ambiguous matter from an IS-success perspective is a contribution to the field of IS research.

Only one of four scales, measuring effect variables, has previously been measured in IS research. The reason for this is quite simple. Neither non-task specific utilization nor colleague support has ever been included as variables in an IS-study. Support seeking has been included, but the way it is conceptualized in the present work is new (cf. Section 4.2 and 5.4), and hence, this variable has not been measured in an IS-study earlier. The measurement of all the adopted and adjusted scales revealed satisfactory discriminant validity as well as unidimensionality through the empirical test. Accordingly, at least the measurement of three out of four effect variables should represent a contribution to the IS-field.

The way we study the effects of end-user involvement here should be clearly distinguished from those studies that investigate user involvement from a traditionally IS-success perspective. In contrast to the present study, these studies assume a priori that involvement is a matter of effective or efficient behavior. The present study does not try to verify the opposite, but it aims at demonstrating that the question about effectiveness and efficiency may be a more problematic issue in connection with involvement than earlier supposed.

All four hypotheses were supported, in addition to the structure of the proposed research model. The findings of this study demonstrate the importance of end-user involvement in shaping individuals' computing behavior. Individuals with high end-user involvement utilized the computer more to solve job tasks, tried out more software functions, were more self-supported and engaged more in coworker assistance. End-user involvement explained 16 percent of the variance in task-specific utilization, 44 percent of the variance in non-task specific utilization, 42 percent of the variance in coworker assistance and 29 percent of the variance in self-support. A summary of the findings is reported in Table 15.

The result from the test including control variables indicated no spurious and masked relationship in the proposed model. However, the inclusion of control variables reduced the regression coefficient for all four relationships in the model. Especially the explanatory potential of end-user involvement on self-support decreased in value. The regression coefficient dropped with 23 percent for this particular variable when the control variables were included. The change in the regression coefficient was mainly caused by the inclusion of *age* in the model. This indicates that age is important for the explanation of how self-supported an end-user is. It should be remarked here that age also is negatively correlated with involvement ($r = -0,25$, $p<0.001$). The reasons for these findings are not entirely clear, but it may be that older users do not feel that using IT is important in achieving personal goals. In this case, older users are less engaged in using the technology (i.e. low end-user involvement), and they seem to be less interested in acquiring support from technology related sources (i.e. low self-support). Such an interpretation of the present pattern is consistent with results from studies regarding age differences in attitudes toward computers (Czaja & Sharit 1998).

The results from this study are not yet another confirmation of individual satisfaction as the main effect of involvement (cf. Hwang & Thorn 1999). The support of all four hypotheses indicates the relevance of having a far-reaching view on the effects of involvement, a view that goes behind the traditional IS-success perspective. The practical implications of such a view will be discussed in the following section.

7.3 Managerial implications

The results from this study indicate that increased levels of end-user involvement are associated with end-users that:

- utilize available computer resources while executing their job-tasks
- employ the action bar or utilize a "trial and error" strategy when they are in need of support
- tinker with functions and facilities in the available software
- are providers of computer support to their coworkers

As these "patterns of consumption" demonstrate clearly, end-users with high involvement are large-scale consumers of IT resources. It seems like they utilize any opportunity they have to interact with the technology. The only face-to-face interaction they are likely to participate in when they act as genuine end-users providing of assistance to coworkers. However, such assistance is typically given "hands-on" or at least close to the computer where the problem emerges.

The characteristic given above gives rise to the following question: Is a high level of end-user involvement something to aim at when the main goal is effective use of IT resources? The author's opinion is that this question cannot be answered without taking into consideration the end-user's professional responsibilities. One way to do this is to investigate the relationship between the end-user's behavior and their professional job performance. Such a test was carried out in an exploratory manner in Section 6.2. The test demonstrated that three out of four behavioral variables covaried with perceived job-performance. Task-specific and non-task specific utilization was positively related to the end-user's professional job-performance (i.e. respectively 0.48, $P<0.001$ and 0.13, $P<0.05$), while coworker assistance was negatively related (i.e. -0.12, $P<0.05$). It should be noted here that the regression coefficients for both non-task specific utilization and coworker assistance are relatively slight. However, the model fit was adequate and end-user behavior explained no less than 25 percent of the variance in job-performance.

The positive relationship between task-specific utilization and job performance fits into common expectations within the IS-field about the contribution from personal computing in a job context (Pentland 1989). The positive relationship between non-task specific utilization and job performance is more surprising. As indicated above, non-task utilization deals with the use of time to tinker with functions and facilities in the available software. Therefore one may expect that this behavior is negatively related, or unrelated to the end-user's professional performance. The most reasonable explanation for the opposite finding is that non-task specific utilization stimulates learning processes and/or the level of confidence with computer usage (cf. Guthrie & Gray 1996). The negative relation between coworker assistance and job performance indicates that coworker assistance may be an ineffective support function. Such an explanation is supported by time-estimates that demonstrate that nontechnical employees spend 4 to 10 percent of their time helping coworkers solve computer problems (Gibbs 1997). Therefore, hidden support is by some authors claimed to take time at the expense of the providers' professional tasks (Kirwin 1995), and the consequences is claimed to be that the annual cost for a PC may be doubled (Gibbs 1997).

In sum, the message to managers is that they should look at end-user involvement as a double-edged phenomenon and not only as a faultless and unproblematic success variable. They should also know that the reason for this is that "personal goals and values" is the crux of the matter in end-user involvement. As indicated before, professionals with a high level of end-user involvement may act very opportunistically, especially when they have to decide between "doing the job" or "doing what they believe is important for themselves". The latter choice may from a management perspective be regarded as dysfunctional under particular circumstances (Guthrie & Gray 1996; Kirwin 1995).

7.4 Limitations and future research

The findings from the present study must be considered in light of the study's limitations, in particularly the use of cross-sectional survey data. As stressed in Section 5.1, the correlation design lacks the possibility to explicitly test directionality. However, this does not imply that the supported research model is completely devoid of support on causal relationships. Both theories on involvement within e.g. organizational behavior[17], and the application of SEM analysis[18] provide support for causal relationships. In spite of this conclusive statements about causality cannot be made since alternative explanations cannot be ruled out. At least one cannot disregard the possibility of reciprocal interaction among the factors studied. Further research, in particular experimental and longitudinal studies, is clearly needed to address these issues.

Psychological research shows that attitudes will not be related to behavior when people are not free to act according to their attitudes (Winter et al. 1998). Hence, it is reasonable to assume that voluntary control may be an important condition for the manifestation of the effects of involvement. Even thought it is argued for that tool utilization normally is a voluntary choice in Section 4.2, one limitation with respect to the study may be that we do not measure the degree of voluntary control. The present study demonstrates indeed clear and incontestable covariations between involvement and end-user behavior. Hence, the lack of voluntary control has at worst resulted in a more conservative empirical test. However, it may be that voluntary control has a potential to explain why the relationship between end-user involvement and task-specific utilization is a substantial part lower (0.34)[19] than the relationship between end-user involvement and non-task specific utilization (0.58). Hence, future studies should measure volitional control and compare the effect of this variable on different aspects of end-user behavior (cf. Winter et al. 1998).

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[17] For example, Brown (1996) that describes *work behavior* (e.g. increased effort or reduced absenteeism) as important consequences of job involvement.

[18] LISREL analysis, like other structural equations modeling, provides powerful support for causal relationships relative to other techniques such as correlation and regression since all the relationships (including those in the measurement model as well as in the structural model) are tested simultaneously.

[19] Standardized regression coefficient.

In addition to the limitations above, this study offers several challenges for future studies. First, the relationships in the hypothesized model can be moderated by other variables such as end-user competence (Munro et al. 1997) or voluntary control (Winter et al. 1998). The main contribution of this research has, however, been to show the direct relationship of end-user involvement and end-user behavior. Future research should break with this initial stage and focus on variables that can moderate or intervene between relationships in the proposed model.

Researchers should also attempt to determine variables that have a potential to explain different levels of end-users involvement. Barki & Hartwick (1989) indicate that variables such as user participation, system quality, top management support and peer behavior may represent potential antecedents. However, very few antecedents have been empirically tested so far. In fact the only variables that has been tested are participation in computer training and system development. The scarce research on antecedents can be attributed to the fact that nearly all studies on involvement have been concerned with the implementation phase, where participation is assumed to play an important role. Hence, future studies should aim at identifying potential antecedents in the post-implementation phase. That is, they should identify factors in the context of end-user computing that have a potential to influence the users' level of involvement. Examples of such variables include *cognitive traits* (e.g. learning style and locus of control; cf. Bostrom et al. 1990; Marcolin 1997), *descriptive traits* (e.g. gender and computer experience; cf. Smith et al. 1999; Whitley 1997), *situational traits* (e.g. end-user computing structure and quality of information center services; Brown & Bostrom 1994; Magal 1991).

This study included job performance to test managerial implications. Future studies should try to identify other work variables that have a potential to validate the role of end-user involvement for professional performance. An example of such a variable is job involvement, which is considered as the key to activate employee motivation, as well as goal-directed behavior (Brown 1996). The interesting case here is the potential for a conflicting connection between *end-user involvement* (i.e. engaged in using technology) and *job involvement* (i.e. engaged in doing the job) concerning organizational effectiveness. However, there may be other work variables as well that are interesting in this connection (e.g., professional self-esteem; Carmel 1997).

One limitation with respect to measurement regards the measurement of self-support and non-task specific utilization. The present study treats these two variables as unidimensional phenomena. Both may have a potential for further improvement. It may be that more specialized research on these variables will demonstrate that they are multidimensional of nature. For example, non-task utilization is here defined as unproductive time spent by users tinkering with software. This definition may be too narrow, especially since it rejects aspects such as utilization of electronic mail for personal purposes or unproductive Internet surfing. Further research, in particular exploratory studies, is needed to address these issues.

A subjective self-report of overall job performance was used for an exploratory test of managerial implications in this study (cf. Section 6.3). Such a measure was applied because it is easy to administer and has been used with success in other studies (e.g. Babin & Boles 1996; Sujan et al. 1994). However, self-rating scales as the one utilized here with very few items may be biased by the end-user's perception of what he does well, not by a balanced perspective of performance on the different, important aspects of the job (Behrman & Perreault 1982). Another possible concern with self-rating scales is that people may tend to be overly generous when rating their own performance (ibid.). However, the administration of the questionnaire insured that each end-user was anonymous, and hence, there are good reasons to assume minimal motivation among the respondents to give inflated ratings. To overcome potential weaknesses of subjective self-reports, future studies should focus on objective performance ratings (if possible), or at least other types of subjective performance ratings (e.g. using supervisors or peers as evaluators). Another angle of incidence may be to choose a more homogenous job sample (e.g. salespersons) and employ a job specific measurement scale (c.f. sales performance scale by Behrman & Perreault 1982).

7.5 Concluding remarks

This study demonstrates how IS research can benefit from an extended view on the effects of involvement. By doing this, we also indicated that the question of effectiveness and efficiency in connection with the effects of involvement is an ambiguous matter. The prior sections have shown that both strengths and limitations characterize the present study. However, most of the limitations arise out of the fact that no one study can address all aspects relevant for studying a particular phenomenon. This regards especially the choice of research method and the aim

of parsimony in selecting the dependent variables. However, the limitations described in this chapter may illustrate useful directions for researchers that aim at theory development in the present area. It is only through a collection of studies that the issue of involvement and end-user computing can be properly unraveled.

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APPENDICES

Appendix A: End user involvement versus perceived usefulness

Barki & Hartwick (1994:62) describe perceived usefulness and user involvement as related, but distinct constructs. Their main argument is that "a system may be seen to be useful, but not necessarily important or personally relevant". Seddon & Kiew (1994:104) go thoroughly into this when they claim that "if what the system does is unimportant to the user, there seems little chance that the user will perceive the system as useful, no matter how well designed it is or how easy it is to use". The crux of the matter here is that perceived usefulness regards a *system* and *performance* relation, while involvement regards a *system* and *self-concept* relation (cf. Table 16).

Table 16: The distinction between perceived usefulness and end-user involvement

Concept	Definition	Main cognitive elements	Benchmark for judging	Related concept
Perceived usefulness	The degree to which a person believes that using a particular system would enhance his or her job performance	A belief	Useful for my job tasks? (i.e. the value of the benefit flowing from the use of the technology in some specific task must exceed zero)	Relative advantage (cf. innovation diffusion theory)
End-user involvement	The degree to which an end-user experiences that the act of using the technology is personally important	An act-related cognitive structure and the self-concept determine a belief about personal importance	Important for me? (i.e. the perceived qualities of using the technology must be experienced as important for the realization of one's personal goals and values)	Vested interest (cf. theory about strong attitudes)

Appendix B: Item list used for data collection

1. End-user involvement

1. It means a lot for me to learn about computer equipment and software because I then increase my possibility to perform better later on
2. It is important for me to get access to the latest information technology to be able to feel comfortable in my job
3. It is important for me to be informed about the latest news within computer equipment and software to be able to obtain my personal goals
4. It is of considerable value for me to have access to the latest information technology if I am to increase my professional knowledge
5. It is important for me to work actively with information technology, because I then learn something that will promote my personal goals
6. I believe that my usage of information technology is important because it is something that will be very useful in the future
7. To use information technology frequently is important for me because it gives me the possibility to perform better in the future

(i.e. from "very bad description" to "very good description"; seven points)

2. Task-specific utilization

Compared with my colleagues I use my computer more frequently than them to:

1. ...communicate with others
2. ...plan various activities
3. ...identify problems/alternatives regarding decisions
4. ...look for trends/tendencies within my field of responsibility
5. ...make revisions and control various circumstances
6. ...control and rule activities
7. ...make decisions
8. ...execute budgeting
9. ...write documents, reports, and so on
10. ...make presentations
11. ...schedule meetings

(i.e. from "very bad description" to "very good description"; seven points)

3. Non-task specific utilization

1. I frequently experiment with the various functions in the software that I utilize (e.g. testing different layout alternatives in Freelance or WordPro).
2. I frequently try unknown functions in the different software packages that I utilize (e.g. the drawing function or the table function in WordPro/AmiPro).
3. I invest a lot of hard work in the experimentation of a suitable layout when I am writing a document in WordPro/AmiPro (or when I am making a presentation in Freelance).
4. I frequently experiment with the different menu facilities within the different software packages that I utilize

(i.e. from "very bad description" to "very good description"; seven points)

4. Coworker assistance

My colleagues:

1. ... sometimes ask me about help in connection with their use of the computer
2. ... sometimes ask me about advice and ideas when they utilize one or more software applications
3. ...ask me frequently about technical questions regarding their computer usage
4. ...use me sometimes as an adviser regarding their utilization of the computer
5. ...regard me as a reliable information source when it comes to software usage
6. ... approach me frequently to obtain assistance regarding their usage of the computer

(i.e. from "very bad description" to "very good description"; seven points)

5. Self-support

What do you do when:

1. ...you don't know how to send or receive an attachment through electronic mail
2. ...you don't know how to copy a table from word processing (or spreadsheet) to the presentation program Freelance Graphics
3. ...there is enough paper in the printer, but you don't receive any copy
4. ...your computer doesn't boot
5. ...you don't remember how to utilize a particular function (e.g. the table function in WordPro/AmiPro)
6. ...you don't get access to a file or a catalogue in Lotus Notes
7. ...the mouse doesn't work, e.g. you press the button and nothing happens
8. ...you wish to auto-correct a word in WordPro/AmiPro, e.g. you wish that "sumer" should automatically be corrected to "summer"
9. ...you wish to delete documents or catalogs that you don't need any longer
10. ...you wonder how a software package (e.g. a spreadsheet) can be used to solve a new problem (e.g. a "what if" analysis)
11. ...you receive a document as an attachment through electronic mail, and run into problems with converting it to your own word processor

(i.e. get in touch with the help-desk, get in touch with a coworker, utilize the help facility in the actual software, experiment on a solution)

6. Perceived job-performance

Compared with my colleagues

1. ... I am more productive than the most of them
2. ... I manage my work time in a more efficient manner
3. ... I am more focused on the job I perform
4. ... I invest more effort in doing my job as well as possible

(i.e. from "very bad description" to "very good description"; seven points)

7. Age (<25, 25-35, 36-45, 46-55, >55)

8. Gender (man, woman)

9. How long is your **experience** with using a PC? (i.e. both at work and in private; number of years)

10. Educational level (primary school, college, from one to two years at a university, from three to four years at a university, honours degree, doctor's degree)

Appendix C: Statistics and validity issues for control variables and job-performance

Table 17: Descriptive statistics

	Mean	Std.dev.	Skewness	Kurtosis	N
Number of packages:	8.497	1.114	0.021	2.393	328
Age:	3.150	0.975	0.336	-0.799	327
Gender:	1.275	0.447	1.013	-0.990	320
PC'experience:	11.266	4.325	0.124	-0.488	320
Education:	4.058	1.187	-0.524	-0.428	326
Perceived job performance:					
Item 1	4.172	1.221	-0.628	0.541	326
Item 2	4.095	1.220	-0.469	0.293	326
Item 3	4.350	1.345	-0.635	0.431	326
Item 4	4.466	1.389	-0.543	0.282	326

Table 18: Fit indices of measurement models including Job-performance

Model	Goodness-of-fit	Specifications
Model 1	Chi-Square = 777.07 (p=0.0) Degrees of Freedom = 527 Normed C-S = 1.47 RMSEA = 0.036, p(close fit) = 1.00 NNFI = 0.95 CFI = 0.96	A priori measurement model
Model 2	Chi-Square = 703.10 (p=0.0) Degrees of Freedom = 494 Normed C-S = 1.42 RMSEA = 0.033, p(close fit) = 1.00 NNFI = 0.96 CFI = 0.96	Item 4 in Job-performance is out due to relatively high residual and corresponding indication of chi-square decrease in the modification index.

Table 19: Test of discriminant validity for job-performance

	End-user involv.	Task-specific utilizat.	Non-task specific utilizat.	Coworker assistance	Self-support	Age	Gender	Number og packages	Average variance extracted
Job-perform.	0.04[a]	0.23	0.05	0.02	0.01	0.00	0.00	0.03	0.74

[a]: squared correlation

Table 20: Reliability information and test of convergent validity for job-performance

	Factor loading	T-value	Error term	T-value	Item reliability	Average variance extracted	Composite reliability
Perceived Job-performance:							
Item 1	0.90	20.01	0.19	6.61	0.81	0.74	0.90
Item 2	0.85	18.26	0.29	9.01	0.72		
Item 3	0.84	18.24	0.29	9.03	0.71		

Appendix D: Questionnaire

PC BRUK PÅ ARBEIDSPLASSEN

NHH STATOIL

Forskningsprosjekt vedrørende bruk av PC i jobbsammenheng.

Gjennomført av doktorgradsstipendiat Øystein Sørebø ved Institutt for Strategi og Ledelse ved Norges Handelshøyskole i samarbeid med Statoil IT.

Dette forskningsprosjektet har som formål å belyse ulike sider ved bruk av PC i jobbsammenheng. Ett av målene er å øke kunnskapen om hva interesse og engasjement vedrørende PC-bruk betyr for bruk av programvare og brukerstøtte. **Spørreskjemaet skal besvares anonymt og alle opplysninger vil bli behandlet konfidensielt etter retningslinjene i Personregisterloven. I rapporten fra undersøkelsen vil det ikke være mulig å spore tilbake hva personer fra f.eks. ulike avdelinger i Statoil har svart.**

Når du besvarer spørsmålene vil du oppleve at noen av dem er relativt like, andre kan virke noe spesielle, men det er en mening med samtlige av dem. Vi anbefaler at spørsmålene besvares fortløpende i et raskt og jevnt tempo, da det er din umiddelbare reaksjon vi er ute etter (erfaringsmessig er den umiddelbare reaksjon også den mest riktige). Det kan ta deg ca. 15 minutter å besvare spørreskjemaet.

Vennligst legg skjemaet i svarkonvolutten når du har besvart det. Faglige spørsmål og kommentarer til undersøkelsen kan du rette til Øystein Sørebø.

Med vennlig hilsen

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På forhånd takk for hjelpen!

1. BRUK AV PROGRAMVARE I JOBBSAMMENHENG

	Navn på programpakker:	Vennligst anslå hvor ofte du bruker ulike programpakker?				
		Flere ganger pr. dag	*En gang pr. dag*	*Et par ganger i uka*	*Et par ganger i måneden*	*Aldri/ Nesten aldri*
1	WordPro/AmiPro (tekstbehandling)	❑	❑	❑	❑	❑
2	Lotus 123 (regneark)	❑	❑	❑	❑	❑
3	Freelance Graphics (presentasjon)	❑	❑	❑	❑	❑
4	Organizer (personlig planlegging)	❑	❑	❑	❑	❑
5	Approach (databaseverktøy)	❑	❑	❑	❑	❑
6	Lotus Notes Mail (elektronisk post)	❑	❑	❑	❑	❑
7	Lotus Notes Saksarkiv (saksbehandlingsverktøy)	❑	❑	❑	❑	❑
8	Internett	❑	❑	❑	❑	❑
9	**Andre vektøy du bruker:**					
	.....	❑	❑	❑	❑	❑
	.....	❑	❑	❑	❑	❑
	.....	❑	❑	❑	❑	❑

2. BRUK AV PC TIL Å STØTTE OPPGAVEUTFØRELSE

PC anvendes vanligvis i forhold til en rekke ulike arbeidsoppgaver. Nedenfor ber vi deg anslå i hvilken grad du anvender PC når du utfører ulike oppgaver.

	Sammenlignet med nære kolleger bruker jeg PC oftere enn dem til å	**Svært dårlig beskrivelse**						**Svært god beskrivelse**
		1	*2*	*3*	*4*	*5*	*6*	*7*
1	...kommunisere med andre personer	❑	❑	❑	❑	❑	❑	❑
2	...planlegge aktiviteter	❑	❑	❑	❑	❑	❑	❑
3	...identifisere problemer/alternativer vedrørende beslutninger	❑	❑	❑	❑	❑	❑	❑

3. BRUK AV PC TIL Å STØTTE OPPGAVEUTFØRELSE (fortsetter)

Sammenlignet med nære kolleger bruker jeg PC oftere enn dem til å	Svært dårlig beskrivelse						Svært god beskrivelse
	1	*2*	*3*	*4*	*5*	*6*	*7*
4 ...avdekke trender/tendenser innen mitt ansvarsområde	❑	❑	❑	❑	❑	❑	❑
5 ...foreta revisjon, kontrollere og sjekke opp forhold	❑	❑	❑	❑	❑	❑	❑
6 ...kontrollere og styre aktiviteter	❑	❑	❑	❑	❑	❑	❑
7 ...ta beslutninger	❑	❑	❑	❑	❑	❑	❑
8 ...utføre budsjettering	❑	❑	❑	❑	❑	❑	❑
9 ...skrive rapporter, referater, m.m.	❑	❑	❑	❑	❑	❑	❑
10 ...lage presentasjoner	❑	❑	❑	❑	❑	❑	❑
11 ...planlegge møter	❑	❑	❑	❑	❑	❑	❑

4. ASSISTANSE TIL ARBEIDSKOLLEGER

Nedenfor ber vi deg ta stilling til noen påstander vedrørende omfanget av den assistansen du gir til dine arbeidskolleger.

Mine kolleger:	Svært dårlig beskrivelse						Svært god beskrivelse
	1	*2*	*3*	*4*	*5*	*6*	*7*
1 ...etterspør av og til hjelp fra meg vedrørende sin bruk av PC	❑	❑	❑	❑	❑	❑	❑
2 ...spør meg av og til om råd og tips i forbindelse med bruken av én eller flere applikasjoner	❑	❑	❑	❑	❑	❑	❑
3 ...henvender seg jevnlig til meg med tekniske spørsmål i forbindelse med deres bruk av PC	❑	❑	❑	❑	❑	❑	❑
4 ...anvender meg av og til som en rådgiver når det gjelder bruk av PC	❑	❑	❑	❑	❑	❑	❑
5 ...oppfatter meg som en god kilde til informasjon når det gjelder bruk av applikasjoner	❑	❑	❑	❑	❑	❑	❑
6 ...kommer regelmessig til meg for å få assistanse i forbindelse med bruken av egen PC	❑	❑	❑	❑	❑	❑	❑

5. BRUK AV ASSISTANSE VED PC-PROBLEMER

Nedenfor ber vi deg ta stilling til hvilken assistansekilde du anvender når det oppstår PC problemer. Angi hvilken type du normalt vil ta i bruk *først* hvis problemet skulle oppstå. **Kun ett kryss for hver linje!**

	Hva gjør du hvis	*Tar først kontakt med Help-Desken (datahjelpen)*	*Tar først kontakt med en kollega som kan hjelpe meg*	*Bruker hjelpe-menyen i den aktuelle program-pakken først*	*Eksperimenterer meg som regel frem til en løsning selv*
1	...du ikke vet hvordan du skal sende eller motta et vedlegg i e-post	❑	❑	❑	❑
2	...du ikke vet hvordan du kan kopiere en tabell fra tekstbehandling (evt. regneark) til presentasjons-programmet Freelance Graphics	❑	❑	❑	❑
3	...det er nok papir i skriveren, men det kommer ingen utskrift ut	❑	❑	❑	❑
4	...PC din ikke starter opp	❑	❑	❑	❑
5	...du har glemt hvordan du bruker en funksjon (f.eks. tabellfunksjonen i WordPro/AmiPro)	❑	❑	❑	❑
6	...du ikke får tilgang til en fil eller et område i Lotus Notes	❑	❑	❑	❑
7	...musa ikke virker, f.eks – du klikker men ingenting skjer	❑	❑	❑	❑
8	...du ønsker å få autokorrigert feilskriving i WordPro/AmiPro, eks. at "sommren" automatisk blir omgjort til "sommeren"	❑	❑	❑	❑
9	...du ønsker å slette / fjerne dokumenter evt. kataloger du ikke lenger har bruk for	❑	❑	❑	❑
10	...du lurer på hvordan en applikasjon (f.eks. regneark) kan tas i bruk på et problem du ikke har løst tidligere (f.eks. en "what if" analyse)	❑	❑	❑	❑
11	...du mottar et dokument som vedlegg til en e-mail og får problemer med konvertering	❑	❑	❑	❑

6. BRUK AV FUNKSJONER OG MENYER I PROGRAMVARE

Nedenfor ber vi deg ta stilling til noen påstander vedrørende din bruk av funksjoner og menyer i de programmene du anvender.

	Svært dårlig beskrivelse						Svært god beskrivelse
	1	*2*	*3*	*4*	*5*	*6*	*7*
1 Jeg eksperimenterer mye med ulike funksjoner i de programmene jeg bruker (f.eks. tester ut ulike layout alternativer i Freelance evt. WordPro)	❑	❑	❑	❑	❑	❑	❑
2 Jeg prøver rett som det er ut ukjente funksjoner i de ulike programmene jeg anvender (f.eks. tegne- evt. tabellfunksjonen i WordPro/AmiPro)	❑	❑	❑	❑	❑	❑	❑
3 Jeg legger ofte veldig mye flid i å eksperimentere meg frem til en hensiktsmessig layout når jeg skriver et dokument i WordPro/AmiPro (evt. lager en presentasjon i Freelance)	❑	❑	❑	❑	❑	❑	❑
4 Jeg eksperimenterer regelmessig med ulike menyvalg i de forskjellige programmene jeg anvender	❑	❑	❑	❑	❑	❑	❑

7. BETYDNINGEN AV INFORMASJONSTEKNOLOGI FOR DEG

Nedenfor ber vi deg ta stilling til noen påstander vedrørende den personlige betydningen det å bruke informasjonsteknologi i jobbsituasjonen har for deg.

	Svært dårlig beskrivelse						Svært god beskrivelse
	1	*2*	*3*	*4*	*5*	*6*	*7*
1 Det betyr mye for meg å lære om PC-utstyr og programvare fordi jeg da øker muligheten til å gjøre det bra i senere sammenhenger	❑	❑	❑	❑	❑	❑	❑
2 Hvis jeg skal trives på en arbeidsplass så er det meget viktig for meg at jeg får tilgang til siste nytt innen informasjonsteknologi	❑	❑	❑	❑	❑	❑	❑
3 For å nå mine personlige målsettinger er det av stor betydning for meg å holde meg orientert om siste nytt innen PC-utstyr og programvare	❑	❑	❑	❑	❑	❑	❑
4 For å utvikle min kunnskap i jobbsammenheng er det av stor verdi for meg å ha tilgang til siste nytt innen informasjonsteknologi	❑	❑	❑	❑	❑	❑	❑
5 For meg er det viktig å jobbe aktivt med informasjons-teknologi, fordi jeg hele tiden lærer noe som er med på å fremme mine personlige mål	❑	❑	❑	❑	❑	❑	❑
6 Jeg tror at min bruk av datamaskinen er viktig, fordi dette er noe jeg vil ha nytte av i fremtiden	❑	❑	❑	❑	❑	❑	❑
7 Å bruke informasjonsteknologi regelmessig er viktig for meg, fordi det gir meg muligheten til å prestere bedre i fremtiden	❑	❑	❑	❑	❑	❑	❑

8. OPPFATNING OM UTFØRELSE AV JOBB

Nedenfor ber vi deg ta stilling til hvordan du vurderer egne jobbprestasjoner.

I forhold til mine kolleger		Svært dårlig beskrivelse						Svært god beskrivelse
		1	*2*	*3*	*4*	*5*	*6*	*7*
1	...er jeg nok mer produktiv enn de fleste av dem	❑	❑	❑	❑	❑	❑	❑
2	...administrerer jeg arbeidstiden min på en mer effektiv måte	❑	❑	❑	❑	❑	❑	❑
3	...er jeg mer fokusert mot den jobben jeg utfører	❑	❑	❑	❑	❑	❑	❑
4	...står jeg mer på for å gjøre jobben min best mulig	❑	❑	❑	❑	❑	❑	❑

10. BAKGRUNNSINFORMASJON

Nedenfor ber vi deg oppgi informasjon om stillingstype, utdanningsbakgrunn, alder m.m.

1. Stillingstype?
- ❑ Fagstilling (ingeniør, mekaniker, geolog, økonom, etc.)
- ❑ Administrativ stilling (sekretær, arkiv, personal, m.m.)
- ❑ Annet, spesifiser:

2. Har du lederansvar i din stilling? ❑ Ja ❑ Nei

3. Alder? ❑ < 25 ❑ 25 - 35 ❑ 36 - 45 ❑ 46 - 55 ❑ > 55

4. Kjønn? ❑ Mann ❑ Kvinne

5. Hvor lang erfaring har du med bruk av PC (både jobb og privat)? Ca. _____ år

6. Utdannelsesnivå - jeg har:
- ❑ Grunnskole
- ❑ Videregående skole
- ❑ Fra ett til to år ved universitet eller høyskole
- ❑ Fra tre til fire år ved universitet eller høyskole
- ❑ Hovedfag/Master-grad
- ❑ Doktorgrad

Appendix E: Information about adjustments in measurement scales

Variables	The initial scale	Interviews	Feedback from pretest	Changes in the initial scale
End-user involvement	The scale was basically adopted from Schneider & Rodgers (1996), which is a consumer involvement scale. Examples of items from Schneider & Rodgers (1996) are: *I attach great importance to selecting a PC; Decisions about selecting a PC are serious, important decisions* (i.e. measured with a five-point Likert scale; totally agree, partly agree, neither agree nor disagree, partly disagree, totally disagree).	No information about this scale emerged from the interviews.	The initial scale was formulated as pure personal importance statements (e.g. *It is important for me to work regularly with information technology*). A lot of the users described these statements as too simple and "naive".	A decision about including "goal" statements in the initial scale was made (e.g. *It is important for me to work regularly with information technology, because I then learn something that promotes my personal goals*). The purpose was to make the scale more meaningful.
Task-specific utilization	The scale was basically adopted from Igbaria & Iivari (1998), and their original version was formulated in the following manner: *With respect to your current job, please indicate to what extent you use the computer to perform the following tasks: Looking for trend; Finding problems/alternatives; Planning* (i.e. measured with a five-point Likert scale; not at all - to a great extent).	No information about this scale emerged from the interviews.	Some users described the initial scale as too general.	Because of the diversity in the job tasks among the users it was not possible to make the scale more specific. However, it was decided to change the preface in the initial scale to: "*Compared with my colleagues I use my computer more frequently than them to:*". The purpose was to make it easier for the respondent to find his "true" utilization level.

Non-task specific utilization	No initial scale was identified through the literature (cf. chapter 5.4). A scale was made up by general statements about "trying out" functions and facilities in the available software.	The interviews demonstrated that the exploration of facilities and functions in connection with various types of software was a common pattern of behavior in Statoil.	Some users described the various statements as too similar.	No substantial changes in the scale were made.
Self-support	None of the existing scales (e.g. Magal 1991, Rivard & Huff 1988) were evaluated to be suitable for the study (cf. chapter 5.4). Two dimensions were developed to make up a adequate scale; one problem focused dimension and one support-source dimension (cf. Appendix B).	The interviews identified: (1) the various sources that the users utilized when they were in need of support; (2) typical problems that may emerge when the users utilize their personal computer.	Some users' described the identified sources and problems as actual and relevant within their work context.	No substantial changes in the scale were made.
Colleague support	The scale was basically adopted from Flynn (1996), which is an opinion seeking scale. Examples of items from Flynn (1996) are: *When I consider buying a cd or tape, I ask other people for advice; I would not choose a record without consulting someone else* (i.e. measured with a seven-point Likert scale; agree - disagree).	The interviews supported the initial assumption about coworkers as an important source of support, in spite of the existence of an institutionalized help-desk.	Some of the users described various statements as very imprecise.	Some of the statements were changed with the purpose of making them more precise. E.g. the statement "*My colleagues regard me as a reliable information source regarding PC utilization*" was changed to "*...regard me as a reliable information source regarding the utilization of various software packages*".

Perceived job performance	The scale was basically adopted from Babin & Boles (1996), which is a self-report job performance scale, made for the retail employees. Examples of items from this scale are: (Prefaced with, "Relative to other servers here, ...) I manage my work time better than most; I am good at my job; I know what my customers expect (i.e. assessed using a five point Likert format).	No information about this scale emerged from the interviews.	No information about this scale emerged from the pretest.	No substantial changes in the scale were made.