User satisfaction and influencing issues

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Abstract

There has been a rapid growth of information systems (IS) the last few years, and with the fast evolvement arise questions about how to manage these systems to obtain efficiency and success. People have used the literature as a forum to discuss these important issues for many years now, and literature concerning information systems is therefore widespread. User satisfaction is one of the terms that have occurred several times in this literature and has a special position in information system research. This literature survey reviews some of the earlier work that has been done with regards to user satisfaction. It describes the term user satisfaction, why it is considered important, relationships - how it is influenced by other factors, and also takes a look at user satisfaction as a measure of system effectiveness.

1 Introduction

This paper presents an introduction to End-User Computing (EUC) through a short glance at the history of End-User Computing and the arising need for support. The survey explains how this is related to user satisfaction, discuss what user satisfaction is, why it is important, and give some examples of research which attempt to measure user satisfaction. Further, it looks at the relationship that user participation and expectation have with user satisfaction, and some other influencing factors. Last the survey will consider user satisfaction as a measure of system effectiveness.

The survey contains a minimal of abbreviations to enhance the readability for those who are not that familiar with the topic. The appendix lists a set of abbreviations which are often encountered in literature relating to information systems and user satisfaction.

2 What is meant by “end-user”?

The term end-user appears everywhere in research discussing user satisfaction and will also be used in this literature survey. An end-user can be defined as the final or ultimate user for which something is intended (i.e. the normal user of a product). It usually implies an individual with a relatively low level of computer expertise, and they do not generally have administrative responsibilities or privileges.

The term end-user distinguishes the user for which the product is designed from other users who are making the product. Developers of a system are usually not considered as end-users of that system. Unless you are a programmer or engineer, you are most likely to be an end user. Often, the term user would suffice.

This definition is supported by many researchers and is how the word is normally used in the literature (e.g. [16, 30, 9, 11, 37, 2, 63, 43]).

3 History

Evolvement of End-User Computing

In the past users had to depend on the central IT department with their large mainframes and were then given direct access via so-called “dumb” terminals. Users were dissatisfied with the situation and having to rely solely on the IT department.

In the mid-to-late 1970’s the phenomena known as “end-user computing” emerged [11, 30, 43]. The computers had moved out of the lab and were in use by several departments, universities and colleges. With the introduction of microcomputers and the IBM PC on the market in the early 1980’s, there was an explosive growth of end-user computing [16, 9, 30, 11]. Users went from being ignorant users to “knowledgeable workers”. At the same time as user sophistication increased, software, high-level programming languages and packages became more user-friendly, and the hardware costs decreased.

During the 1980’s the users began to develop their own applications and systems to meet their computing needs, and with the continuous improvement of hardware and software performance, this resulted in end-user computing being popular and widespread. The past computing technologies which were based on centralized architectures from the mainframe evolved as the deployment of desktop computers conquered terrain. Desktops then connected to the mainframes and there was an increased use of networks. This lead to the spread of distributed services and deployment of LANs (Local Area Networks) in the 1990’s [11].

The arising need for support

With the fast evolution of information systems and literate users, the community requires support to function efficiently [37]. Systems become more complex, thus the users have greater informational needs. As with any learning experience, a circular pattern develops: a user acquires basic skills, applies these skills to new problems, and thereby develops the competence to acquire additional skills for more complex problems. The users represent a stream of future demands at the same time as the technology is improving and more powerful hardware and software is required.

User training is needed to obtain the maximum benefit from the end-user computing environment. Not spending enough resources on educating the users may have severe consequences which can result in decreased productivity and other organizational costs. Examples of such costs can be compromised security, delays in deployment or deployment of products, “incorrect” approaches in system management or product development, frustration inside the organization and low quality work / designs [2].

There are different sorts of proactive and reactive support. But users are diverse and need differentiated education, training, support, and software tools [13, 33, 56, 59, 61, 63]. It is a difficult and large task to manage and please the majority of the users. They are becoming more demanding as they get further

knowledge and skills, and have specific requests. This, and the fact that they may have strong opinions, makes them challenging to satisfy.

Users came in focus when managing the organization, and as number of desktop computers per full-time support person increased, outsourcing became an option for some sites [43, 78, 23]. Studies show that users were generally dissatisfied with the support function [29, 54, 69]. This was, and still is, measured by surveys asking about or reflecting users' satisfaction.

4 User satisfaction

In a work environment in which computer use is mandatory, one would expect judgments of "user satisfaction" to be based primarily on the degree to which the system in question enhances productivity. However, productivity is probably not the prime motive driving people when they are playing computer games. Regardless of whether users are forced to interact with computers at work or whether they choose to do so in their leisure time, one would assume that the overall user experience will include some sense of "satisfaction".

Superficial tests and measurements of satisfaction by "visiting" test-users may reflect the appeal, design, or appearance, and not the real satisfaction that will appear over time [48]. Therefore tests and measurements should be done using the normal everyday-user to get a view how the system works and fulfills the users' needs. First impressions are important to attract users / customers [48], but after a while there is needed more usability and the will to accommodate requests to satisfy users and keep customers.

Perceived ease-of-use is an important component of user satisfaction with information systems [20]. End-users are often novice and reluctant adopters of information systems [21]. Specific training programs and support to satisfy end-users is therefore becoming more vital as organizations make larger investments in information technology [7]. The next section discusses how to define user satisfaction.

What is user satisfaction?

Cyert and March (1963) [17] believed that if an information system meets the requirements of the users, the users' satisfaction with the information system will increase. Conversely, if the information system does not provide the needed information, the users will become dissatisfied.

Locke (1976) defined satisfaction as an emotional response or affect toward an object [49]. Similar definitions of satisfaction have been used by information system researchers. Ives, Olson and Baroudi (1983) defined user satisfaction as the extent to which users believe the information system available to them meet their informational requirements [42]. Bailey and Pearson (1983) defined satisfaction as the sum of feelings or attitudes, both positive and negative, affecting the specific situation [4]. Doll and Torkzadeh (1988) also defined satisfaction as an affective attitude [20]. Galetta and Lederer (1989) concluded that satisfaction includes both perceptions and attitudes [25].

Melone (1990) then defined user attitude as a tendency to respond favorably or unfavorably to a computer system, application, system staff member, or a process related to the use of system or application [52]. Rainer and Harrison

(1993) said that end-user satisfaction is an individual's attitude toward the use of computers, spanning all computer-related activities required or necessary to accomplish one's job [60].

Further research on the effects of attitudes was conducted by Harrison and Rainer (1996) who set up several hypotheses to prove a relationship between attitudes and user satisfaction among other things [34]. They mailed a questionnaire regarding various aspects of computer use to the 3 488 salaried personnel of a university, and a total of 776 usable responses were received. The relationship between computer skill and user satisfaction had not been thoroughly addressed in the literature. However, a study by Pratkanis and Greenwald (1988) suggests that satisfaction may be a function of the roles and tasks a person must perform in a given situation [58]. Harrison and Rainer proposed the hypothesis that there would be a positive correlation between user satisfaction and computer skill. This was verified by statistical significance.

Igbaria and Parasuraman (1989) noted that computer attitudes can be related to user satisfaction [40]. Harrison and Rainer tested this by setting up three hypotheses:

- There will be a significant positive correlation between user satisfaction and positive attitudes toward computer use.
- There will be a significant negative correlation between user satisfaction and negative attitudes toward computer use.
- There will be a significant negative correlation between user satisfaction and lack of understanding of computers.

All three constructs were confirmed. Pancer, George and Gebotys (1992) insinuate that user satisfaction is an attitude that may be affected by computer training (i.e. user computing satisfaction is a state) [67].

Harrison and Rainer continued by looking at anxiety toward computer use. Earlier research indicated that individuals with high computer anxiety possessed lower self-confidence in their abilities and demonstrated poorer performance outcomes than subjects with low computer anxiety [36]. It was also noted that computer anxiety can be related to dissatisfaction with the computer system [40]. Harrison and Rainer proposed the following hypotheses:

- There will be a significant positive correlation between user satisfaction and low anxiety toward computer use.
- There will be a significant negative correlation between user satisfaction and high anxiety toward computer use.

Both these theories were shown to have statistical significance.

Baroudi, Olson and Ives (1986), and Igbaria and Nachman (1990) found strong relationships between user satisfaction and computer usage [5, 39]. Harrison and Rainer assume that there will be a significant positive correlation between user satisfaction and computer usage. This statement was also proven to be true, but there were variations between different user groups which need to be studied further.

Why is user satisfaction important?

User satisfaction with computers is an increasingly important topic in view of the enormous growth in the number of organizational personnel who use computers in their work and the resulting need to evaluate the effectiveness of such usage [34]. This has contributed to user satisfaction as probably the most widely used single measure of information systems success [27, 28, 22, 68, 19, 20, 12, 50, 66, 31, 73].

Melone (1990) concluded that an individual's perceptions of the computer system and related activities are predictive of the success of the computer system, and that user satisfaction is an affective attitude toward all the various activities surrounding an end-user's interaction with a computer-based information system [52].

Novice end-users are likely to perform poorly and be dissatisfied in complex task environments. Improving their performance and increasing their levels of satisfaction will probably lead to more efficient use of information systems resources in organizations [7].

Examples of research

Here are some examples of research with regard to user satisfaction. They illustrate that user satisfaction is used as a measure of a systems success, and that it is part of information systems in different settings. The purpose is to give a better understanding of user satisfaction.

End-User Satisfaction of a Patient Education Tool: Manual Versus Computer-Generated Tool

The article reports a non-experimental comparative study of end-user satisfaction before and after implementation of a vendor supplied computerized system for providing up-to-date patient instructions regarding diseases, injuries, procedures, and medications [76]. Before implementation, a questionnaire was given to nurses on five clinical units to evaluate their current satisfaction of the manual process of acquiring patient educational material. The computer system was made available on 38 clinical units. Staff education about the computer application was provided through demonstrations, posters, and brochures. All educational materials included step-by-step instructions on how to interact with the program.

Two month after implementation, the questionnaire was redistributed to the same staff nurses for data collection so that data could be compared and analyzed. The results showed that ease-of-use and accessibility to the new computer system was rated with the lowest scores. People said that the application was difficult to operate and that there were too few terminals since the computers were also used for many other things (applications) and were often occupied. The conclusion was that in order to improve satisfaction, they needed to increase availability and enhance familiarity with the application.

User Satisfaction with Information Seeking on the Internet

The research described in the article is focused on how satisfied Australian academics are when they use the Internet to search for information [10]. The

Internet has been described as an "information superhighway" which implies that it provides effective information seeking. But the assumption had not been tested and proven with sufficient justification. This lead to an attempt to find out how satisfied users were when they looked for information using the network. The research study indicated that there were no significant relationship between attending an Internet training session and an academic's satisfaction with information seeking on the Internet. But this might be because of factors associated with the training, such as number of training sessions, trainer / trainee ratios, hands-on time, and quality of support materials. Previous studies of end-users have suggested that there exists a relationship between user satisfaction with an information system and the frequency of use (e.g. [5, 39, 34]). This relationship is underpinned by a simple logic. The more an information system is used, the more skilled the user becomes, and the more satisfied the end-user will be with the outcomes of information seeking, which might result in the user using it more often. However, there are differences between users. In some situations, users are required to interact with information systems because it is mandatory and unavoidable, while other users might find another way to do their work. It must also be noted that an end-user doesn't necessarily use the system more although he or she is satisfied and gets the task done quickly. It might be that there is just more time for other tasks, thus it depends on the job-function.

The data in this study [10] did not provide evidence of a statistically significant relationship between user satisfaction with information seeking on the Internet and frequency of use, but the conclusion drawn was that users believe information problems will be resolved when they search for information on the Internet.

The effects of download delay on performance and end-user satisfaction in an Internet tutorial

A study was conducted which investigated the effects that download delay of instructional materials had on Internet-based learning [18]. Eighty-two undergraduate and graduate volunteers were recruited through advertising on campus and announcements made in psychology classes at a large state university.

Four dependent variables were measured:

- the participant's performance
- time spent reading the paragraphs and examining the pictures for every frame in the tutorial
- perceived effectiveness
- end-user satisfaction

This research was the first empirical study of the effects that download delay had on performance and satisfaction with online learning [18]. The results of which affects download delay had on performance, time spent on lesson, end-user satisfaction, and perceived effectiveness, were mixed. This consists with the mixed effects of feedback delay found in previous studies of computer-based teaching (e.g. [1, 44, 70]). The conclusion was that the effects of download delay might be more complicated than originally though.

Measuring user satisfaction with data warehouses

Organizations with massive volumes of data need to have control of the storage, access, and processing of data. For some organizations, a data warehouse might be an option. The article discusses end-users' satisfaction with data warehouses [12]. A number of major mid-south US metropolitan corporations known to have implemented data warehouses were selected as the subjects of the research. Surveys were mailed or faxed to 53 managerial end-users. Amongst all the returned questionnaires, 42 were found to be complete and usable. Thus the study was conducted by analyzing the surveys of 42 business managers. The findings indicated that end-users' satisfaction was dependent on the support provided.

5 Relationships

End-user satisfaction is believed to be associated with system success [20]. Understanding how factors affect satisfaction enables designers and managers to enhance system effectiveness, possibly through user education and training. The next sections look at relationships and factors influencing user satisfaction.

The relationship between user participation and user satisfaction

User participation has been widely advertised by the MIS (Management Information System) community as a means to improve user satisfaction with system development. This claim, however, had not been consistently substantiated in the empirical literature. McKeen *et al.* (1994) started an investigation of four contingency factors [51]; task complexity, system complexity, user influence, and user-developer communication. They conducted analysis of 151 independent system development projects in eight different organizations.

Earlier research has indicated a link between user participation and user satisfaction. Gallagher (1974) found that users who participated in systems design tended to value the resulting systems more highly than those users who did not participate [26]. Alter (1978) found that users were much more likely to resist system introduction in situations where they had neither initiated the project nor participated in its development [3]. Supporting evidence is also provided by Oppelland and Kolf (1980), who found that active user participation enabled better problem understanding and resulted in helpful system design contributions [55]. Baroudi, Olson and Ives (1986) found that user participation in systems development led directly to both user satisfaction and system usage [5]. In addition, a meta-analytic review of reported empirical studies found a correlation of 0.28 between user participation and system success [72].

McKeen, Guimaraes and Wetherbe [51] believed information system project development requires the appropriate users to participate in the project at the appropriate stage and in a manner which enables a meaningful contribution. Therefore they proposed that user participation in systems development activities should lead to greater commitment, involvement, acceptance, use, and ultimately, greater satisfaction. They set up the following hypothesis:

- H1: A positive relationship exists between user participation and user satisfaction.

There were two types of complexity to be looked at; task complexity, and system complexity. According to Naumann, Davis and McKeen (1980), increased project complexity decreases the level of assurance of achieving the project goals [53]. To manage the risk of system failure, they suggest that user participation be increased proportionally with project complexity. Beath (1987) goes further by actually claming that the relationship between user participation and system success will differ depending on the degree of task complexity [6]. McKeen *et al.* (1994) [51] proposed the following hypotheses:

- H2: The greater the task complexity, the greater the relationship between user participation and user satisfaction.
- H3: The greater the system complexity, the greater the relationship between user participation and user satisfaction.

The next variable to be examined was user influence. It is through participation in activities related to systems development that users can exercise influence over systems development. Without participation, there could be no influence. However, the opposite is possible. Users are able to participate in system development without exercising any real influence. It is in this case that the participation becomes ineffectual and unproductive. Without adequate influence to change things and affect results, users are likely to see their participation as a waste of time. Where users are able to influence the decisions regarding systems development, their participation becomes valued and valuable. McKeen *et al.* (1994) [51] hypothesized:

- H4: The greater the user influence, the greater the relationship between user participation and user satisfaction.

The last variable to be explored was user-developer communication. Edstrom (1977) found a significant relationship between effective communication and system success [24]. Users have the understanding and insight of business practice. They have to convey this to developers who, in turn, must receive the information and translate it into a working computer system. According to Robey and Farrow (1982) [62], effective communication plays the facilitating role during user participation by enabling conflict identification and resolution. Effective communication facilitates the exchange of information that is essential for the derivation of systems requirements and the eventual success of a systems development effort [77]. McKeen *et al.* (1994) [51] suggested the following hypothesis:

- H5: The greater the quality of user-developer communication, the greater the relationship between user participation and user satisfaction.

Figure 1 shows the proposed model of the relationship and moderating variables being tested.

Linear regression analysis (LRA), subgroup analysis and moderated regression analysis (MRA) were used to test the relationships. As hypothesized (H1), user participation does have a significant positive relationship with user satisfaction. The coefficient of determination (R^2) was 0.166. Also H2 (task complexity)

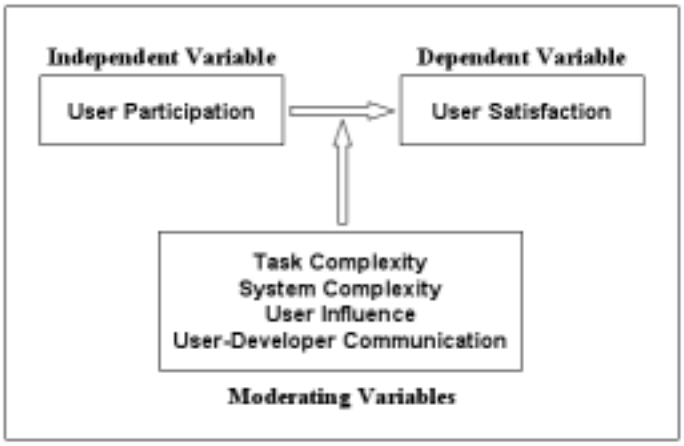

Figure 1: Proposed Relationships

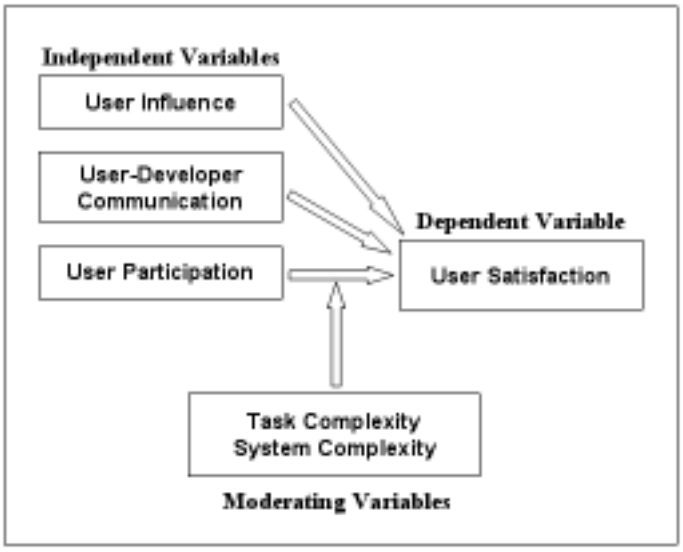

Figure 2: Relationships Found

and H3 (system complexity) were shown to be true, indicating that the relationship between user participation and user satisfaction is dependent upon them. In situations where task complexity or system complexity was high, the relationship between user participation and user satisfaction was much stronger.

In contrast, both user influence and user-developer communication were shown to be independent predictors of user satisfaction. Neither affected the relationship between user participation and user satisfaction directly. Thus, hypotheses H4 and H5 were rejected. In systems developments where there was a high degree of user influence and user-developer communication, there was also a high degree of user satisfaction regardless of the degree of user participation. Figure 2 shows the resulting model of relationships and moderating variables.

McKeen *et al.* (1994) [51] concluded that user participation had a direct relationship with user satisfaction, and that the four contingency factors played key roles. Task complexity and system complexity proved to be pure moderators. That is, the strength of the participation-satisfaction relationship depended on the level of these factors. In projects where there was high level of task complexity or system complexity the, the relationship between user participation and user

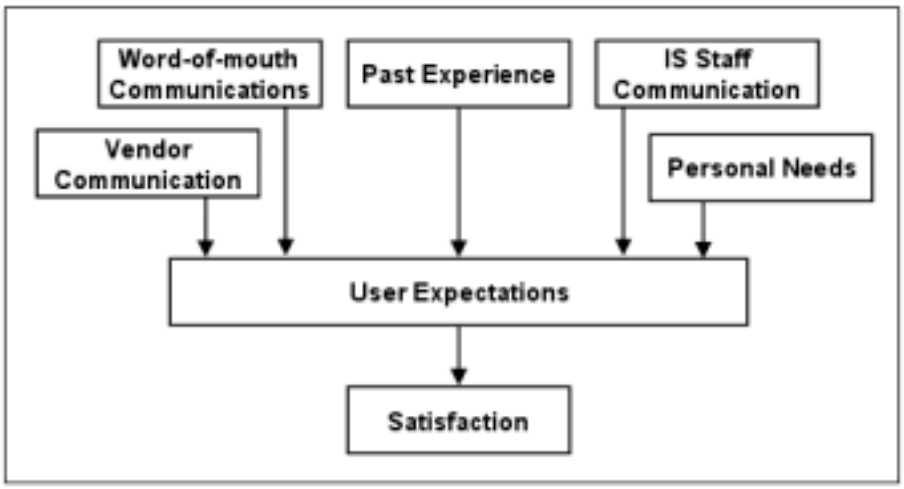

Figure 3: Determinants of users' expectations

satisfaction was significantly stronger then in projects where task complexity or system complexity was low. Further they concluded that user influence and user-developer communication were independent predictors of user satisfaction. That is, user influence, or user-developer communication, was positively related to user satisfaction regardless of the level of participation.

The relationship between user expectation and user satisfaction

Studies have suggested that the impact of user expectations should be considered when assessing user satisfaction. In a survey of information systems conducted by Conrath and Mignen (1990) [15], "user expectation" was ranked second in a list of 33 items affecting user satisfaction. This is consistent with earlier research that have found that user expectations have a strong effect on overall satisfaction with information systems [64]. The importance of users having realistic expectations was emphasized by Szanja and Scamell (1993) [73].

Despite the attention to the effect of expectations on user satisfaction, no empirical study had been done to examine the relationship between determinants of expectations and user satisfaction. Though there are many factors that determine expectations of computer users, Zeithaml, Berry and Parasuraman (1993) [80] identified the key determinants to be word-of-mouth communications, personal needs, past experience, and communication by the service provider. Pitt, Watson and Kavan (1995) later added vendor communication to this list [57]. Figure 3 displays the model of determinants.

Ryker, Nath and Henson (1997) [66] wanted to explore the relationship between the determinants of user expectations and user satisfaction. A total of 551 surveys were distributed, of which 252 were returned complete and found usable. Determinants of expectations were divided into 3 categories: sources internal to the organization, sources external to the organization, and past experience. The reason for doing so was the belief that expectations that are influenced by external sources, e.g. vendors, may be less realistic than expectations set by IS staff. Vendors, in trying to sell their products, may raise expectations by emphasizing the best features of their wares and avoid or downplay issues such as system conversion, compatibility, or integration with

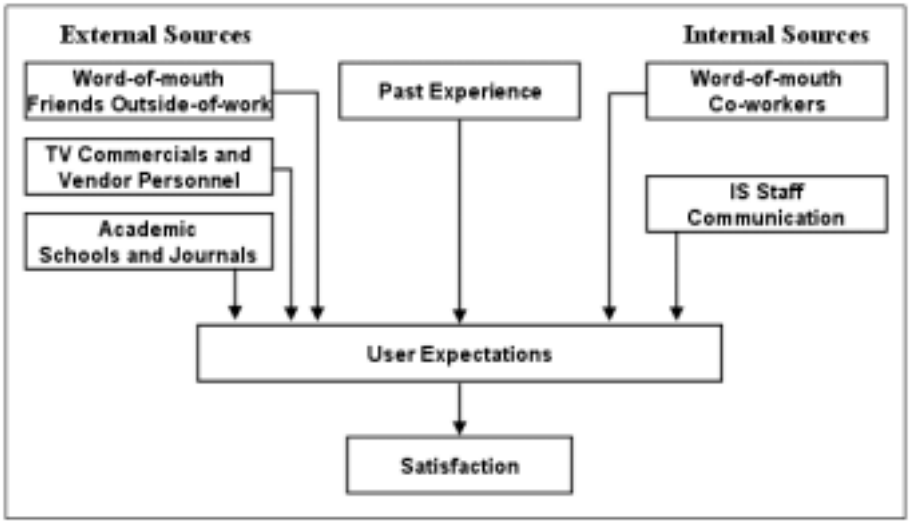

Figure 4: Augmented Determinants of expectation model

existing systems. Organizations are likely to have more control over internal sources of expectations. Ryker *et al.* (1997) [66] considered two sources of vendor communication: television commercials and vendor personnel. Word-of-mouth communications were also considered in two ways: outside the organization they may come from friends outside-of-work, and inside the organization they may come from co-workers. Another determinant of expectation, not appearing in Pitt *et al.*'s (1995) [57] model, is also added. That is, academic sources such as schools and technical journals. Personal needs were not included in the study because the term was considered too vague and should be more fully defined.

Figure 4 shows the result of changes to the previous expectation model (Figure 3).

Ryker, Nath and Henson (1997) [66] formed the following two hypotheses to confirm their beliefs:

- H1: The mean satisfaction levels of users differ according to the sources (internal, external, and experience) that influence user expectations.
- H2: Users influenced by internal sources have higher satisfaction than those influenced by external sources.

To test the hypotheses, they used a one-way ANOVA and Scheffe's post-hoc test for differences in overall user satisfaction among the three groups of influencing factors (i.e. internal sources, external sources, and past experience). Hypothesis H1 was found to be supported ($p=0.014$). That is, overall user satisfaction differed for the three sources of influence. Further examination showed that there was a significant difference between the internal and external group, thus hypothesis H2 was also supported.

Ryker *et al.* (1997) [66] concluded that users whose expectations are primary influenced by sources internal to the organization (e.g. school, friends outside-of-work or vendors) are significantly more satisfied with their information systems than those whose expectations are primary influenced by external sources (e.g. co-workers or IS staff). Understanding the expectations and sources of

expectation can help the IS managers to address the problem with dissatisfied users. The results highlight the need for IS staff to communicate realistic expectations to users. If they don't set users' expectations, others will.

Prior expectations seem to play a major role in shaping user satisfaction [66]. This is also supported by Lindgaard and Dudek [48]. Further they imply that the perceived quality of subsequent experiences may depend on the first impression. Thus getting the first impression right may prove to be more important than creating highly efficient and effective applications. Usability issues need not affect the level of satisfaction sufficiently to lower the total satisfaction below a neutral level. This might not be true if users are pursuing particular tasks in which usability problems do get in the way of successful task completion.

6 Influencing factors

The growth in end-user computing warrants an investigation of factors that improve end-user performance and satisfaction. Some of the relationships are discussed in the section above, but there are also several other factors that influence the users' level of satisfaction.

Hardware and procedural components

As workstations play a greater role of end-user computing, hardware issues becomes a considerable part of users' satisfaction. These are factors like whether their computers have enough memory, disk space, speed, etc. For example, a user's satisfaction may be significant affected by whether they have a fast enough CPU and sufficient memory to run their programs without any problems. A user's satisfaction may also be significantly affected by ergonomic items such as screen size and functionality (i.e. the possibility to adjust the screens physical attributes), wrist rests, or comfortable keyboards.

The procedures component of an information system may also affect user satisfaction. Procedures are instructions, written for users, that explain how to operate an information system. Procedures are typically found in the form of a user manual. One might expect that issues such as whether the procedures are well organized or whether they provide good examples, can affect user satisfaction. Error messages can also be vied as procedures. They tell a user that something is wrong, but often do not give the user clear instructions of what they must do to correct the problem.

Both the statements above are supported by Ryker and Nath who collected data from 232 users (1997) and showed that hardware and procedural components had a strong correlation with overall user satisfaction [65].

Support factors

Organizations are investing large sums of money in information technology, but often they do not experience the performance gains they had expected. Extracting benefits from these investments depends on the support given to ensure effective use and satisfied users [69].

Shaw, DeLone and Niederman (2002) examined support factors across multiple user groups. They did so by looking at the gap between support level expected and support level provided for each of the support factors examined

and for each of the user groups [69]. The results showed larger gaps in IS staff response time, staff technical competence, software upgrades, ease of access to computing facilities, documentation to support training, cost effectiveness of systems, users understanding of the system, and data security and privacy. These eight support factors are a summary of all the user groups, and the gaps between expected support level and perceived support level were negatively associated with overall user satisfaction. As insinuated, the gaps were found by looking at the different user groups individually. It is worth to mention that software upgrades and IS staff response time were both common factors and were associated with user satisfaction across multiple organizations. Support factors' significance on users' satisfaction differs across work environments and across user groups with different experience and usage profile. Any effort to improve user satisfaction ought to study the different impacts of end-user support at the user group level and not just for the population as a whole. Shaw *et al.* (2002) had a generally dissatisfied user population and concluded that future studies should test the robustness of their results with a more highly satisfied user group.

Human factors

Factors affecting IT end-user satisfaction falls into three major categories: perceived benefits and convenience, user background and involvement, and organizational attitude and support.

Perceived benefits and convenience represent the job-related benefits that the individual user believes will follow through the use of a specific information system which then affects the usage level of that system. If the users perceive the system to be easy to use, they need less effort to use it, and will have more time for other activities, which may contribute to overall job performance [38].

The dimensions of user background and involvement are also important. It is the end-users who are most likely to know their requirements. End-users who are involved in the development process are likely to perceive the system as both important and personally relevant, and develop the feeling that the system is good [35].

Organizational attitude and support are other vital dimensions. End-users may lack knowledge of software and hardware. Therefore, adequate support is a must in order to realize productivity gains. Guimaraes, Igbaria and Lu (1992) claim that user training is directly related to user satisfaction [32]. It is believed that training programs are likely to increase user confidence and the ability to use computers, and that lack of training is a major reason for an information system's lack of success [38]. Yoon and Guimaraes (1995) said that management support is essential in providing the necessary resources for effective use of the information system and in showing interest in employees' satisfaction [79].

The dimensions mention above was tested by Mahmod *et al.* (2000) [50] who found that end-user satisfaction was strongly affected by perceived benefit and expectations characters such as perceived usefulness, ease of use, and user expectations. Ease of use was not deemed to be among the most important factors. It seemed like end-users primarily adopted an application based on perceived benefits and how easy or hard it was to achieve those benefits. This leads to the conclusion that users are willing to tolerate some difficulties of operating the system if the functions it perform for them are deemed to be

useful. Also, users with unrealistic expectations can become dissatisfied and may discontinue using the system if possible. Further findings were that that user background, involvement, and variables such as user experience, user skills, and user involvement, also were statically significant. Participation in system development results in system acceptance by users due to a sense of contribution and control, feeling of ownership toward the system and a better understanding of the system's capabilities [5]. Organizational support and user attitude affect satisfaction as well. Management support can be in from of encouragement to use the system, providing a wider selection of user-friendly software, and applying information to support a wide variety of business tasks. It may mitigate users' negative attitudes toward the system, and overcome user resistance. There has been found essential to provide effective user support and encourage end-users to use their systems in order to achieve end-user acceptance of the information system [47, 46, 38, 50]. Appropriate training programs for end-users may also play a crucial role in the success of end-user computing [8, 50].

Mahmod *et al.* (2000) found the most significant relationships to be user involvement in systems development, perceived usefulness, user experience, and user attitude toward the information system [50].

7 User satisfaction as a measure of system effectiveness

User satisfaction is widely acknowledged as a measure of a system's success [27, 28, 22, 68, 19, 20, 12, 50, 66, 31, 73]. It has also been used in computer information systems as a surrogate measure of system effectiveness [19, 27] because it is believed that satisfied users will be more productive. Gatian (1994), Thong and Yap (1996), Gelderman (1998) and Downing (1999) speculate whether user satisfaction actually can be considered as a applicable measure of system effectiveness [27, 74, 28, 22].

Interestingly, while there is some evidence in the psychological literature that a positive correlation exist between job satisfaction and job performance, critics of user satisfaction as a measure of system effectiveness point out evidence in the same literature that satisfaction and performance may not be correlated [14, 25, 41, 52, 71, 75]. Critics have also noted problems with assuming that user satisfaction and job satisfaction are equivalent. An employee can love their job and hate the information system, or hate their job and love the information system. Furthermore, some opponents point to evidence that collectively, the various and different user satisfaction questionnaires do not all measure the same construct, and that improper choice of questionnaire and/or careless interpretations of result could cause managers and researchers to draw poor conclusions [45, 74].

To answer the question regarding user satisfaction as a valid measure of system effectiveness, Gatian (1994) looked at the relationship between user satisfaction and user performance [27]. One would assume that if user satisfaction is to be used as a surrogate for system effectiveness, then user satisfaction would in all probability have a more direct impact on user performance. The results found provided substantial evidence that user satisfaction was related to efficiency. There was also evidence that user satisfaction was related to the performance of making decisions, and that performance of making decisions was in turn related to efficiency. Gatian

concluded that user satisfaction in deed could be used as an appropriate measure of information systems effectiveness. The statistical significant and strong relationship discovered between user satisfaction with quality information and decision-making performance, supported the psychological theory that availability of relevant information improves the performance of making quality decisions in a modern information system setting. Further, the statistical significant relationships to efficiency provide support for using user satisfaction as a surrogate measure for information systems effectiveness. This suggests that satisfied users may in fact be more productive.

A study conducted by Gelderman (1998) [28] concur with the findings done by Gatian (1994) [27]. That is, Gelderman also found strong and consistent correlation confirming that user satisfaction was significantly related to performance, and concluded that user satisfaction was an adequate proxy for organizational performance. It is also mentioned that the relationship between usage and performance of an information system is not significant. This has to do with a number of complications when measuring usage. One of them is that many assume that more usage is better. This isn't necessarily the case. It might be the true in some cases were work can be transferred over to the information system and be carried out more efficiently. On the contrary, in other cases more usage might reflect problems and result in less time for other tasks and therefore decreasing the overall productivity. It is also important to bear in mind that the working environment may influence the usage. Factors like voluntary or mandatory use of the information system will have an effect as well.

8 Summary

This literature survey has shown that user satisfaction is a complex variable in information systems. It is related to and influenced by several factors. Some of them are mentioned here while many others are not addressed. User satisfaction is proved to have a strong relationship with user participation. It is believed that higher satisfaction can be achieved through activities were users are able to influence the system and thereby feel as a part of the system. Further there is evidence that the users' expectations towards the system will play an important role in how satisfied they will become. Communicating realistic expectations to the users is crucial as users with unrealistic expectation may easily become dissatisfied. This literature survey has also shed light on some other factors related to user satisfaction such as hardware and procedural components of a work environment and providing the necessary support. These factors are all affecting the users' satisfaction. Last but not least, there are several human factors as well which contribute to the overall level of satisfaction. It is widely acknowledged in the literature that there is a lot more research remaining to fully understand the impact of user satisfaction on information systems today.

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A Appendix

Abbreviations used in user satisfaction literature:

AP	-	Ancillary Products
EUC	-	End-User Computing
EUCSI	-	End-User Computing Satisfaction Instrument
HCI	-	Human Computer Interaction
IC	-	Information Center
IT	-	Information Technology
ITS	-	IT Services
KI	-	Knowledge and Involvement
MIS	-	Management Information System
SUs	-	Superusers; ‘first-line’ help in ‘Best Practice’
UIS	-	User Information Satisfaction
US	-	User Satisfaction