SUPPORT FOR COMPUTER USERS: CONCEPT DEVELOPMENT AND MEASUREMENT

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ABSTRACT

This study explores how support for computer users can be conceptualized and measured in information systems research. A number of studies have proposed that support for computer users plays an important role in the acceptance and utilization of information technology applications. In these studies, the support concept has been conceptualized in a variety of ways, and the findings have often not been as hypothesized. The paper provides a conceptual framework for understanding support for computer users, and then describes the development of an instrument to measure support for computer users in a business school lab environment. The paper should help further understanding and measurement of a concept that seems important, as well as problematic, for information systems research.

Keywords: Computer user support, SERVPERF, instrument development, computer usage

INTRODUCTION

A number of studies have explored various factors that can influence the successful adoption and utilization of information systems applications. Recently, the Technology Acceptance Model (TAM) has encouraged a large stream of literature focusing on the role that an individual's beliefs and attitudes play in the development of their intentions to accept information technology (IT) and in their subsequent IT usage (11). However, an intended behavior may not occur if the surrounding environment creates barriers to carrying out the intention (e.g., difficulty in running the software). Furthermore, an information technology may be adopted, but then used minimally, due to poor facilitating conditions (e.g., insufficient training).

In the TAM model, support is conceptualized as a factor that will influence the model's two key variables: perceived usefulness and perceived ease of use (11). A number of other researchers, taking different approaches, have also recognized the importance of support, and have studied its role in a variety of ways. In order to better understand this factor, this study provides a conceptual framework for understanding support for computer users based upon a review of the literature. Then, the study describes the development of an instrument intended to measure support for computer users in a business school lab environment. A better understanding of how to conceptualize and measure support for computer users should facilitate future research and enhance understanding of the technology acceptance process.

CONCEPTUAL FRAMEWORK

A number of key studies illustrate how support has been conceptualized and measured. One early effort identified 39 items that could affect computer user satisfaction (e.g., technical competence of the IS staff, convenience of access, and vendor support) (4). Later research grouped factors affecting computer user success into three groups, one of which were factors that were considered fully controllable (e.g., user training, end-user support policies) (6). Based upon a review of the literature, it appears at this point in time there are at least four main approaches that researchers are using to measure support/satisfaction in the IT literature. Each of these is briefly described below.

In developing a model of personal computer utilization, researchers (30) built upon the work of Triandis (31) to hypothesize that behavior cannot occur if objective, facilitating conditions in the environment prevent it. However, their hypothesis that there would be a positive relationship between facilitating conditions and personal computer usage was not supported in their study (30). Since prior work supported the expectation that support would be positively related to computer usage, the researchers suggested that their findings were due, in part, to the measures they used and that "the operationalization of facilitating conditions must take context into account" (29, p. 136). Subsequent researchers using the same measures also expected to find that support would be positively related to self-efficacy and performance expectations, key factors that the literature suggests influence computer usage (8). However, contrary to their expectations, they found support was negatively related to self-efficacy and to performance expectations, and in their discussion they concluded that additional research was needed to follow up on these findings.

Another research stream has explored the influence that support has directly on usage and on other factors which are expected to influence usage. In this research stream, organizational support has been hypothesized to include two categories: 1) end-user support, which includes instruction and guidance in system applications and 2) management support, which includes encouragement and the allocation of resources (17). While subsequent work has found support for this conceptualization (2,18), other studies have found, for example, that internal support was not relevant to personal computing acceptance in small firms (19) and that organizational support was negatively related to Internet usage in organizations (3).

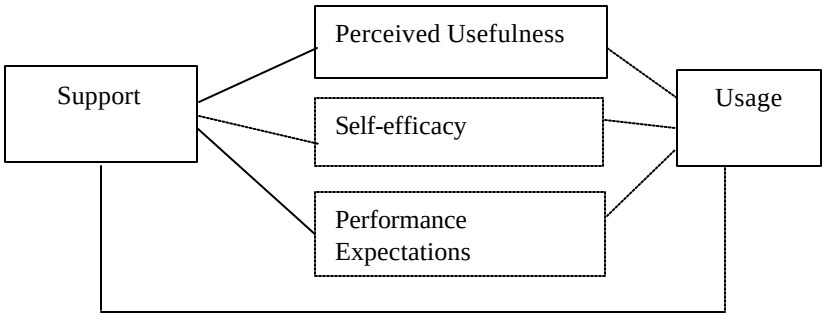
A review of the literature also finds that a great deal of prior work has been done regarding service quality. Information systems research has explored the factors that influence end user satisfaction (13). An End-User Computing Satisfaction instrument based upon the SERVQUAL and USISF (User Satisfaction with Information Services Function) scales has been tested and retested in a variety of studies (20,22). The SERVQUAL scale is well known in the marketing field and has been developed to help service firms ensure ongoing high quality service to consumers (25,26,27). The SERVQUAL instrument is intended to be relevant to all service sectors and consists of five dimensions (tangibility, reliability, responsiveness, assurance and empathy). Although problems have been found, such as questions related to the reliability of the instrument's tangibility construct, the overlap between

SERVQUAL and the other measures of support suggest that SERVQUAL could provide a well-known and useful basis for assessment of the support construct.

Another approach to the measurement of support in the IT literature is based upon the development of unique measures related to the specific context in which the behavior of interest occurs. This approach is used by studies based upon the Theory of Planned Behavior (1) which propose that intention to perform a behavior is predicted, in part, by perceived behavior control. Perceived behavior control reflects an individual's perception of whether the necessary resources are available for them to achieve a particular outcome. Perceived behavioral control, thus, is comparable to the measures of facilitating conditions that are used in other studies measuring support (31). However, since the approach required by the Theory of Planned Behavior "requires a pilot study to identify relevant outcomes, referent groups, and control variables in every context in which it is used" (23, p. 178), it requires significantly more effort to employ than measures that are applied in the same way across various applications.

This literature review indicated that the research has found support to be directly related to usage, and that support is also related to a number of key factors that the literature suggests will influence usage. A model that summarizes some of these relationships is depicted below (Figure 1). The literature review also suggests that further work is needed to clarify the concept of support, and that valid and reliable measures are needed before the nature of the relationships can be better understood.

Figure 1: Role of Computer Support



MEASUREMENT OF THE SUPPORT CONCEPT

The remainder of this paper describes one effort to measure the support for computer users in a business school environment. Business students who are learning new computer applications and using software to complete educational assignments often rely upon effective computer labs and support personnel in order to be successful. Students may be motivated to learn computer applications and faculty may develop effective learning materials. However, if computer support is problematic (e.g., computer lab facilities are not accessible when needed), then pedagogical goals and learning outcomes may be undermined (12).

First, an exploratory study was conducting using SERVQUAL to assess its usefulness in measuring support for computer users in a business school lab environment. However, despite the fact that

SERVQUAL was developed with a similar population (business school students), a number of issues arose when it was used in this context. The concerns raised by the SERVQUAL exploratory study included the fact that: 1) the expectations section yielded no usable results, 2) the expected five dimensions were not identified and 3) the instrument's twenty-two items did not adequately predict user satisfaction with the computer lab/service center. The fact that SERVQUAL did not prove to be an adequate instrument in this study might bolster the contention that measures of support/facilitating conditions must take the particular context into account in order to adequately understand a particular usage behavior (28).

Since the exploratory survey using SERVQUAL indicated some potentially serious problems, it was decided that a new scale needed to be developed to measure support for users in a computer lab environment. The new University Computer User Evaluation Scale (UCUES) was created as a result of rigorous scale development procedures (5). Organizations who wish to better understand the role that computer support plays in user decisions to adopt information technology applications may wish to consider a similar approach tailored to their needs, or one that builds upon the process used in the Theory of Planned Behavior (1). The scale development process, which is summarized below, consists of : 1) instrument format revision, 2) focus group research, 3) dimension and item generation, 4) purification, and 5) assessment of internal consistency, discriminant validity, and construct validity.

Instrument Format Revision

Due to the problems the exploratory study found with the SERVQUAL measurement of expectations, the format of the instrument was revised. The format used by the SERVPERF scale was adopted instead. SERVPERF is an alternative measure that uses SERVQUAL's five dimensions, but which omits the expectations measures (9,10). By modifying the instrument to only measure performance, it was hoped that the problems found in the exploratory study would be overcome.

Focus Group Research

Focus group research was important to the development of a new and improved instrument since it allowed the researchers to obtain information in the students own words and enabled students to interact with each other and with the researcher in developing their responses. Three focus groups meetings were held in order to develop a more detailed and specific understanding of the dimensions that students felt were important to the performance of a computer lab. An understanding of the dimensions that students felt were relevant was especially important in light of the problems the exploratory study uncovered with the reliability of the SERVQUAL instrument's dimensions.

Dimension and Item Generation

Based upon the exploratory study and the input from the focus groups, the researchers identified six dimensions that appeared relevant to the evaluation of computer service and support in business school labs. An initial pool of 219 items was generated for these six dimensions from the prior exploratory study and the focus group input. Three Ph.D. students with knowledge of personal computers and the

computer labs were asked to judge the applicability of the items. If two of the judges agreed that an item was very applicable and no judge deemed it non-applicable, an item was retained. A total of 108 items were retained for the following dimensions:

a) access - the lab and its services can be utilized when needed (15 items)
b) assistance – the help from lab employees (17 items)
c) atmosphere - the environment of the lab (15 items)
d) facilities – the lab tools used to complete tasks (17 items)
e) reliability - the lab equipment dependability and accuracy (19 items)
f) self-learning – the ability of an individual to learn how to complete tasks without help from lab personnel (15 items)

Purification

In order to purify the scale and assess its reliability, a sample of 255 students were asked to complete the instrument and evaluate the computer lab's performance on a ten point scale. The resulting data was analyzed using principal components factor analysis with a varimax rotation with no constraints (7), and resulted in a seven factor solution consisting of 61 items that accounted for 68.8 of the variance with eigen values that ranged from 20.8 to 2.3. The assistance, atmosphere and self-learning dimensions were stable. However, the dimensions of access, facilities and reliability were refined into four dimensions: hours of operation, access to equipment, quality of printed output, and reliability of equipment/software. A second phase of data gathering was conducted with an additional 188 students, which identified items that respondents felt were unclear. Approximately 5% of the questions were re-worded to make them work better with the "poor to excellent" scale. Following these changes to the questions, a third sample was collected when all students enrolled in business courses (870 respondents) were asked to complete the revised questionnaire. A third factor analysis was conducted that resulted in a seven factor solution. The three phases of data gathering and principal components factor analysis was thus able to reduce the initial 108 items to a 40 item scale that represented key aspects of computer lab performance. The seven dimensions that make up the scale are assistance, access to equipment, hours of operation, quality of printed output, atmosphere, reliability, and self-learning.

Assessment of Internal Consistency, Discriminant Validity, and Construct Validity

LISREL VIII (21) was used for confirmatory factor analysis. The intercorrelations among the 40 items on the scale were input into LISREL in order to examine the internal consistency and discriminant validity of the seven factor model. The analysis indicated the self-learning factor had low correlations with other factors, suggesting that the self-learning factor might not be part of the computer lab performance construct (24). After reconsidering the conceptual reasons for the inclusion of self-learning and the analysis results, the researchers determined that self-learning is not a key attribute that students use to evaluate computer labs, and to the factor was dropped. Support for the discriminant of the 6 factor model was supported by a number of tests (e.g., the analysis of ϕ estimates, average variance extracted between constructs, and around ϕ between each pair of constructs) (14,15,16). This analysis indicates the 6 factor model adequately assesses user's perceptions of computer lab performance.

Finally, multiple regression analysis was performed to determine the importance of the each dimension, and this analysis indicated substantial improvement over the initial exploratory analysis. Those who are interested in this approach are encouraged to a copy of the instrument and refer to the detailed description of the steps and analysis involved in this rigorous scale development process (29).

CONCLUSION

Support for computer users can be expected relate directly to computer usage, as well as to a number of factors that indirectly influence usage such as self-efficacy, perceived usefulness, and performance expectations. Information systems researchers have used a variety of measures to operationalize the support construct and have obtained some mixed results. This study evaluated the usefulness of the SERVQUAL instrument for measuring support for computer users in a business school lab environment. When the SERVQUAL instrument did not prove satisfactory, a new instrument was developed to measure computer user support following rigorous scale development procedures. This research may assist others who wish to study support for computer users, either by employing existing measures such as SERVQUAL or by developing a scale that is directly related to the context in which the expected behavior occurs.

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