MEASURES AND RELATIONSHIPS OF COMPUTER USAGE, COMPUTER LOCUS OF CONTROL, COMPUTER LITERACY, AND END-USER SATISFACTION AMONG COLLEGE OF BUSINESS SENIORS

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Abstract

Psychometric measures in the computing environment have been employed for many years. Many instruments have been proposed to help understand and attempt to predict user's actions or inactions in the computing environment. This study moves toward a deeper awareness of computer users by investigating the correlation between four IT-related measures: computer usage, computer locus of control (Kay, 1990), computer literacy (Kay, 1990), and end-user satisfaction (Doll and Torkzadeh, 1988). Six hypotheses were proposed; all except one were supported. Reasons for the lack of findings on this hypothesis, along with a discussion of the five hypotheses that were supported are presented, as well as some interesting findings concerning the factor level scales of each measure.

Keywords: Computer Locus of Control, Computer Literacy, End-User Satisfaction, Computer Usage

Theoretical Background

The construct of locus of control has been shown to have a relationship with everything from job-satisfaction (Noor, 2002), to depression in children (Rawson, 1992), to self-efficacy (Strausser et al, 2002), to even being a better predictor of grades than standardized tests (Stipek and Weisz, 1981). Literature suggests that a relationship exists between an individual's locus of control and their attitude toward computers (Coovert, 1980). Literature also suggests that a significant relationship exists between locus of control and generated outcomes in a computing environment (Tyler, 1995).

Tyler (1995) found similar results to Louie et al. (1985/86) in that students experience a shift toward a more internal locus of control after computer instruction. This seems logical, that effective instruction would generate a more "in control" feeling within the user. Also, on a purely rational basis, it seems that an internal locus of control would have a positive correlation with a higher end-user satisfaction; that users who feel more in control of their lives will be more satisfied with the outcome they generate from a computer. However, Meinert et al (1991) did not find this significant relationship between a general measure of locus of control (Rotter, 1966) and end-user satisfaction.

A possible explanation for the lack of findings is that a general measure of locus of control may not capture an individual's attitude toward specific situations or applications (Lefcourt, 1976). Lefcourt (1976) suggested that a specific measure of locus of control should be used when attempting to explain variables in specific areas. Kay (1990) developed a specialized measure of locus of control for use in the computing environment as well as a measure of computer literacy. Kay (1990) conducted this research because there had been conflicting results (Griswold, 1983 / Wesley, Krockover, and Hicks 1985) about the relationship between locus of control and computer literacy. Lefcourt (1976) suggested that stronger, more significant results could be found by using a more specific measure of locus of control. Accordingly, Kay (1990) found a positive relationship was found between the two measures, though it was not determined if a causal relationship existed. This research intends to test the relationship between the specialized measure of computer locus of control and that of end-user satisfaction (Meinert, 1991) as well as the relationship between computer locus of control and computer literacy. The first two hypotheses are as follows:

H1: Computer Locus of Control will be positively correlated with Computer Literacy.

H2: Computer Locus of Control will be positively correlated with End-User Satisfaction.

Montazemi (1988) found that in small companies, increased computer literacy led to increased user satisfaction – that more computer literate people would be able to produce a result that they were more satisfied with. Therefore, hypothesis three is as follows:

H3: Computer Literacy will be positively correlated with End-User Satisfaction.

System usage has also been found to have a significant positive correlation with user satisfaction (Geldernman, 1998). However, this relationship may be moderated by attitudes toward computers (Necessary, 1996). Necessary (1996) found that increased computer usage results in a better liking for computers and greater computer knowledge (computer literacy). Also, he found that increased computer usage was positively correlated with computer confidence, which can easily be tied to an internal computer locus of control, which has been shown to have an impact on user satisfaction (Coovert, 1980). Therefore, the final three hypotheses are:

H4: Computer Usage is positively correlated with Computer Locus of Control.

H5: Computer Usage is positively correlated with Computer Literacy.

H6: Computer Usage is positively correlated with End-User Satisfaction.

This research proposes to assess the above stated hypotheses simultaneously from the same dataset rather than from different studies as has been done in the past. This discussion will continue in the following manner; a discussion of each of the instruments and their respective reliabilities and validities will be followed by the methodology and results. The paper will conclude with future research directions and limitations.

Instrument Assessment

Computer Locus of Control

Kay (1990) developed a 10-item instrument to assess computer locus of control. The questions were presented on a 5-point likert scale ranging from strongly disagree (1) to strongly agree (5). Five of the items (the even numbered questions) were reverse coded for reliability.

The data was properly coded and the analysis sufficiently agreed with that of Kay. In both studies, the Chronbach alpha was above 0.8 with Kay's analysis reporting an alpha=0.87 and this study reporting an alpha=0.88. A principal components factor analysis with varimax rotation was performed and constrained to a two-factor solution to replicate Kay's findings. The first factor had an eigenvalue of 4.88 accounting for 48.8% of the variance (Kay reported an eigenvalue of 4.7 and variance explained of 47%). However, the second factors eigenvalue (.883) and variance explained (8.83%) was less than expected, though similar to Kay's finding (eigenvalue of 1.1 and variance explained of 11%). The factors loadings are very decisive and seem to consist of a "want-to" attitude toward the computer (factor-1) and a "have-to" attitude (factor-2).

Computer Literacy

Kay's second instrument was that of computer literacy. This instrument consists of 24 items divided into four categories of six questions each: basic skills, application software skills, computer awareness, and programming skills. Kay found from a principal components factor analysis that both the basic and application subscales formed Factor 1, while awareness and programming formed Factors 2 and 3 respectively (though a great deal of overlap was reported between factors).

Since Kay reported such overlap among factor loadings, a principal component factor analysis with varimax rotation was conducted and constrained to three factors to see if more decisive loadings could be found. Similar, though cleaner results were found. The results from this analysis reveal Factor 1 as the combination of the basic subscale and half of the application subscale. Also, the programming rather than the awareness subscale formed Factor 2 and, the remaining awareness and computer application subscales rather than the programming formed Factor 3. The Factors reported in this study seem to describe basic computer skills (Factor 1), language/programming skills (Factor 2), and awareness skills (Factor 3).

End-User Satisfaction

The measure of End-User Satisfaction was developed by Doll and Torkzadeh (1988) and has been retested for validation (Doll and Torkzadeh, 1991; Hendrickson, Glorfeld, and Cronan, 1994; McHaney, 1999; McHaney, 2002). The instrument is highly reliable, consistently reporting reliable Cronbach alphas (Hendrickson, Glorfeld, and Cronan, 1994). It has been used in the personal computing environment and well as the mainframe environment (Hendrickson, Glorfeld, and Cronan, 1994), the Decision Support System environment (McHaney and Cronan, 2001) and with computer simulations (McHaney and Cronan, 1998).

The questions are designed to capture information on a specific information technology based on five subscales: content, accuracy, format, ease of use, and timeliness. There are twelve items presented on a 5-point likert scale ranging from almost never (1) to almost always (5). The items are written such that they can easily be tailored to specific technologies. The Chronbach alphas for each of the subscales are consistent with those found by McHaney and Cronan (1998) when they studied the end-user computing satisfaction of business simulations.

Computer Usage

Computer Usage has been operationalized in many different ways. Necessary (1996) used weekly computer use as a surrogate measure of computer usage in his analysis of the relationship of computer usage and computer-related attitudes. The amount of time that a user feels they have spent on a system has also been employed (Bajaj and Nidumolu, 1998) to assess a feedback model of system usage. Geldernman (1998) used four different measures to operationalize computer usage to study the relationship between user satisfaction, usage and system performance. Gelderman's four measures were hours of direct usage, hours of indirect usage, frequency of direct usage, and frequency of indirect usage.

The instrument used in this piece is a general measure of computer usage. Respondents indicate their frequency of usage based on a 5-point likert scale ranging from 1-not at all to 5-very frequently. It assesses different types of technologies, such as word processing software, presentation software, e-mail, online research etc. Also, the weekly computer usage was included as used by Necessary (1996) as well as weekly Internet usage. An exploratory factor analysis (with varimax rotation retaining only eigenvalues greater than 1) presented a five-factor model explaining 58.9% of the variance.

In the initial exploratory analysis, all of the loadings were clean except for item 11 (obtain news or weather), which did not load greater than 0.5 on any factors. Therefore, an exploratory principal components factor analysis was conducted without item 11. After the second analysis, all of the loadings were clean and greater than 0.5. The five factors explain five basic ways that the respondents in this study use computers: Factor 1 usage is by heavy users such as gamers (computer hours per week, internet hours per week, playing online games), Factor 2 is usage for basic office automation (word processing, spreadsheet, presentation, online research), Factor 3 is usage for basic media (copy pictures or text, download music, download video), Factor 4 is usage for advanced purposes (database, statistics, personal assistance), and Factor 5 is usage for basic internet functions (e-mail, instant messaging, online shopping). Using these factors, a reliability analysis was performed. The Chronbach alphas are reported in Figure 7.

Methodology

Data was collected through an online survey over the course of a one-week period. The students were all seniors with a minimum 2.2 GPA (prerequisite), enrolled in a Strategic Management course at a large southeastern university. There were approximately 530 students enrolled in the course of which 235 participated in the survey yielding a 44% response rate. The students participated on a voluntary basis and were offered a financial incentive (a drawing for a $25 gift certificate) for participating in the survey. The gender of the respondents was almost a perfect split (52% female, 48% male) with an average age of 22 (range 19 – 40), an average GPA of 2.9, an average of three previous computer courses, and an average of 10 years using computers.

The students came from various backgrounds in the College of Business and were all introduced to a new technology, the CAPSIM Simulation (class requirement), at the same time. This allows a control for some students having experience with the simulation previously and allows an unbiased measure of the relationship that computer usage, computer locus of control, and computer literacy have with each other and end-user computing satisfaction of the CAPSIM simulation system.

Results

As expected, hypothesis 1 - that computer locus of control would be positively correlated with computer literacy - is supported. The overall measure of computer locus of control (CLOC) is positively and significantly correlated with computer literacy (CL). However, of greater interest is the discrepancy between the subscale factors of computer locus of control ("want-to" and "have-to"). Only those who scored high on the "want-to" internal computer locus of control were significantly correlated with all three factors of computer literacy. Respondents whose computer locus of control leads them to a "have-to" attitude are only significantly correlated with the basic computer literacy factor. This is rational because users who have an internal "want-to" computer locus of control possibly have a greater desire and interest in learning about the computer than those who have a "just show me what I have to know" computer locus of control.

Hypothesis 2 - that computer locus of control would be positively correlated with end-user computing satisfaction - was also supported for the overall measures (CLOC and EUCS). This suggests that as students have a more internal computer locus of control, they are able to generate a result that they are more satisfied with. Again, however, there is interesting discussion in the findings within the subscales. The respondents who scored high on the "want-to" factor of computer locus of control were only satisfied (they gave high ratings on the EUCS) with the accuracy and timeliness factors of the CAPSIM Simulation (at alpha=0.01), while those who scored high on the "have-to" factor of computer locus of control only scored the accuracy (at alpha=0.05) of the CAPSIM high in satisfaction. This suggests that even though overall end-user computing satisfaction is positively correlated to computer locus of control, there is a difference between respondents with a "want-to" and those with a "have-to" approach to the technology of the CAPSIM simulation. Both groups are very concerned with the accuracy of the system – possibly because twenty percent of their grade in the Strategic Management course is dependent on the outcome of the simulation. However, only the students with a "want-to" attitude were satisfied with the timeliness in which they receive their information.

The third hypothesis - that computer literacy would be positively correlated to end-user satisfaction - was also significant for the overall measures, yet (again) there are interesting relationships between the subscales that should be discussed. Students who scored high in the "basic" subscale of computer literacy also rated the CAPSIM system high in satisfaction of accuracy, ease of use, and timeliness, while those who scored high on the "awareness" subscale of computer literacy only rated the CAPSIM system satisfactory in accuracy. Those students who scored high in the "programming" subscale of computer literacy did not score the CAPSIM system high on any measure of the end-user computing satisfaction scale. This suggests that the more advanced people become as users their "satisfactory" demands on systems increase also.

The fourth and fifth hypotheses state that computer usage is positively correlated with computer locus of control and computer literacy, respectively. Both of these hypotheses are supported, sustaining the literature and the rational suggesting that the more people use computers, the more comfortable they are and the more knowledgeable they are. But, since this is not a causal relationship, it could also be that the more comfortable and knowledgeable users are, the more they will use computers. Either direction, the relationship is positive and significant. However, there is discrepancy that should be noted in the way that the students use their computers, based on their scores on the factors of locus of control and computer literacy.

Users who scored high on the basic factor of computer literacy also scored high on usage of computers for gaming and office automation software, while users who scored high on the awareness factor of computer literacy also scored high on the usage of computers for office automation. Though the awareness level users did not score high on usage for gaming, they did score high on the use of computers for basic media as well as advanced personal use. Students who scored high on the last computer literacy factor, programming, shared the use of computers for gaming with those who scored high on the basic literacy factor, yet other usage was directed toward media and advanced personal assistance software.

Students scoring high on the "want-to" factor of computer locus of control scored high on the usage of computers for gaming, office automation, and advanced personal software. Conversely, students scoring high on the "have-to" factor of computer locus of control only scored high on the usage of office automation software. This is rational, because the students are seniors in the college of business and have to use word processing, presentation software, and spreadsheet software for their classes whether they want to or not.

The sixth hypothesis – that computer usage is correlated with end-user computing satisfaction was not supported. Actually, none of the subscales of computer usage were correlated with end-user computing satisfaction. An explanation of this could be that the instrument used to measure computer usage was not specialized or tailored toward usage of the CAPSIM simulation system and therefore was not intended to capture that relationship. A more specific measure of system usage should be included in future studies of this nature to examine the relationship of general computer usage and specific system usage and the end-user satisfaction of the specific system.

Conclusions

This study is limited in that it was not longitudinal and therefore could not attempt to model causal relationship between these constructs. It was simply a one-time survey and was only able to provide correlated measures at best. However, this piece contributes to the literature by providing support for use of factor level subscales to more specifically explain human behavior.

A greater contribution is the analysis of the individual subscales and their relationships providing a better explanation to the findings. The computer locus of control measure was found to consist of two factors: a "have-to" attitude and a "want-to" attitude toward using computers. Computer Literacy contained three factors: basic, awareness, and programming and computer usage was factored into 5 categories of usage: heavy (such as gamers), office automation, media, advanced personal assistance software, and Internet usage. These were very beneficial in the subsequent analysis of each hypothesis.

Future research should further investigate the relationships of these and other subscale factors to move toward a categorization of users based on multiple psychometrics. Categories should include objective and subjective computer experience (Smith et. al, 1999), technology-related background, leadership skills, personality traits, and other non-IT measures to gain a broader perspective of users and give better understanding technology users actions or inactions.

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