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Student User Satisfaction with Web-based Information Systems in Korean Universities

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Abstract

Despite of the rapid adoption of computer-based information systems in higher education in Korea and their increased importance both in education/research activities and administration, there have been few studies on whether these campus-wide information systems (CWIS) are being effectively used from the student user' point of view. This study tests a modified model developed for this study based on previous literatures to measure student user satisfaction of the information systems. It was found that information and system satisfaction significantly affected the overall user satisfaction with CWIS.

Keywords: Campus-wide information systems, User satisfaction, End-user computing satisfaction

1. Introduction

Computer-based information systems, at various levels of sophistication, have contributed a great deal to today's higher education, let alone to various research activities. Information systems that process data into information in a meaningful format to the end users have become an inevitable component especially for knowledge-related activities in a rapidly changing techno-societal environment. Not only computer-related studies but other fields have to make use of fast campus LAN and applications through the network.

Universities in general adopt most advanced technologies such as computer systems and keep on upgrading as new technology arise. As a result, universities as such are likely to have technological 'melting-pot', with centralized legacy systems connected somehow with different versions of latest solutions. Legacy systems that used to automate administrative transactions in earlier stage would create problems of interoperability with prevalent web-based systems today. Old systems can hardly solve the diversified information needs in campus today. Lee et al. (2009) pointed out that it is urgent for Korean universities to overhaul the existing computer systems, so that they might compete with the rest of the world in a fast globalizing world, while enhancing the quality of their educational services.

In Korea, Government has taken a strong initiative in educational informatization drive since early 90's, initially to cool off the nation's private education fever. Educational reform over decades also centered around the provision of equal educational opportunities throughout the various income strata. The Internet and advanced IT of the nation contributed largely to this effort. Government funded various levels of educational institutions to develop integrated information systems that were web-based. Divisional systems were integrated to an integrated system through the fast network, and ordinary users could exploit the system for their own good (Etnews, 2006a, b).

Information systems, after all, are to be useful enough to satisfy the end-users through providing right information, and continual upgrading complying with technological innovations. In other words, there should be routine system evaluations and system audits to see if the system and its outputs are fully satisfied by the users.

The objective of this study is to analyze the student user satisfaction of campus-wide information systems (CWIS) in Korean universities. From the reviews of previous studies, a framework suitable to evaluate various aspects of the information systems will be discussed. Then, a measure based on it will be empirically tested over a sample for its statistical significance. The end-users of the CWIS are limited to the students in this study.

2. Literature Review

2.1 Campus-Wide Information Systems

CWISs are the computer-based systems that process various data to generate information primarily implemented in universities. From the viewpoint of data being processed, CWISs can be categorized into three groups: those handling primary data such as texts, journals, reports, various digital data, public-domain software and shareware, multimedia materials, those processing secondary resources including catalogs, metadata, journal lists, and those aiding communications including electronic mailing, electronic boards, and integrated information systems.

To be useful, CWISs need to be used effectively accomplishing the system's goal, and managed by an effective growth plan (Semiawan and Middleton, 1999). Users will perceive the value of the CWIS and the information available by the system. Strategic information systems are in need for the successful use of the systems, considering the information needs of the users in the flux of overall educational environment (Strauss, 1992).

In Korea, the first full-fledged CWIS was introduced in 1995 by Ewha Women's University, shortly followed by major universities. Since then, most campuses installed campus LANs, which facilitated the integration of departmental systems throughout the organization. The LANs were connected to the Internet, the nation's fastest growing sector, contributing greatly to the advancement of the higher education of the nation (Etnews, 2006a, b).

New IT applications automate the sequence of academic transactions from recruitment of new students to their graduation. New CWISs expedite communications within and with outside of the campus. At the same time, portal sites provide all kinds of information at a few key strokes. Not for long, electronic learning has provided education opportunities for those who cannot come to classes regularly. EDI expedites document exchanges in a secure way.

2.2 User satisfaction

Considering the number of computerized systems increases sharply, information systems should be evaluated somehow in an appropriate manner. Information system evaluation on how well they are effectively used, therefore, has become one of very important research topics (Harrison and Rainer, 1996). Many of previous studies suggested that user satisfaction can be a viable variable measuring the system effectiveness (Baroudi et al., 1988; Conrath and Mignen, 1990; Ginzberg, 1978; Hamilton and Chervany, 1981; Ives and Olson, 1984; Powers and Dickson, 1974). In other words, one can conclude that if the users are well satisfied with the system as they use it, then the system will be working fine. Other behavioral measures often used include system usage as a quantitative measure. In this case, information systems are developed after all to be used; therefore, frequent usages would indicate the information system's success. DeLone and McLean (1992) reported that user satisfaction has been widely employed in practice as a surrogate measure of information systems effectiveness.

Neumann and Segev (1980) found that the users' perceived satisfaction in multiple aspects of the systems was significantly correlated with their responses to the organizational effectiveness. Swanson (1974), on the other hand, identified a high level of correlation between the users' perceived system satisfaction and their applications of the system outputs. Powers and Dickson (1974) concluded user satisfaction was an essential factor for system success. Although not a single standard measure has been proposed yet, user satisfaction is a viable indicator of system effectiveness (Baroudi et al., 1988; Igbaria and Nachman, 1990).

In a pioneer study in this field, Bailey and Pearson (1983) proposed a model that took consideration of both positive and negative responses by the users about the information systems. Here a good information system is a system that the users perceive satisfaction with the key factors comprising the system. In other words, user satisfaction can be an aggregate of positive or negative feeling or attitude that has an effect on certain instance.

Galetta and Lederer (1989) defined user satisfaction in terms of his/her perception or attitude toward the information systems. User's attitude, according to Melone (1990), will be favorable or unfavorable inclination toward such dimensions of the system as computer system, applications, administration, system or application related processes. Later, the end-user satisfaction was regarded as the individual's attitude toward computer uses, or related activities required to perform tasks in an organization (Rainer and Harrison, 1993).

Sometimes, users are asked bluntly to rate their perceived overall satisfaction level on a Likert scale data. Most studies, however, suggest use of multiple variables, each of which measures a certain factor that is presumed to construct the overall satisfaction. Various literatures often quoted variables such as accuracy, content, frequency, timeliness, reliability, assistance, adequacy, accommodation, communication, accessibility, appreciation, and flexibility. It seems that different set of variables were selectively employed, depending on research objectives (Ives et al., 1983).

Doll and Torkzadeh (1988) defined user satisfaction as an emotional attitude that had five dimensions, such as content, accuracy, format, ease of use, and timeliness. They could develop a 12-item instrument, namely, End-User Computing Satisfaction Instrument, with empirically proven validity and reliability tests (Torkzadeh and Doll, 1991; Hendrickson et al., 1994). Tafti (1992) suggested information satisfaction, system satisfaction, and support-group satisfaction be

considered as key factors of the overall user satisfaction.

End-user computing typically includes spreadsheet application, database management, document writing, programming, data analyses, graphics, communications, data search, and memory support (Carr, 1988). University students, as end-users of CWISs, are more or less conducting similar activities.

3. Empirical Analysis

3.1 Research Model and Hypotheses

A research framework was explored in this study to measure the student user satisfaction with the CWIS. It is based on the previous related studies mostly applied to business firms, e.g., salient studies by Doll and Torkzadeh (1988) and Seddon and Kiew (1994). The former proposed such characteristics as content, accuracy, format, timeliness, and ease of use as the key factors affecting the systems satisfaction. The latter tested two categories to evaluate systems success: information quality and system quality. Seddon and Kiew (1994) adopted all the items developed by Doll and Torkzadeh (1988). This study prepared the 12 items corresponding to five dimensions of end-user computing satisfaction. We also expanded two more items related to system satisfaction to construct user satisfaction measure. The overall student user satisfaction can be the net feeling of pleasure as they interact with the CWIS.

The measure under consideration should be a useful diagnostic tool that will pinpoint ailing or unsatisfactory components of the system in need for further investigation from the user's perspective. Figure 1 illustrates our research model, which has information satisfaction (content, accuracy, format, and timeliness) and system satisfaction (ease of use, and user interface) as independent variables, and overall satisfaction as a dependent variable. Two hypotheses were examined as follows:

•Hypothesis 1: Information satisfaction has a significant effect on the overall user satisfaction.

•Hypothesis 2: System satisfaction has a significant effect on the overall user satisfaction.

3.2 Data collection

A survey using a questionnaire was conducted to the sample students of four-year universities in Seoul. We selected a few popular shopping centers where many university students come and go to efficiently obtain the various university students' survey data. A total of 245 usable responses were collected out of 250 distributed. The descriptive statistics of the respondent's demographic characteristics were analyzed and presented in Table 1.

< Insert Table 1. Here>

3.3 Reliability and validity assessment

The measurement items for the factors presented in this research model were derived on the basis of research into Doll and Torkzadeh (1988) and Seddon and Kiew (1994). The Cronbach's alpha coefficients ranged from 0.654 to 0.813 were more than the acceptable minimum level of 0.6 in all the items (Nunnally, 1978). The alpha coefficients of measurement items for each construct are presented in Table 2.

All the items measured in the survey were subjected to confirmatory factor analysis. The goodness-of-fit of the measurement model was evaluated using a variety of indices. The result of the confirmatory factor analysis is presented in Table 2. We assessed the overall goodness-of-fit using the chi-square test. The chi-square test assesses the adequacy of hypothesized model in terms of its ability to reflect variance and covariance of the data. Due to its tendency to be sensitive to sample size, other fit indices (e.g., GFI, NFI, TLI, and CFI) were considered in conjunction with the chi-square. For the statistical significance of parameter estimates, t-values were used. The results of confirmatory factor analysis revealed chi-square of 60.17($p<0.01$), goodness-of-fit index (GFI) of 0.94, normed fit index (NFI) of 0.92, Turker-Lewis index (TLI) of 0.90, comparative fit index (CFI) of 0.94, and root mean square error of approximation (RMSEA) of 0.10. Generally, fit statistics greater than or equal to 0.9 for GFI, NFI, TLI, and CFI indicate a good model fit (Bagozzi and Yi, 1988; Mulaik et al., 1989). Furthermore, RMSEA values ranging from 0.05 to 0.1 are acceptable (Steiger and Lind, 1980); therefore, the RMSEA suggested that the model fit was acceptable. Reviewing the fit indices in Table 2, we noted that all the fit indices indicated a well-fit.

< Insert Table 2. Here >

< Insert Table 3. Here >

We also conducted the test of convergent and discriminant validity. For assessing the validity, the fit of model, statistical significance for each standardized path coefficient, composite reliability (CR), and average variance extracted (AVE) were utilized. All the standardized path coefficients for the items were significant ($t>1.96$) and the CR values were higher than 0.7, as shown in Table 2 and Table 3, which suggested that convergent validity of the scale was satisfied (Anderson and Gerbing, 1988).

According to Fornell and Larcker (1981), the AVE should be greater than the square of the correlations between

constructs. As shown in Table 3, the square of the correlations between the construct and any other construct in the model were all smaller than the AVE values, which indicated that discriminant validity was satisfied. The results, therefore, confirmed that the instrument had satisfactory construct validity.

3.4 Hypothesis testing

The hypotheses tests to identify factors that affect the overall user satisfaction with CWIS were conducted through a regression analysis. The results of the analysis suggest that 50.4% of the variation in overall user satisfaction can be explained by the students' information and system satisfaction. All the hypotheses were supported at the 0.01 level of significance (See Table 4).

It seems that information satisfaction relatively more affects overall user satisfaction than system satisfaction. In other words, the direct benefits obtained from the outputs of the system in terms of context, accuracy, format, and timeliness are more important than ease of use and user interface related to system satisfaction.

< Insert Table 4. Here>

As such, it was confirmed by this study what needs to be done of CWIS to be effective, or perceived to be satisfactory from the end-user's point of view. First, student user expects CWIS to provide information that is accurate, timely, in a useful format, and of up-to-date content. Also, they want the system to be friendly enough to cause little stress when using the system. This finding suggests that system interface design be given proper attention in development stage.

4. Discussion and Conclusion

Today's fast IT progress and its impact on the various aspects of social dynamics naturally demand the rise of creative people, capable of accessing to diverse information sources, then processing, and communicating the information as needed. Higher education, at the same time, needs to shift from the current supply-oriented to demand-oriented services that stress vigorous use of IT and self-teaching available through the Internet. In this venue, web-based information systems will perform a major role in different levels of education.

In general, problems with IS remain unnoticeable until they cause the system to fail. Routine system evaluation along with surveys of the users' information requirements, therefore, is vital for the system to succeed (CSUP, 1992; Darby, 1992; Fleck and McQueen, 1999). System evaluation is one of the main phases of system life cycle. However, most Korean universities would put more emphasis on technological upgrading of portal sites, data processing, and campus network. Considering that the main objective of CWIS is servicing for the user's information requirements, routine system evaluation on how student users feel about the system should be paid due attention.

This study is to develop a reliable measurement that evaluates the end-user satisfaction, based on some satisfaction factors found in the previous studies. According to the related literature, factors that comprise the user satisfaction include, first of all, the output information in terms of content, accuracy, format, and timeliness. In other words, the users will be satisfied if the system output is appropriate, correct and in a desirable format. Also, the users will be satisfied, depending on the operation of the system itself. The system should be easy to use, equipped with friendly interface. Systems should accommodate the different levels of understanding by the users. User interface needs to be comprehensible, and visibly attractive to the users.

This study reviewed previous studies on the user satisfaction, mostly done for business firms so far, and generated a modified framework that was applied to student users of the CWIS. By relating the five dimensions proposed by Doll and Torkzadeh (1988) with factors of information and system satisfaction (DeLone and McLean, 1992; Seddon and Kiew, 1994), a new conceptual framework was proposed, which then was tested for student users of Korean universities. The 14-item measure corresponding to six dimensions of user satisfaction with campus-wide information systems was examined to be a viable diagnostic instrument for information systems evaluation. In other words, user's overall satisfaction over a period of time measured by the instrument may lead to an in-depth system analysis, or system audit for upgrading. At the same time, the satisfaction scores measured along the different dimensions of the system may provide a clue that relatively unsatisfied areas may be confronted with problems for further inspection. In this way, the measure by this study will contribute to the operation of more satisfying information systems. It is hoped that similar studies will follow for universities in other countries as well.

The major limitation of this study is that the sample size is small. Thus limiting the extent to which the finding of this study may be generalized. In spite of the small sample size, it is likely that the views of the respondents are representative of student users in Korean universities. The study was carried out in Seoul, a major Korean educational hub. Further research may consider comparison of the results of this study against a larger sample.

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Table 1. Demographics of respondents

Measure	Item	Frequency	Percentage (%)
Gender	Male	142	58.0
	Female	103	42.0
Grade	Freshman	37	15.1
	Sophomore	73	29.8
	Junior	84	34.3
	Senior	51	20.8
Major	Human and Art	51	20.8
	Social science	189	77.1
	Natural science and Engineering	5	2.0

Table 2. Measurement model assessment

Construct	Item[a]	Path coefficient	t-value	Fit indices	Cronbach's alpha
Information satisfaction	Con	0.79	13.49***	χ^2= 60.17 (p-value=0.00) df=17 GFI=0.94 NFI=0.92 TLI=0.90 CFI=0.94 RMSEA=0.10	0.779
	Acc	0.69	11.37***		
	For	0.68	11.14***		
	Tim	0.62	9.99***		
System satisfaction	Eas	0.69	10.43***		0.654
	Int	0.71	10.68***		
Overall satisfaction	Sat1	0.84	14.76***		0.813
	Sat2	0.82	14.50***		

***p<0.01, a: Content, Accuracy, Format, Timeliness, Ease of Use, User Interface

Table 3. Construct validity

Construct	Mean	Standard deviation	Correlation between constructs		
			Information satisfaction	System satisfaction	Overall satisfaction
Information satisfaction	4.127	0.758	1.000		
System satisfaction	3.952	0.966	0.508	1.000	
Overall satisfaction	3.937	0.984	0.642	0.588	1.000
Construct reliability (CR)			0.790	0.658	0.816
Average variance extracted (AVE)			0.487	0.490	0.689

Note: All correlations are significant at the 0.01 level.

Table 4. Regression analysis

Model	Unstandardized coefficients		Standardized coefficients	t-value	Sig.
	B	Standard error	Beta		
Intercept	0.042	0.256		0.163	0.871
Information satisfaction	0.600	0.068	0.462	8.793	0.000***
System satisfaction	0.359	0.054	0.353	6.771	0.000***
R^2=0.504, F=122.922, Sig. F= 0.000***					

*** $p<0.01$

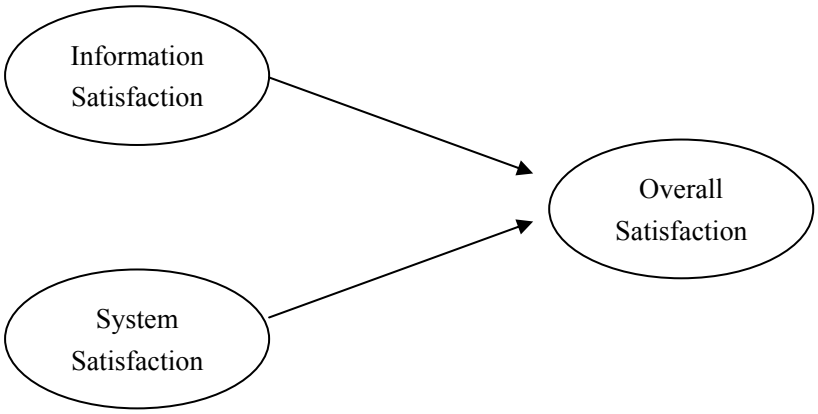

Figure 1. Research model