Journal of International Technology and Information Management

Volume 17 | Issue 2 Article 6

2008

Validating an End-User Computing Satisfaction Instrument: A Confirmatory Factor Analysis Approach Using International Data

Kee-Sook Lim
The University of Toledo

Jeen-Su Lim
The University of Toledo

John H. Heinrichs
Wayne State University

Validating an End-User Computing Satisfaction Instrument: A Confirmatory Factor Analysis Approach Using International Data

Kee-Sook Lim
Jeen-Su Lim
The University of Toledo
USA

John H. Heinrichs
Wayne State University
USA

ABSTRACT

This study evaluates the construct validity of an end-user computing satisfaction scale in the context of the Korean culture. The structure and dimensionality, reliability and validity of an end-user computing satisfaction (EUCS) instrument were cross-validated using data obtained from 108 managers of Korean firms in the context of the end-user satisfaction with their office information system. The results of this study are generally consistent with previous findings regarding the measurement property of this instrument. However, Korean data also supports the five correlated first-order factors model. Managerial and research implications of the identified results are discussed.

INTRODUCTION

Many studies have been conducted to explore the concept of user satisfaction with information systems and to examine the validity of measures of user satisfaction with information systems. User information system satisfaction (UISS) refers to the extent to which end-users perceive that an available information system meets their information requirements and needs. UISS has received significant attention in the literature because UISS is considered as a surrogate measure of information system success (Au, Ngai & Cheng, 2002; Galletta & Lederer, 1989). The reasons for user satisfaction being widely used as a measure of information system success include the availability of reliable measurement tools and their high face validity (DeLone & McLean, 1992). User information system satisfaction is often used as an indicator of user perception of the effectiveness and success of a management information system (Akbulut & Motwani, 2005; Bailey & Pearson, 1983; Doll & Torkzadeh, 1988).

Although there have been several definitions and measures of end-user computing satisfaction (EUCS) (Bailey & Pearson, 1983; Doll & Torkzedah, 1988; Ives, Olson & Baroudi, 1983), Doll and Torkzadeh's end-user computing satisfaction (EUCS) instrument has been widely used as an end-user computing satisfaction measure that is relevant to specific software or information system applications. Their five-component model is based on a specific information system satisfaction of end-users. The five-component model consists of the accuracy, content, ease-of-use, format, and timeliness for the information system application. In addition, cross-cultural studies of end-user information system satisfaction have been conducted in many countries (McHaney, Hightower & Pearson, 2002; de Madariaga, 2004). In their comprehensive review of the relationship of culture with information and information technologies, Leidner and Kayworth (2006) reported that differences in culture could account for information technology use and outcome. They indicated that certain cultural values are related to user satisfaction and successful implementation of information systems. Similarly, Jones et al. (2003) reported cultural differences in the perception and use of EDI in a global setting. With increased globalization and the cross-cultural teamwork environment, information system implementation issues across countries are becoming more important. This new trend calls for extending research on end-user information system satisfaction and validating existing instruments in other countries (McHaney, Hightower & Pearson, 2002). This study recognizes the importance of the cross-cultural validation research requirement and continues this research stream.

Thus, a further cross-cultural extension of the existing end-user computing satisfaction instrument is warranted. The purpose of the current study, therefore, is to examine the construct validity of Doll and Torkzadeh's end-user computing satisfaction instrument in South Korea. The validation of the instrument is performed by assessing the end-user satisfaction of office information system by managers in various South Korean firms.

CONCEPTUAL BACKGROUND

In the past, many researchers have utilized the measurement of end-user satisfaction as a surrogate measure of the success of a specific application (Bailey & Pearson, 1983; DeLone & McLean, 1992; Ives & Olson, 1984). According to Doll and Torkzadeh (1988), end-user satisfaction represents the affective attitude towards a specific computer software application. Doll and Torkzadeh (1988) developed a 12-item end-user computing satisfaction instrument. Conceptualizing end-user satisfaction as a multifaceted construct, they developed five subscales that measure end-user satisfaction. Their conceptualization includes five subscales of the accuracy, content, ease-of-use, format, and timeliness of a computer software application and a single overall second-order construct labeled EUCS. These subscales represent the usefulness and user-friendliness of a specific computer software application.

Many researchers reported cross-validation of the scale and related measurement models using different types of software applications and varying samples sizes (Doll & Xia, 1997; Doll, Xia & Torkzadeh, 1994; Doll, Raghunathan, Lim & Gupta, 1995; Hendrickson, Glorfeld & Cronan, 1994; Hendrickson, Massey & Cronan, 1993; McHaney & Cronan, 1998; McHaney, Hightower & White, 1999; Somers, Nelson & Karimi, 2003). Doll and Torkzadeh's EUCS instrument has been validated with voice mail and e-mail applications (Adams, Nelson & Todd, 1992), software applications on either a mainframe or PC/desktop (Hendrickson, Glorfeld & Cronan, 1994), telephone interactive voice response systems (Downing, 1999), data warehouses (Chen, Soliman, Mao & Frolick, 2000), and ERP systems (Somers, Nelson & Karimi, 2003). While these studies evaluated reliability and construct validity using various software applications, cross-cultural validation of this instrument has been quite limited. One such cross-cultural validation study was reported by McHaney, Hightower and Pearson (2002) using Taiwanese end-users of business software applications. As many previous studies (Calhoun, Teng & Cheon, 2002; Harper & Utley, 2001; Kanungo, 1998; McDermott & Stock, 1999; Rose, Evaristo & Straub, 2003) reported significant linkages of cultural values to user satisfaction and information system implementation success, it becomes increasingly important to validate existing measurement scales in different cultural contexts.

Cultural Difference Dimensions

Seminal works by Hofstede (1980, 1983) and others (e.g. Nath & Murthy, 2004) have recognized the importance of cultural differences in work-related values of end-users, and they proposed several characteristics to identify and differentiate the impact of culture on their satisfaction. While a majority of the previous UISS scale validation efforts were conducted using United States samples, this study utilized a Korean sample to validate the scale. Therefore, to examine the possible cultural differences in scale validation outcomes, this section will discuss the difference in cultural characteristics between the United States and Korea. Among the four dimensions identified by Hofstede, the United States and Korean cultures show differences in the "collectivism versus individualism" and "weak versus strong uncertainty avoidance" dimensions.

The Asian culture (e.g., Korea and Japan) is characterized as "collectivist," while the American culture is identified as "individualist" (Hofstede, 1983). In a collectivist society where the ties among individuals are strong, everyone is responsible to look after the interest of the group as a whole. Individuals in this society consider the effects of their decisions on other members of the group (e.g., family, schools, associations, firms). Whereas, in an individualist society, the ties among individuals are weak and therefore, individuals make decisions with regard to only their interests and satisfaction.

The uncertainty avoidance dimension deals with how individuals live with the uncertainty of the future. The United States culture is identified as a "weak uncertainty avoidance" culture. In this culture, individuals accept each day as it comes and take risks rather easily. They have a natural tendency to feel relatively secure. The Korean culture is identified as a "strong uncertainty avoidance" culture. In this culture, individuals minimize or avoid risk. They use institutions and use tools such as technology to create security.

Building on the Hofstede's work, many researchers have investigated the impact of these cultural differences in information technology adoption, application, and usage. Straub (1994) investigated differences in the way firms diffuse information technology in Japan and the United States. He reported that United States firms preferred using electronic mail over fax machines; while Japanese firms preferred using fax machines over e-mail. He attributed these technological diffusion differences to the cultural avoidance of the uncertainty dimension. Couger (1986) reported significant cultural differences between Singapore and the United States in the motivation of analysts and programmers. Watson, Ho, and Raman (1994) reported similar cultural differences in decision support system group behavior. They reported greater pre-meeting agreement for Singaporean groups and larger agreement shift for the United States groups. Gefen and Straub (1997) identified cultural influence on gender differences in the perception and use of e-mail. Chu, Spires, and Sueyoshi (1999) reported differences in choice behavior and the use of decision aids between participants from Japan and the United States. These studies suggest that user information system satisfaction could be influenced by cultural differences.

Alternative Factor Structure Models

Doll, Xia, and Torkzadeh (1994) proposed four alternative models of factor structure. The four alternative factor structure models are presented in Figures 1 through 4. Figure 1 presents the one first-order factor model. In this model, one first-order factor accounts for all the common variances among the 12 items of the EUCS. Under this model, a summated score of the 12 individual items can be used to represent the overall satisfaction construct (Simon, 2000). Figure 2 presents the five uncorrelated first-order factors model. This model hypothesized that the 12 items form into 5 orthogonal first-order factors defined as accuracy, content, ease-of-use, format, and timeliness.

Figure 1: Model 1 – One First-Order Factor Model.

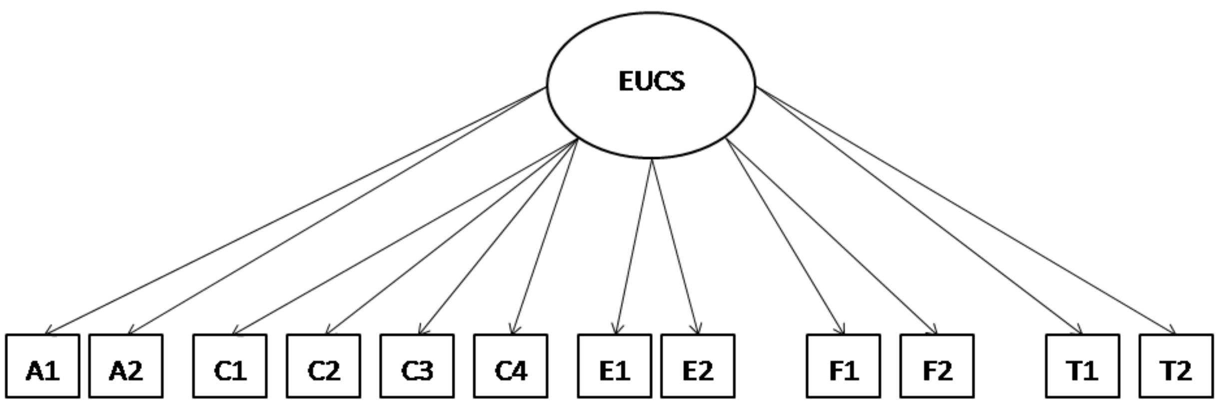


Figure 2: Model 2 – Five Uncorrelated First-Order Factors Model.

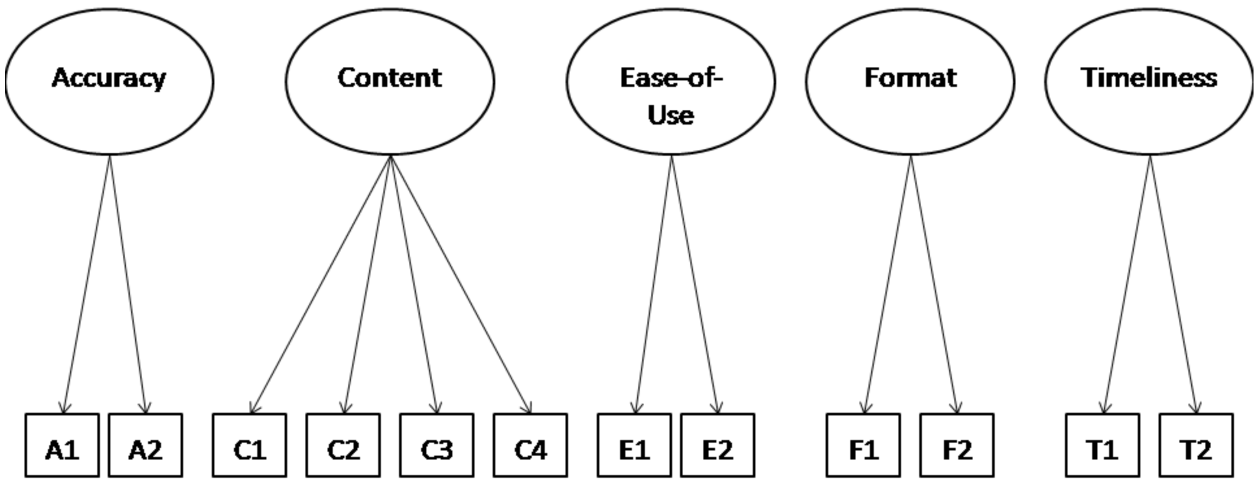


Figure 3 presents the five correlated first-order factors model. This model presumes that the five first-order factors are correlated with each other. Figure 4 presents the one second-order factor model. In this model, it is hypothesized that five first-order factors form into one second-order factor representing the overall construct of EUCS. While the Figure 4 model includes the second-order factor, EUCS, it cannot be directly measured by indicator variables. In this model, the first-order factors measured by their respective indicator variables are considered as components of the second-order factor. This model has been tested by other researchers in the past (Doll & Xia, 1997; Doll, Xia & Torkzadeh, 1994; McHaney & Cronan, 1998; McHaney, Hightower & Pearson, 2002; McHaney, Hightower & White, 1999; Somers, Nelson & Karimi, 2003).

Figure 3: Model 3 – Five Correlated First-Order Factors Model.

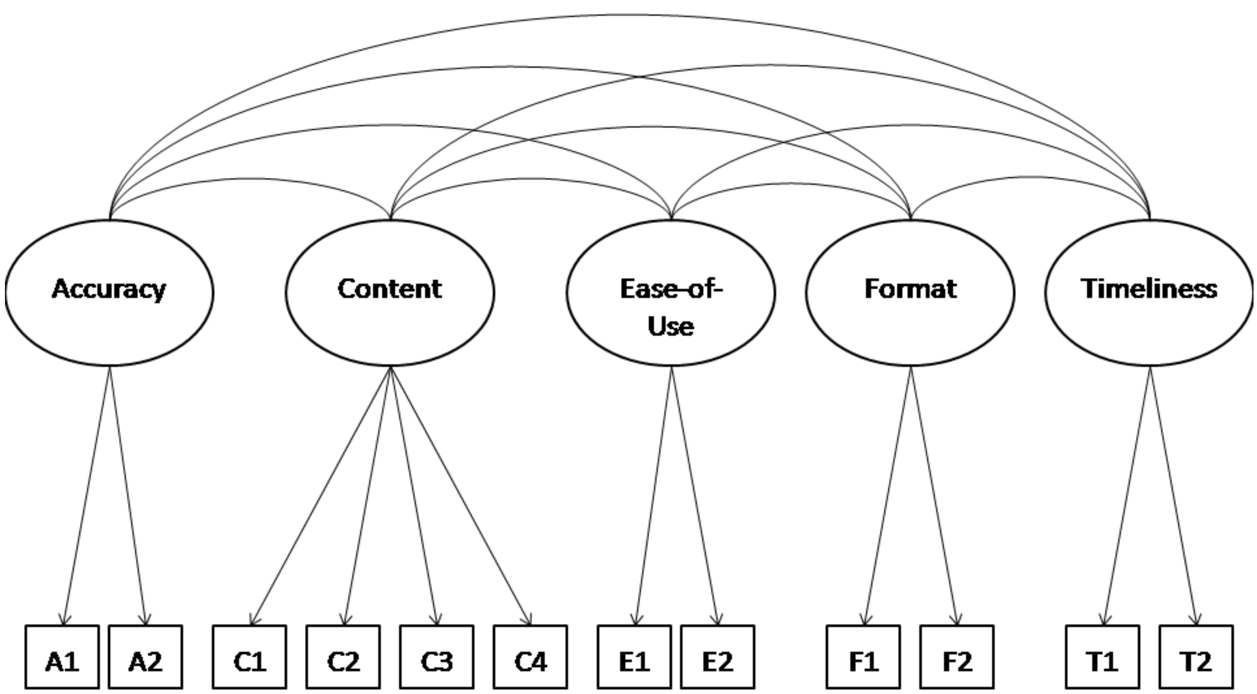
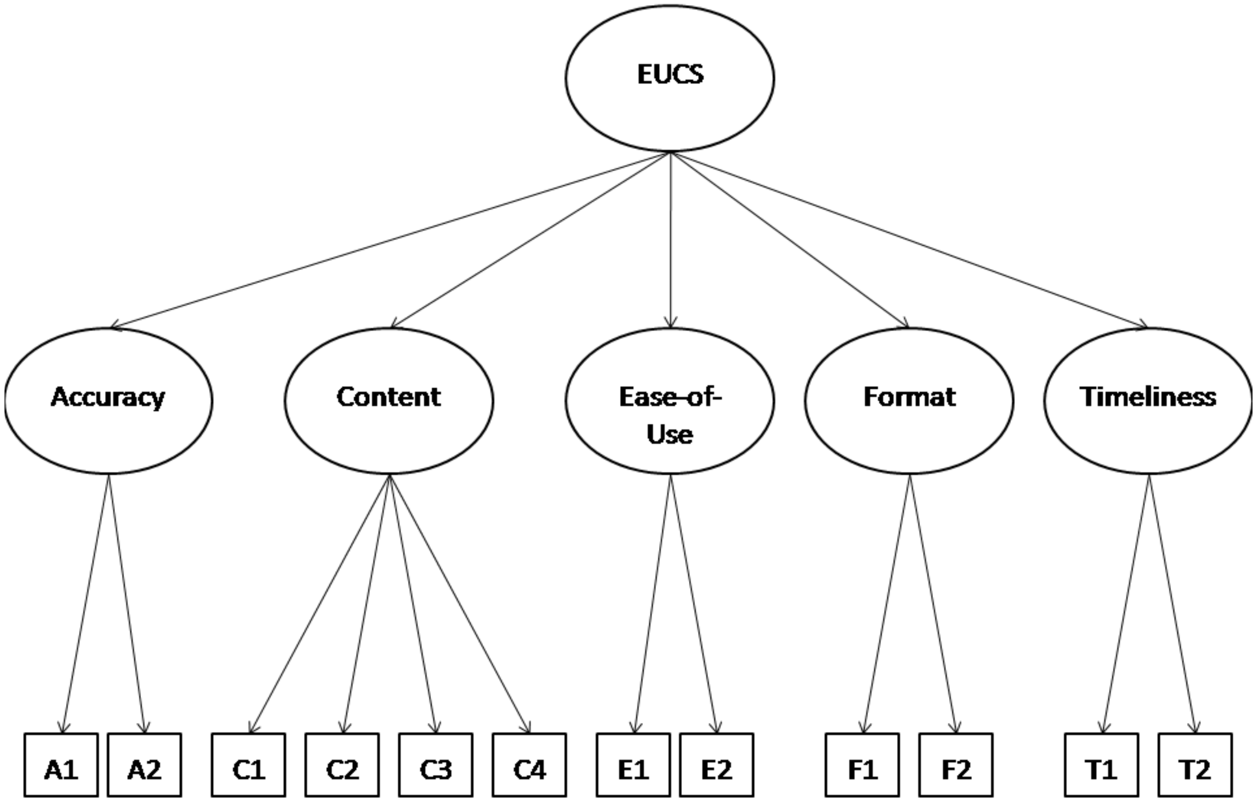


Figure 4: Model 4 – Five First-Order Factors with One Second-Order Factor Model.



RESEARCH METHOD

All instruments, including Doll and Torkzadeh's (1988) 12-item instrument, were translated into Korean following the procedures recommended by Brislin (1993). Specifically, bilingual business administration faculty and graduate students translated the instrument items into Korean, and then a second bilingual graduate student translated the items back into English. When the original version was not equivalent to the back-translated version, discussions among them were conducted to find a resolution. The translated Korean version and re-translated English version were revised until the meanings of the original English version were translated equivalently. After three iterations, the translated versions were regarded as equivalent to the original version by using standards described above.

A senior manager of the South Korean firms distributed the questionnaires to each participant at their work-sites. The participants were informed that their participation was voluntary and that their responses were anonymous. Participants were asked to seal the completed questionnaires in an envelope and forward the envelope to a designated contact person. The envelopes were collected 10 days after the questionnaires were initially distributed. A total of 108 usable questionnaires were received from the South Korean manufacturing firms. The majority of the respondents were middle managers of their firm. The breakdown of the responses by position was Director, 3%; Managers, 29%; and Assistant Managers, 68%. The breakdown of responses by number of employees at the firm was 100-499, 5%; 500-999, 11%; 1000 or more, 84 %. The Korean managers were asked to indicate their end-user satisfaction with respect to their firm's current business software applications.

RESULTS

Analysis

Descriptive statistics for the Doll and Torkzadeh's 12-item instrument to measure EUCS is presented in Table 1. The item means ranged from 3.15 to 3.54 on a five point scale (1 = almost never; 3 = about half the time; 5 = almost always) indicating that Korean end-users were satisfied slightly more than half of the time with their business software applications in terms of accuracy, content, ease-of-use, format, and timeliness. The mean ratings for timeliness ranged from 3.15 to 3.24; this was the lowest reported item mean ratings. The mean ratings for accuracy ranged from 3.46 to 3.54; this was the highest reported item mean ratings.

Data were analyzed by structural equation analysis via LISREL. In analyzing the four alternative factor structural models, overall fit for each of the models, as well as individual coefficients, were evaluated. Confirmatory Factor Analysis (CFA) was used to assess the validity of the four described factor structural models. These models specify the structural relationship linking the twelve observed variables and the underlying theoretical factors, which are presumed to determine responses to the observed variables. The measurement model was tested using LISREL.

In evaluating the goodness-of-fit of the four alternative factor structural models, eight common model-fit measures were used. These eight model-fit indices included chi-square ($\chi 2$), chi-square/degrees of freedom ($\chi 2/df$), normed fit index (NFI), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), root mean square residual (RMSR), non-normed fit index, (NNFI), and comparative fit index (CFI). The chi-square ($\chi 2$) fit index is appropriate for sample sizes between 100 and 200, with the significance test becoming less reliable when the sample sizes are outside this range. The chi-square/degrees of freedom ($\chi 2/df$) ratio is better than the $\chi 2$ fit index, and this ratio should be less than three (Carmines & McIver, 1981) or less than two in a more restrictive sense (Premkumar & King, 1994).

Table 1: Descriptive Statistics.

Code	Question Item	Mean	Std. Deviation
A1	Is the system accurate?	3.54	0.68
A2	Are you satisfied with the accuracy of the system?	3.46	0.62
C1	Does the system provide precise information you need?	3.52	0.74
C2	Does the information content meet your needs?	3.44	0.75
C3	Does the system provide reports that seem to be just about exactly what you need?	3.27	0.74
C4	Does the system provide sufficient information?	3.43	0.74
E1	Is the system user friendly?	3.49	0.79
E2	Is the system easy to use?	3.45	0.74
F1	Do you think the output is presented in a useful format?	3.39	0.73
F2	Is the information clear?	3.34	0.73
T1	Do you get the information you need in time?	3.15	0.75
T2	Does the system provide up-to-date information?	3.24	0.72

Five point scale: 1 = almost never; 2 = some of the time; 3 = about half of the time;
4 = most of the time; 5 = almost always.

Model Comparisons

Table 2 presents the overall model fit indices for the four alternative factor structure models. The fit indices for Model 1 present a relatively poor fit of the data to the structural model. Seven of the fit indices for Model 1 (except RMSR) did not meet the recommended values. The $\chi 2/df$ ratio was above its defined acceptable threshold. The NFI, GFI, AGFI, NNFI, and CFI were all below the recommended threshold value of 0.90. The RMSR value was 0.08 which is less than the recommended value of 0.10. Model 2 also indicates a poor fit of the data to the model. All eight fit indices for Model 2 did not meet the recommended values, thus indicating a poor fit for Model 2. The $\chi 2/df$ ratio and RMSR were greater than their acceptable threshold value. The NFI, GFI, AGFI, NNFI, and CFI were all below the recommended threshold value of 0.90. Based upon these indices, Model 1 has a better fit to the data than Model 2. The results obtained for Models 1 and 2 are consistent with the previous research findings (Doll & Xia, 1997).

Model 3 presents a fairly good fit of the model to the data. Four of the fit indices meet the recommended threshold values. The $\chi 2/df$ ratio (1.86) and RMSR (0.05) were less than their acceptable threshold values. The GFI (0.90) and CFI (0.93) were equal to or greater than the recommended threshold value of 0.90. Model 4 also presents a fairly good fit of the model to the observed data. Four of the fit indices meet the recommended threshold values. The $\chi 2/df$ ratio (1.78) and RMSR (0.05) were less than their acceptable threshold values. The NNFI (0.90) and CFI (0.93) were equal to or greater than the recommended threshold value of 0.90. When Model 4 was compared to Model 3, Model 4 showed slightly improved fit indices. While previous research (Doll & Xia, 1997; McHaney, Hightower & Pearson, 2002) reported a relatively poor fit of the Model 3 and significant improvement in fit of the Model 4 over Model 3, this study found similarly good fit of the Model 3 and Model 4.

Table 2: Goodness-Of-Fit Measures for the Four Alternative Models.

Goodness of Fit Indexes	Recommended Values	Model 1: One First-Order Factors	Model 2: Five Uncorrelated First-Order Factors	Model 3: Five Correlated First-Order Factors	Model 4: Five First-Order Factors with One Second-Order Factor
Chi-Square (*df*)		156.84 (54)	256.80 (54)	81.79 (44)	87.25 (49)
Chi-Square / *df*	≤ 2.00	2.90	4.76	1.86	1.78
Normed Fit Index (NFI)	≥ 0.90	0.74	0.57	0.86	0.85
Goodness-of-Fit Index (GFI)	≥ 0.90	0.83	0.69	0.90	0.89
Adjusted Goodness-of-Fit Index (AGFI)	≥ 0.90	0.76	0.55	0.82	0.82
Root Mean Square Residual (RMSR)	≤.100	0.08	0.31	0.05	0.053
Non-Normed Fit Index (NNFI)	≥ 0.90	0.76	0.53	0.89	0.90
Comparative Fit Index (CFI)	≥ 0.90	0.80	0.61	0.93	0.93

Table 3 presents standardized estimates and construct reliabilities for the twelve item measure. The lambda coefficients were all significant at the 0.01 level and ranged from 0.63 to 0.91 that are larger than the threshold value of 0.60 recommended by Bagozzi and Yi (1988). These results indicate the unidimensionality of the five subscale items. Composite reliabilities (ρc) of the latent constructs recommended by Fornell and Larcker (1981) were calculated for the five subscales. Composite reliabilities (ρc) of the latent constructs ranged from 0.786 to 0.887. The two items for the format subscale show composite reliability (ρc) of 0.786 that is lower than the recommended value of 0.800. The composite reliabilities (ρc) for accuracy, content, ease-of-use, and timeliness subscales were 0.833, 0.887, 0.802, and 0.814 respectively. R-square values range from 0.44 to 1.00, providing evidence of acceptable reliability for all factors. These results show the evidence of convergent validity and construct reliabilities of subscales.

Table 3: Standardized Lambda Coefficients, t-values, and Construct Reliabilities.

	Factor				
Question Item	Accuracy	Content	Ease-of-Use	Format	Timeliness
A1: System is accurate	0.80				
A2: Satisfied with system accuracy	0.76 (6.22)				
C1: System provides precise information needed		0.81			
C2: Information content meets needs		0.75 (8.20)			
C3: System provides required reports		0.65 (6.92)			
C4: System provides sufficient information		0.79 (8.87)			
E1: System is user friendly			0.91		
E2: System is easy to use			0.65 (5.25)		
F1: Output is presented in a clear manner				0.82	
F2: Information is clear				0.63 (4.61)	
T1: Information provided in time					0.79
T2: Information is up-to-date					0.73 (6.29)
R-Squared	0.50	1.00	0.46	0.44	0.63
Composite Reliabilities (ρc)	0.833	0.887	0.802	0.786	0.814

[a] Indicates a parameter fixed at 1.00 in the original solution.
t-values from factor loadings are indicated in parentheses.

Table 4 presents the correlation coefficients of the five factors obtained from Model 3 LISREL output. The correlations ranged from 0.30 to 0.79. Five correlations were larger than 0.60. The correlations of content with the other four factors and correlation between accuracy and ease-of-use were larger than 0.60. These correlations indicate somewhat questionable discriminant validity of the five subscales.

Table 4: Model 3 Construct Correlation Coefficients.

Factor	Accuracy	Content	Ease-of-Use	Format	Timeliness
Accuracy	1.00				
Content	0.69	1.00			
Ease-of-Use	0.60	0.64	1.00		
Format	0.39	0.68	0.30	1.00	
Timeliness	0.55	0.79	0.52	0.49	1.00

The structural coefficients and their t-values (in parenthesis) for accuracy, content, ease-of-use, format, and timeliness subscales were 0.56 (5.91), 0.81 (9.10), 0.52 (5.39), 0.58 (6.16) and 0.62 (6.72) respectively. These results indicate acceptable construct validity of the latent factors comprising the EUCS construct. The results obtained from the Korean sample data support the identified structural equation model and the underlying theory. While the higher-order factor structure (Model 4) is found to be a better fit model, the five correlated first-order factors structure (Model 3) was an equally good fit to the data. The improvement of Model 4 over Model 3 was not as substantial as was expected. These results generally support the generalizability of EUCS and the robustness of EUCS as a measure of user information system satisfaction.

CONCLUSIONS AND DISCUSSION

This study explored the four alternative factor structure models of end-user computing satisfaction using a sample of managers of South Korean firms. This study found support for the generalizability of the EUCS instrument. Many researchers call for extending the replication of an existing instrument, such as EUCS, in the MIS field (Berthon, Pitt, Ewing & Carr, 2002; Boudreau, Gefen & Straub, 2001; Klenke, 1992). This study advances previous research by using the EUCS instrument in a different sample and a different application.

This study supports previous findings that the EUCS has been shown to be a valid predictor of user satisfaction and good instrument usable for multiple cultures. However, interestingly, this study found somewhat different validation results from the Korean sample as compared to United States sample results reported in previous studies (Doll & Torkzadeh, 1988; Doll & Xia, 1997; Doll, Raghunathan, Lim & Gupta, 1995; McHaney, Hightower & White, 1999). Although this study's results support Model 4, contrary to the United States sample results where the improvement of Model 4 over Model 3 is substantial, the Korean sample results show that Model 3 and Model 4 are equally well supported. In addition, the evidence of the discriminant validity of the five subscales in Model 4 seems to be less than satisfactory in this study.

These validation result differences may be in part explained by cultural difference dimensions identified by Hofstede (1983). As described earlier, the Korean culture can be characterized as having "collectivist", "strong uncertainty avoidance", and "high power distance". McDermitt and Stock (1999), for example, found a positive relationship of group-oriented (i.e., collectivist) cultures to managerial satisfaction with advanced manufacturing technology outcomes. Similarly, Kangungo (1998) found a stronger relationship of computer-network use with user satisfaction in more task-oriented cultures.

As such, these cultural differences may have played a role in the way Korean managers answered the UISS scale items. The results show that Korean managers seem to have perceived these five dimensions as highly correlated first-order factors in their work environment. The high correlations among the five factors suggest that for Korean managers, the five UISS dimensions tested in this study may not be clearly defined and perceived distinctively. Especially, high correlations were found between content and timeliness and between content and accuracy. This suggests that timeliness and accuracy are highly correlated to content and implies that the appropriate timeliness and accuracy may be dependent upon the nature and scope of the content. This finding may be due to the fact that Asian, and in particular Korean, management systems do not value or encourage the knowledge sharing and communication of accurate and timely information (Bock et al., 2005). Asian managers typically safeguard valued information among their closed group members instead of disclosing it for public scrutiny or use. Computer files, business information, system reports, and software applications are more commonly shared among close-knit group members and are considered as group-owned rather than individually owned. In addition, deadlines or report requirements are more flexibly defined and enforced among Korean managers. These differences in the information system work environment would make it difficult for Korean managers to separate these five components of EUCS and assess the satisfaction level distinctively. A similar finding is reported by Yoo and Torrey (2002). Their study shows that there exists significant differences in the way Korean and United States consultants create, seek, share, and preserve knowledge in their respective organizational setting. They reported that Korean consultants rely more on social networks than on external searches for knowledge and information. Japanese managers who share a similar collectivist and uncertainty avoidance culture, tend to use information technology for purposes of control rather than for individual support (Kambayashi & Scarbrough, 2001). Loiacono and Lin (2005) reported significant cultural differences between Chinese and US website customers in their assessment of website quality.

In addition, the correlation between content and format was also very high suggesting that content may determine the appropriateness of the format used in presenting the information. As Asian culture is more socially oriented and situation centered, the release of information which promotes conformity and reinforces the existing relationship networks is encouraged. Messages which advocate radical change or undermine social stability tend to be suppressed (Kim & Peterson, 2003). As such, cultural values can influence the processes used for communicating and interpreting information. While Western cultures use low context forms of communication, the Asian high context cultures tend to use more implicit and indirect communication (Möller & Svahn, 2004). This often translates to the absence of both formal communications systems and explicit, consistent, or clear rules. In Asian culture there is little value in codifying business information into a certain specified form if its context would be lost. Therefore, Asian managers tend to use ambiguous or conditional statements to maintain flexibility, promote harmony, preserve face, achieve compromise, and avoid conflict (Espinosa et al., 2006). As a result, this study found that Korean managers consider content accuracy, timeliness, and format factors are all contingent to the content of interest.

The differences found in validation results using Korean sample data provide significant implications for theory development and cross-cultural management practices. When global businesses are incorporating or developing information systems in Asian cultures, these global businesses should consider implementing an IS system and report formats that do not challenge the power relationships (Peterson et al., 2003). The IT applications that challenge the power relationships are difficult to get implemented and accepted by those in authority roles as well as subordinates. Any new applications which impose new work practices that may directly conflict with the core Asian culture values would not be able to achieve high end-user satisfaction. This is particularly important for global Multi National Corporations (MNCs) such as airline companies as information must be gathered, stored, distributed, and presented in such a way as to ensure integrity and effectiveness of the global network. Due to competitive market environment, local cultures cannot be easily accommodated in this situation. Therefore, to minimize the negative cultural impact and to increase end-user satisfaction of applications, global MNCs should make every effort to address cultural differences within the project teams developing the IT systems or when outsourcing the IT systems development (Chen et al., 2006; Wei & Peach, 2006) and provide training such that a clearly defined set of methods and procedures are followed (Espinosa et al., 2006). It is also critical to reduce anxiety experienced by top management in those high uncertainty avoidance cultures by demonstrating that the same application or systems are successfully used in similar cultural settings and have maintained the close-knit group relationships as well as information business structure (Martinsons & Westwood, 1997; Yang, 2006).

Global MNCs should make investments wisely such that IT applications help senior management monitor and control business operations and selectively communicate management directives to organizational subordinates (Shore & Venkatachalam, 1996). Those managers in MNCs who interact with Korean business leaders or develop information systems for the Korean market should be sensitive to and take account of the distinctively characterized Asian information management practice (Kim & Peterson, 2003).

If researchers are interested in using the five subscales in analysis separately in a cross-cultural research, care should be taken regarding the discriminant validity. Different cultures may create confounding among factors and may result in weak discriminant validity. Future research also needs to evaluate other higher-order factor structures in different cultural settings. In addition, further refinement of the measurement scale would provide advancement of measurement theory development and construct validation research.

REFERENCES

Adams, D. A., Nelson, R. R., & Todd, P. A. (1992). Perceived Usefulness, Ease-of-Use, and Usage of Information Technology: A Replication. *MIS Quarterly*, 16(2), 227-247.

Akbulut, A. Y. & Motwani, J. (2005). The Road to ERP Success: Understanding End-User Perceptions. *Journal of International Technology and Information Management*, 14(4), 13-26.

Au, N., Ngai, E. W. T. & Cheng, T. C. E. (2002). A Critical Review of End-User Information System Satisfaction Research and a New Research Framework. *Omega*, 30(6), 451-478.

Bagozzi, R. P. & Yi, Y. (1988). On The Evaluation of Structural Equation Models. *Journal of the Academy of Marketing Science*, 16(1), 74-94.

Bailey, J. E. & Pearson, S. W. (1983). Development of a Tool for Measuring and Analyzing Computer User Satisfaction. *Management Science*, 29(5), 530-545.

Berthon, P., Pitt, L., Ewing, M. & Carr, C. L. (2002). Potential Research Space in MIS: A Framework for Envisioning and Evaluating Research Replication, Extension, and Generation. *Information Systems Research*, 13(4), 416-427.

Bock, G. W., Zmud, R. W., Kim, Y. G. & Lee, J. N. (2005). Behavioral Intention Formation in Knowledge Sharing: Examining the Roles of Extrinsic Motivators, Social-Psychological Forces, and Organizational Climate. *MIS Quarterly*, 29(1), 87-111.

Boudreau, M., Gefen, D. & Straub, D. W. (2001). Validation in Information Systems Research. *MIS Quarterly*, 25(1), 1-14.

Brislin, R. (1993). Understanding Culture's Influence on Behavior. Fort Worth, TX: Harcourt Brace College Publishers.

Calhoun, K. J., Teng, J. T. C. & Cheon, M. J. (2002). Impact of National Culture on Information Technology Usage Behavior: An Exploratory Study of Decision Making in Korea and the USA. *Behavior and Information Technology*, 21(4), 293-302.

Carmines, E. G. & McIver, S. P. (1981). Analyzing Models with Unobserved Variables: Analysis of Covariance Structures. In G.W. Bohrnstedt & E. F. Borgatta (Eds.), Social Measurement: Current Issues. Beverly Hills, CA: Sage.

Chen, F., Romano, Jr., N. C. & Nunamaker, Jr.,J. F. (2006). A Collaborative Project Management Approach and a Framework for Its Supporting Systems. *Journal of International Technology and Information Management*, 15(2), 1-16.

Chen, L. D., Soliman, K. S., Mao, E. & Frolick, M. (2000). Measuring User Satisfaction with Data Warehouses: An Exploratory Study. *Information and Management*, 37(3), 103-110.

Chu, P. C., Spires, Eric E. & Sueyoshi, T. (1999). Cross-Cultural Differences in Choice Behavior and Use of Decision Aids: A Comparison of Japan and the United States. *Organizational Behavior and Human Decision Processes*, 2(77), 147-170.

Couger, J. D. (1986). Effect of Cultural Differences on Motivation of Analysts and Programmers: Singapore vs. the United States. *MIS Quarterly*, 10(2), 189-196.

DeLone, W. H. & McLean, E. R. (1992). Information Systems Success: The Quest for the Dependent Variable. *Information Systems Research*, 3(1), 60-95.

Doll, W. J. & Torkzadeh, G. (1988). The Measurement of End-User Computing Satisfaction. *MIS Quarterly*, 12(2), 259-274.

Doll, W. J., Raghunathan T. S., Lim, J. & Gupta, Y. (1995). A Confirmatory Factor Analysis of the User Information System Satisfaction Instruments. *Information Systems Management*, 6(2), 177-188.

Doll, W. J. & Xia, W. (1997). A Confirmatory Factor Analysis of the End-User Computing Satisfaction Instrument: A Replication. *Journal of End User Computing*, 9(2), 24-31.

Doll, W. J., Xia, W., and Torkzadeh, G. (1994). A Confirmatory Factor Analysis of the End-User Computing Satisfaction Instrument. *MIS Quarterly*, 18(4), 357-369.

Downing, C. E. (1999). System Usage Behavior as a Proxy for User Satisfaction: An Empirical Investigation. *Information and Management*, 35(4), 203-216.

Espinosa, J. A., DeLone, W. & Lee, G. (2006). Global Boundaries, Task Processes, and IS Project Success: A Field Study. *Information Technology and People*, 19(4), 345-370.

Fornell, C. & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, 18(2), 39-50.

Galletta, D. F. & Lederer, A. L. (1989). Some Cautions on the Measurement of User Information Satisfaction. *Decision Sciences*, 20 (3), 419-438.

Gefen, D. & Straub, D. W. (1997). Gender Differences in the Perception and Use of E-Mail: An Extension to the Technology Acceptance. *MIS Quarterly*, 21(4), 389-400.

Harper, G. R. & Utley, D. R. (2001). Organizational Culture and Successful Information Technology Implementation. *Engineering Management Journal*, 13(2), 11-15.

Hendrickson, A. R., Glorfeld, K. & Cronan, T. P. (1994). On the Repeated Test-Retest Reliability of the End-User Computing Satisfaction Instrument: A Comment. *Decision Sciences*, 25(4), 655-667.

Hendrickson, A. R., Massey, P. D. & Cronan, T. P. (1993). On the Test-Retest Reliability of Perceived Usefulness and Perceived Ease of Use Scales. *MIS Quarterly*, 17(2), 227-230.

Hofstede, G. (1980). Culture's Consequences. Beverly Hills, CA: Sage.

Hofstede, G. (1983). The Cultural Relativity of Organizational Practices and Theories. *Journal of International Business Studies*, 14(2), 75-89.

Ives, B. & Olson, M. H. (1984). User Involvement and MIS Success: A Review of Research. *Management Science*, 30(5), 586-603.

Ives, B., Olson, M. H. & Baroudi, J. J. (1983). The Measurement of User Information Satisfaction. *Communications of the ACM*, 26(10), 785-793.

Jones, M. C., Berry, R. L. & Yi-Fang Ku, C. (2003). Electronic Data Interchange: A Perspective From Taiwan. *Journal of International Technology and Information Management*, 12(1), 121-136.

Kambayashi, N. & Scarbrough, H. (2001). Cultural Influences on IT Use Amongst Factory Managers: A UK-Japanese Comparison. *Journal of Information Technology*, 16(4), 221-236.

Kangungo, S. (1998). An Empirical Study of Organizational Culture and Network-based Computer Use. *Computers in Human Behavior*, 14(1), 79-91.

Kim, C. S. & Peterson, D. K. (2003). A Comparison of the Perceived Importance of Information Systems Development Strategies by Developers from the United States and Korea. *Information Resources Management Journal*, 16(2), 1-18.

Klenke, K. (1992). Construct Measurement in Management Information Systems: A Review and Critique of User Satisfaction and User Involvement Instruments. *INFOR*, 30(4), 325-348.

Leidner, D. E. & Kayworth, T. (2006). A Review of Culture in Information Systems Research: Toward a Theory of IT-Culture Conflict. *MIS Quarterly*, 30(2), 357-399.

Loiacono, E. T. & Lin, H. (2005). A Cross-cultural Comparison of U.S. and Chinese Website Customers. *Journal of International Technology and Information Management*, 14(1), 53-70.

McDermott, C. M. & Stock, G. N. (1999). Organizational Culture and Advanced Manufacturing Technology Implementation. *Journal of Operations Management*, 17(5), 521-533.

McHaney, R. & Cronan, T. P. (1998). Computer Simulation Success: On the Use of the End-user Computing Satisfaction Instrument: A Comment. *Decision Sciences*, 29(2), 525-534.

McHaney, R., Hightower, R. & Pearson, J. (2002). A Validation of the End-user Computing Satisfaction Instrument in Taiwan. *Information and Management*, 39(6), 503-511.

McHaney, R., Hightower, R. & White, D. (1999). EUCS Test-Retest Reliability in Representational Model Decision Support Systems. *Information and Management*, 36(2), 109-119.

de Madariaga, J. G. (2004). Customer Relationship Management (CRM): A Comparative Study between USA and Spain. *Journal of International Technology and Information Management*, 13(2), 87-96.

Martinsons, M. G. & Westwood, R. I. (1997). Management Information Systems in the Chinese Business Culture. *Information and Management*, 32(5), 215-228.

Möller, K. & Svahn, S. (2004). Crossing East-West Boundaries: Knowledge Sharing in Intercultural Business Networks. *Industrial Marketing Management*, 33(3), 219-228.

Nath, R. & Murthy, N. R. V. (2004). A Study of the Relationship between Internet Diffusion and Culture. *Journal of International Technology and Information Management*, 13(2), 123-132.

Peterson, D. K, Kim, C. S. & Kim, J. H. (2003). Perceptions of Information Systems Objectives: A Comparison of IS Professionals from the United States and Korea. *Journal of Global Information Technology Management*, 6(2), 27-44.

Premkumar, G. & King, W. R. (1994). Organizational Characteristics and Information Systems Planning: An Empirical Study. *Information Systems Research*, 5(2), 75-109.

Rose, G. M., Evaristo, R. & Straub, D. (2003). Culture and Consumer Responses to Web Download Time: A Four-Continent Study of Mono and Polychronism. *IEEE Transaction on Engineering Management*, 50(1), 31-43.

Shore, B. & Venkatachalam, A. R. (1996). Role of National Culture in the Transfer of Information Technology. *Journal of Strategic Information Systems,* 5(1), 19-35.

Simon, S. J. (2000). The Relationship of Learning Style and Training Method to End-User Computing Satisfaction and Computer Use: A Structural Equation Model. *Information Technology, Learning, and Performance Journal*, 18(1), 41–59.

Somers, T., Nelson K. & Karimi J. (2003). Confirmatory Factor Analysis of the End-User Computing Satisfaction Instrument: Replication Within An ERP Domain. *Decision Sciences*, 34(3), 595-621.

Straub, D. W. (1994). The Effect of Culture on IT Diffusion: E-Mail and FAX in Japan and the U.S. *Information Systems Research,* 5(1), 23-47.

Watson, R. T., Ho, T. H. & Raman, K. S. (1994). A Fourth Dimension of Group Support Systems. *Communications of the ACM*, 37(10), 45-55.

Yang, I. (2006). Jeong Exchange and Collective Leadership in Korean Organizations. *Asia Pacific Journal of Management*, 23(3), 283-298.

Yoo, Y. & Torrey, B. (2002). National culture and knowledge management in a global learning organization. In The Strategic Management of Intellectual Capital and Organizational Knowledge, C.W. Choo and N. Bontis (eds.), New York, NY: Oxford University Press, 421-434.

Wei, J. & Peach, B. (2006). Development of a Risk Assessment Model for Global Information Technology Outsourcing. *Journal of International Technology and Information Management*, 15(4), 35-50.

THIS PAGE LEFT BLANK