

Important Factors Affecting Student Information System Quality and Satisfaction

Cannur Gürkut ^{1*}, Muesser Nat ¹

¹ Cyprus International University, Management Information Systems, Nicosia, NORTH CYPRUS

Received 4 October 2017 • Revised 1 December 2017 • Accepted 3 December 2017

ABSTRACT

Student Information System is one of the key systems for facilitating the management and development of Higher Education Institutions. Its use for academic decision-making purposes as well as other academic tasks is crucial. Therefore, this paper aims to understand the impact of System Quality, Information Quality and Information Presentation on Student Information System satisfaction of academic and administrative staff. In this study, System satisfaction survey is carried out and factor analysis and regression tests are applied to interpret the collected data. The results show that only Information Quality has direct effect on satisfaction. Then the impact of decision-making as a mediator factor on system satisfaction is measured and the results reveal that System Quality and Information Quality has indirect significant effect whereas Information Presentation does not have direct nor indirect effect on system satisfaction.

Keywords: system satisfaction, student information system, higher education institution, information quality, system quality, information presentation

INTRODUCTION

“Producing meaningful, accessible, and timely management information has long been the holy grail of higher education administrative technology” (Goldstain & Katz, 2005, p.1). Significant and timely information management is important for the decision-making process. Higher Education Institutions (HEIs) collect and organize all student data with the help of the Student Information Systems (SIS) to provide meaningful information that affects the decision-making process. However, is the collected data sufficient to prepare a report for decision-makers and do HEIs obtain the information they require?

New decision support systems are being developed and researched with the rapid development of information and communication technologies. The work of Negash (2004) aimed to improve the timing and quality of input in the decision-making process and to facilitate management work. For this reason, author developed a framework and identified a potential research area that emphasized the significance of data to support informed actions of decision-makers.

Today, there is an increasing pressure from organizations to supply information for managerial decisions. According to Abubakar et al. (2017) information integration and exchange encourage the creativity and learning within the organization, which has significant impact on organizational performance. Most HEIs are greatly pressured to maximize student retention and reduce the time of completion of the program. HEIs are increasingly gaining insights about their students through the data they collect, and this is done for the benefit of international accreditation bodies, national accreditation bodies and government bodies which are continuously seeking for more information in order to measure and assess the effectiveness of HEIs. Each one increases the demand for information. For this reason, the quality of the provision of successful information and the relevance of such information to measurements and evaluations by international and national accreditation bodies become critical (Goldstein & Katz, 2005).

Bharati and Chaudhury (2004) investigated the factors which affect decision-making satisfaction in web-based decision support systems through the hypothesis that “system quality, quality of information and the way it is

Contribution of this paper to the literature

- Impact of System Quality, Information Quality and Information Presentation on Student Information System (SIS) measures the satisfaction levels of academics and administrative staff.
- This system is significant because information gathered in this way, can be used to make decisions about strategies of institution up to departments and programs' needs and helps to develop statistical information for accreditation purposes.
- Course advisors use the SIS to decide courses that the students will get based on their performance. And finally, students use SIS to make online course registration, to check their time table, exam schedules, exam results and transcript.

presented affect decision-making satisfaction". According to the results of the research, even though the way information is presented has no importance on the decision-making process, the quality of the system and the quality of the information positively influences the user's decision-making.

The decisions taken by the universities are very important and these decisions directly affect many different parties; such as students, administrators and faculty members. The majority of organizational decisions involve some degree of conflict or dissatisfaction. SISs are commonly often used to support decisions by university administrators. Administrators in universities believe that the collection of diverse data on student performance and enrollment should be included in the SIS.

This study considers the development of HEI with the SIS to assist academic and administrative staff in generating reports. Faculty coordinators generate reports on the number of students in each department and determine the number of sections (groups) for each course, the Rector's office uses these reports to determine the number of students from each faculty/department in order to see the increase or decrease in the number of students. This information is then used to decide on whether to consider closing the program or improving the department's needs. Faculties use statistical information for accreditation issues. Course advisors use the SIS to decide courses that the students will get based on their performance. And finally, students use SIS to make online course registration, to check their time table, exam schedules, exam results and transcript. Given the importance of the SIS to HEIs, this study examines the level of satisfaction of academic and administrative staff using SIS generated reports.

Since SIS is a vital system for HEIs, it is important to understand the factors that affect user satisfaction. The structure of this article is as follows: Section II is a literature review of the use of SIS in higher education institutions and previous work on system satisfaction. Section III is the research methodology that describes the model used in the research and provides information about the questionnaire, hypothesis, data collection and analysis. According to the results of the analysis, the article describes the experimental findings and discussions in Section IV.

LITERATURE REVIEW

Use of SIS in HEIs

The effectiveness of organizational decision-making and daily tasks is critical for every organization (Begam, 2015). Likewise, decision-making and productivity in HEIs is important, not only for their present position, but also for their future development. For this reason, universities should consider the use of technology for decision-making. In universities, SIS plays an important role as a system because it is used to store information that is used to generate reports for decision-making about students, lecturers, departments, faculties and curriculum (Bayangan-Cosidon, 2016). There are many factors (i.e. quality of information system, information presentation, etc.) that affect the use and dissemination of such systems in organizations.

According to Wang & Strong (1996) poor data quality can have significant social and economic impacts. While companies improve data quality with practical approaches and tools; efforts to improve focus are tightly intensive on accuracy. They also talk about the fact that data consumers have a greater concept of data quality that IS professionals recognize. Entries in the organization's information system can contain hundreds of data items. As the use of organizational information systems increases; the cost, complexity and quality of the data on which decisions are based on become critical (Huang et al., 1998; Laudon, 1986).

Price and Shanks (2004) stated that quality information and its management within an organization is compulsory for adequate transactions and decision-making. According to the same study, decision makers can be kept very far from original data sources or information about data conditions or associations. Having the necessary rigorous and generic skills to understand the quality of data will be essential to understand how the data collection decision affects the decision-making process and to create strategies that are used to improve the quality of data (Price & Shanks, 2004). Data collection and quality of knowledge are important for organizations, as strategic and

tactical decision-making depends on the quality of the data used in decision-making. Increasing use of data warehouses in order to collect and join various sources of data to improve decision-making to its highest level points out the vulnerability of an organization regarding the poor data quality (Bharati & Chaudhury, 2004).

The information system quality and success have been recently studied with different methodologies. However, the studies like Bayangan-Cosidon (2016) and Alzahrani et.al. (2017) consider students' evaluations of SIS. Bayangan & Cosidon (2016) aims to improve the efficiency of the existing SIS of Kalinga State University Rizal Campus. To obtain this objective, an evaluation of the current system was done through investigation and interview methods from the perspective of acting registrar, faculty members, campus secretary and students. The survey questionnaire was developed based on the characteristics and sub-characteristics of ISO Software Quality Model 9126. The results show that the current SIS met the five requirements: security, reusability, usefulness, maintainability, and functionality. The information system quality and success model has been studied on a digital library system by Alzahrani (2017) and it has been found that "behavioural intentions are greatly influenced by system quality, information quality and service quality".

Information System Satisfaction

Gelderman (1998) explore the effectiveness of two frequently used measures for the success of information systems: usage and user satisfaction. The results indicate that user satisfaction is significantly related to performance. In the study mentioned, the information system satisfaction is cognitive evolution of gratified level of end-users who directly interact with the IS. The end-users are non-technical users.

Au et al. (2002) defines the information system satisfaction of end users as "the IS end-user's overall affective and cognitive evaluation of the pleasurable level of consumption-related fulfilment experienced with the IS. IS end users refer to non-technical personnel who use or interact with the system directly, as opposed to technical personnel who design the IS". DeLone and McLean (1992) describe the success model as an IS influence at the organizational and individual level. As a result, six basic dimensions of IS success model have been revealed; system quality, information quality, usage, user satisfaction, individual impact and organizational impact (DeLone & McLean, 1992). The model has been updated with the new variables in 2003 as: Information Quality, System Quality, Service Quality, Intention to Use, Use, User Satisfaction, and Net Benefits after ten years (DeLone & McLean, 2003).

Abubakar et al. (2017, p.4) opined that "to increase the success of knowledge management projects and applications, investing in information technology is unavoidable". Rezaei et al. (2016) studied effect of cloud computing systems on the service quality of knowledge management systems. The uploading result of a knowledge management system using the cloud computing technology is also investigated aiming to answer the main question "whether this new knowledge management system can cause a proper result on the quality of services or not?" According to their findings the users observed significant differences after the implementation of the service. Alzahrani (2017) evaluated the success of a digital library system based on DeLone & McLean's IS Success Model and it has been reported that digital library systems have a strong influence on the quality factors, satisfaction, behavioral intent and deviation of actual use. Padayachee et al. (2010) used ISO 9126 model to analyze the external systems quality characteristics, sub-characteristics and domain specific criteria for evaluating e-Learning systems. "Educators, educational administrators, and higher education institutions adopting Course Management Systems (CMS) to implement e-learning have a vested interest in evaluating 'quality in use' as they inform the decision-making process with regards to the choice of CMS" (Padayachee et al., 2010). Moreover, Mir and Mehmood (2016) examined the success factor of online student support system of Allama Iqbal Open University by using the DeLone and McLean IS Success Model with the sampling of 173 students. According to their findings, most of the students were satisfied with this online support system in terms of technical standards and functionality. However, they were not satisfied with the information or responses. Another case study from Epoka University by Sherifi (2015) investigated the impact of information systems in satisfying students of the university. The dimensions of the student satisfaction were assurance, responsiveness, tangibility (the physical evidence of the service), empathy and reliability. According to the same study, students are satisfied by the Student Affairs Information System services.

The Bharati and Chaudhury (2004) model (**Figure 1**) was established on the basis of structure along with information quality and their impact on user satisfaction, since it was in a way a part of the IS success model. According to their study, independent variables, System Quality, Information Quality and Information Presentation are affected. A successful model is given in **Table I**, "decision-making". "Deciding on a system's problem solving and decision-making skills indicate that these variables are in position to determine if the system helps the individual in identifying problematic areas, structuring system problems and making decisions regarding the aim of managing a business cycle" (Bharati & Chaudhury, 2004). This model uses decision-making confidence and decision-making effectiveness for the decision-making structure.

Many studies in literature have evaluated the satisfaction and success of information systems at universities from students' perspective with different methodologies like ISO 9126, Serwqual, and DeLone & McLean IS Success Model. However, this paper contributes to the literature by evaluating student information system satisfaction and success from the administrative and academic staff perspective who are the main users of such systems for better decision-making.

METHOD

Considering the purpose of this study, main data is collected through the questionnaire which is inspired from Bharati and Chaudhury (2004) and adopted from various sources such as Chervany et al. (1972), Belardo et al. (1982), Mahmood (1987), Zmud et al. (1983), Bailey and Pearson (1983), Srinivasan (1985), Miller and Doyle (1987), King and Epstein (1983), Vessey (1994), Swanson (1985), Goslar et al. (1986), as displayed in [Table 1](#). This study uses the conceptual model of Bharati and Chaudhury (2004) displayed in [Figure 1](#) as a basis. The questionnaire is applied to the academic and administrative staff of a HEI.

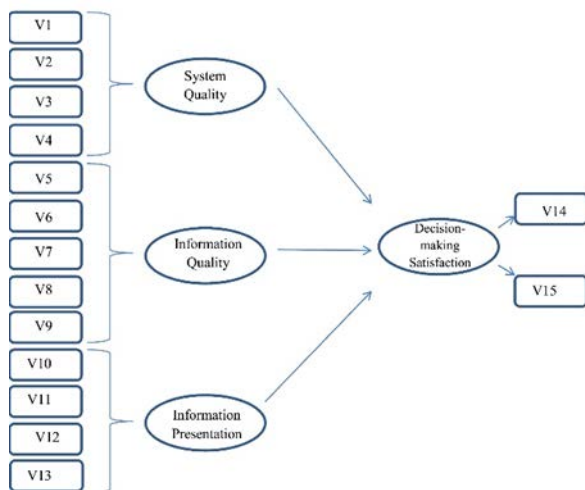


Figure 1. Base Conceptual Model

The questionnaire had two main sections, first section included demographic variables and second section grouped into 5 groups like system quality, information quality, information presentation, decision-making, and satisfaction. The questionnaire had 59 questions using 1 to 5 Likert type scale. Cronbach's Alpha reliability statistics was used to test the reliability of the instrument. Results confirmed that the instrument is reliable (system quality: %79, information quality: %95, information presentation: %88, satisfaction: %77). The overall reliability result was %96.

In total 120 questionnaires were distributed to the faculties and 96 were returned within 30 days which shows 80% response rate. The collected data was analyzed with SPSS to accept or reject the hypothesis. The demographic questions were included the administrative positions of the responders such as Rector/Vice Rector, Rector's Advisor, General Secretary, Dean/Vice Dean/Head of a School, Head of Department/Vice Head of Department, Faculty Coordinator and student advisors. Also, the overall performance of the SIS was asked to be evaluated on a 7 Likert scale.

Table 1. List of Utilized Instruments

Variables Type	Variable's name	Item no.	Item measured	Reference
Independent	System Quality	1	System reliability	(Srinivasan, 1985)
		2	Convenient to access	(Bailey & Pearson, 1983)
		3	System ease of use	(Belardo, Karwan & Wallace, 1982)
		4	System flexibility	(Srinivasan, 1985)
Independent	Information Quality	5	Information accuracy	(Bailey & Pearson, 1983), (Mahmood, 1987), (Miller & Doyle, 1987), (Srinivasan, 1985), (Ge & Helfert, December 2015)
		6	Information completeness	(Bailey & Pearson, 1983), (Miller & Doyle, 1987)
		7	Information relevance	(Bailey & Pearson, 1983), (King & Epstein, 1983), (Miller & Doyle, 1987), (Srinivasan, 1985)
		8	Information content needs	(Doll & Torkzadeh, 1988)
		9	Information timeliness	(Bailey & Pearson, 1983), (King & Epstein, 1983), (Mahmood, 1987), (Miller & Doyle, 1987), (Srinivasan, 1985)
Independent	Information Presentation	10	Presentation graphics	(Swanson, 1985), (Vessey, 1994)
		11	Presentation color	(Swanson, 1985), (Vessey, 1994)
		12	Presentation style	(Swanson, 1985), (Vessey, 1994)
		13	Navigationally efficiency	(Swanson, 1985), (Vessey, 1994)
Mediator	Decision-Making	14	Decision confidence	(Goslar, Green & Hughes, 1986), (Gueutal, Surprenant & Bubeck,, 1984), (Zmud, Blocher & Moffle, 1983)
Dependent	Satisfaction	15	Decision effectiveness	(Chervany, Dickson & Kozar, 1972)

Hypotheses

System Quality (SQ) is one of the measurements for the information processing system itself Petter et al. (2013) and it's a manifestation of system software and hardware (Bharati & Chaudhury, 2004). Sensitive measures such as ease of access Bailey & Pearson (1983); user friendliness, system reliability and flexibility Srinivasan (1985) and Belardo et al. (1982) have been utilized in previously assessed survey instruments in order to obtain system quality measurement. According to Gürkut and Nat (2016) the System Quality has positive effect on decision-making satisfaction. Considering this, four measures mentioned above have been taken into account and the following hypotheses are stated:

Hypothesis 1: *System Quality has significant direct effect on satisfaction.*

The quality of the information (IQ) is a measure of the value of the information offered to the user. The user perception of the value of Gallagher's (1974) information system was used to determine the quality of information of the system. The measures that have been employed for information quality are information accuracy, information completeness, information relevance, information content needs, and information timeliness (Bailey & Pearson, 1983; Doll & Torkzadeh, 1988; Ge & Helfert, 2015; Iivari, 1987; King & Epstein, 1983; Mahmood, 1987; Miller & Doyle, 1987; Srinivasan, 1985). These five dimensions are used for the quality of information structure. According to Gürkut and Nat (2016) the Information Quality has positive effect on decision-making satisfaction. Considering this, measures mentioned above have been taken into account and the following hypothesis is stated:

Hypothesis 2: *Information Quality has significant direct effect on satisfaction.*

Information presentation (IP) is a research area that examines how information is displayed. "Many studies have focused on factors such as image formats, colors and graphics in contrast to tables, and how these factors help to decide" (Vessey, 1994). Interfaces and improperly designed screens can adversely affect users and cause unnecessary work in decision-making environments. Dimensions of informative presentation; graphics, colors, introductory style and navigational efficiency. According to Gürkut & Nat (2016) the Information Presentation has positive effect on decision-making satisfaction. Considering this, four measures mentioned above have been taken into account and the following hypothesis is stated:

Hypothesis 3: *Information Presentation has significant direct effect on satisfaction.*

Therefore, in order to identify the significant direct effect of System Quality, Information Quality, and Information Presentation on satisfaction, the conceptual model in [Figure 1](#) has been modified and Model-1 in [Figure 2](#) is created.

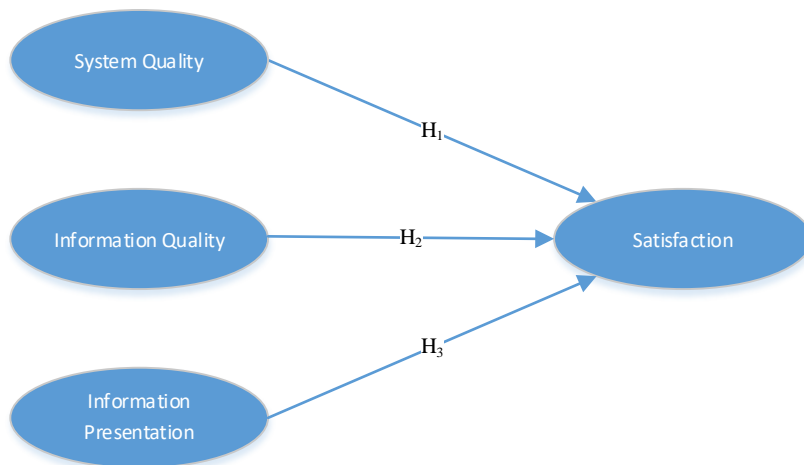


Figure 2. Model-1

Data Analysis

In this study, the factor analysis is applied to examine if all the variables are representing their corresponded variable to test our Model-1. Kaiser-Meyer-Olkin (KMO) and Bartlett's test is applied to the System Quality variables, Aprox. Chi-Square is obtained as 646.231 with the significance of 0.000 and the results show that KMO is 0.790 for the system quality. These results indicate that the data were suitable for factor analysis. Bartlett's test is also applied to the variables of the Information Quality and Information Presentation. Aprox. Chi-Square is obtained as 1313.032 with the significance of 0.000 and the results show that KMO is 0.945 for information quality variables. Aprox. Chi-Square is obtained as 436.852 with the significance of 0.000 and the results show that KMO is 0.881 for information presentation. These results show that the data is suitable for factor analysis of information quality (Bharati & Chaudhury, 2004) and information presentation group of questions. Finally, KMO and Bartlett's test is applied for variables of the decision-making and satisfaction, Aprox. Chi-Square is obtained as 0.592 with the significance of 0.000 and the results show that KMO is 0.597 for decision-making. Aprox. Chi-Square is obtained as 154.032 with the significance of 0.000 and KMO is 0.730 for the satisfaction. These results show that the data were sufficient for factor analysis of satisfaction separately.

According to factor analysis results which can be seen in Table 2, all variables are suitable to test our Model-1. The loaded value of factors is more than 0.50 and factor analysis table shows that the determinant is more than 0.00001 which signifies the absence of multicollinearity.

Table 2. Factor Analysis of Variables

Variables	Reliability Cronbach's Alpha	KMO	Bartlett's Test	
			Aprox. Chi-Square	Sig
System Quality	0.799	0.790	646.231	0.000
Information Quality	0.950	0.880	1313.032	0.000
Information Presentation	0.881	0.848	436.852	0.000
Decision-Making	0.600	0.592	228.147	0.000
Satisfaction	0.766	0.730	154.030	0.000

Nevertheless, to test the direct significance of model in overall (all variables together) regression test is applied and coefficients results in Table 3 show that only Information Quality is significant at 5% level with an impact of 0.292. System quality and information presentation are not significantly significant which means Information Quality has direct effect on satisfaction, but System Quality and Information Presentation does not have significant direct effect on satisfaction.

In light of this, researchers developed the following hypothesis to capture the full view.

Hypothesis 4: System quality has significant indirect effect on satisfaction

Hypothesis 5: Information quality has significant indirect effect on satisfaction.

Hypothesis 6: Information presentation has significant indirect effect on satisfaction.

Model-2 has been created by using decision-making as mediator variable to identify the significant indirect effect of variables to satisfaction. Effectiveness of this model on satisfaction has been analyzed by regression test and results are shown in **Table 3**.

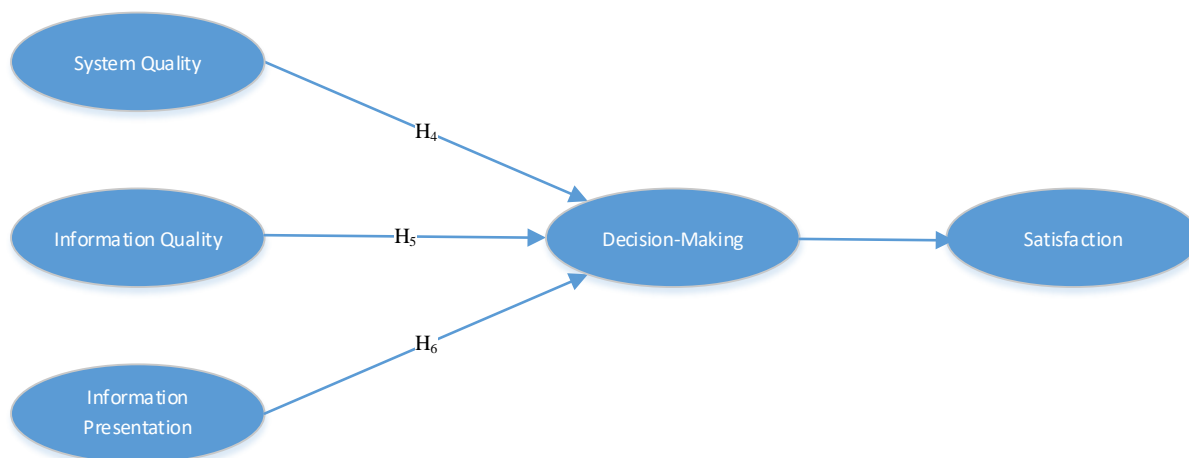


Figure 3. Model-2

In view of the hypothesis H4, H5 and H6 the Model-2 in **Figure 3** was created, and decision-making is considered as a mediator variable. Regression test results in **Table 3**, show that, with decision-making, system quality become significant at 5% level with an impact of 0.315, information quality still significant at 5% level with an impact of 0.254, and information presentation is not significant.

Table 3. Repost Regression Model

Variable	Dependent Variable: Satisfaction			
	Model-1	VIF	Model-2	VIF
Constant	1.254		-0.212	
System Quality	0.306 (0.179)	2.346	0.315 (0.158)**	2.346
Information Quality	0.292 (0.125)**	2.346	0.254 (0.110)**	2.346
Information Presentation	0.86 (0.108)	2.045	-0.018 (0.97)	2.134
Decision-Making	-	-	0,561 (0.107)*	1.130
R Square	0.323		0.479	
Adj. R Square	0.301		0.456	
Darbin Watson				

*, and **, denotes significant level at %5 and %1 respectively. The standard error values are referral in parenthesis.

EMPIRICAL FINDINGS AND DISCUSSIONS

Results of this study show that the System Quality has a significant direct effect on satisfaction (Hypothesis 1 is accepted), so increase in the System Quality guide to increase in satisfaction. Information Quality has a significant direct effect on satisfaction (Hypothesis 2 is accepted), so increase in the Information Quality guide to increase in satisfaction. These findings are in line with Tian and Xu (2017), where their results also show that system quality and information quality has significant impact on satisfaction. Information Presentation has significant direct effect on satisfaction (Hypothesis 3 is accepted), so increase in the Information Presentation guide to increase in satisfaction. These findings are in line with Gürkut and Nat's (2016) study which reports that System Quality, Information Quality and Information Presentation all together have positive effect on decision-making satisfaction. Nevertheless, it is assumed that the complete implementation of system (Model-1) makes academic and administrative staff satisfied, if all variables are working together. However, when the significant direct effect of variables tested results show that only Information Quality is significant at 5% level with an impact of 0.292, and System Quality and Information Presentation are not significant. These findings show that Information Quality has

direct impact on satisfaction, but System Quality and Information Presentation does not have direct impact on satisfaction. Information Quality includes information accuracy, information completeness, information relevance, information content needs and information timeliness which are also considered by Bharati and Chaudhury (2004) for the decision-making satisfaction on a web-based decision support system. Therefore, SIS should provide relevant, complete, timely and accurate information in order to increase user satisfaction. In hypothesis H4, H5 and H6 decision-making is considered as the mediator variable for satisfaction and Model-2 is created. And when this model is tested; the Information Quality becomes statistically significant at 5% level with an impact of 0.254, the System Quality becomes significant at 5% level with an impact of 0.315 and the Information Presentation is identified as not significant. This might show that people ask for information based on their needs and the way of their understanding. Furthermore, according to Carnoy (2004), the lack of training, lack of data analysis skills of administrators, and lack of user-friendly software for analysing test results at the school level are some of the important barriers for ICT-based management tools used in educational management. The statistical results also show that all variables support our research models. Model-1 shows that only System Quality has significant direct effect on satisfaction when there is no mediator variable. However, in Model-2 with the mediator variable decision-making; System Quality becomes significant, which shows it has indirect effectiveness between System Quality and satisfaction. With the mediator variable, Information Quality significance increases by 15% which means System Quality has effectiveness on Information Quality as well. Results for Information Presentation, which is in line with Bharati and Chaudhury (2004 and 2006) show that it is not significant on both Model-1 and Model-2, can be interpreted as the way of information is presented is not important as long as their needs are satisfied.

CONCLUSION

It is widely known that HEIs use SIS to collect, organize, and manage all student data to provide meaningful information that affect the decision-making process and day-to-day activities. Reports derived from SIS are used to support decisions of academics and administrative staff. According to the results of this study, decision-making is the most mediator variable in terms of satisfaction. Also, from findings it can be observed that the System Quality and the Information Quality affect the overall satisfaction of the SIS users. Previous research (Bharati & Chaudhury, 2004) show that Information Presentation is not important in the decision-making process. However, as Nyhan and Reifler (2015) advocates graphical representation of information reduces misperception. Today's technological advancements and people's mindsets make it possible to make decisions on the basis of visual (a clear and pictorial) presentation. Users are interested in finding up-to-date and detailed information to make an effective decision. This study demonstrates that the users' preferences may differ on the visualization and presentation of data from their preference of information, depending on the satisfaction they have, either directly or indirectly.

This paper is expected to guide a large frame of research which is required to improve SIS for futuristic uses. Also, it will help SIS developers to design a system in light of users' needs. As a future work, this study will be extended by considering different HEIs and various administrative and academic staff who use SIS for various reasons.

REFERENCES

- Abubakar, A. M., Elrehail, H., Alatailat, M., & Elçi, A. (2017). Knowledge management, decision-making style and organizational performance. *Journal of Innovation*. Advance online publication. doi:10.1016/j.jik.2017.07.003
- Alzahrani, A., Mahmud, I., Ramayah, T., Alfarraj, O., & Alalwan, N. (2017). Modelling digital library success using the DeLone and McLean information system success model. *Journal of Librarianship and Information Science*. Advance online publication. doi:10.1177/0961000617726123
- Au, N., Ngai, E. W., & Chengb, T. (2002). A critical review of end-user information system satisfaction. *The International Journal of Management Science*, 30(6), 451-478. doi:10.1016/S0305-0483(02)00054-3
- Bailey, J. E., & Pearson, S. W. (1983). Development of a toll for measuring and analyzing user satisfaction. *Management Science*, 29(5), 530-545.
- Bayangan-Cosidon, E. (2016). Student Information System for Kalinga State University-Rizal Campus. *International Journal of Management and Commerce Innovations*, 4(1), 330-335.
- Begam, A. R. (2015). Measuring the Efficiency in Decision Making of Managers of Service Sector Organizations in Sri Lanka. *12th International Conference on Business Management (ICBM) 2015*. doi:10.2139/ssrn.2706295
- Belardo, S., Karwan, K. R., & Wallace, W. A. (1982). DSS component design through field experimentation: An application to emergency management. *Proceedings of the Third International Conference on Information Systems*, 93-108.
- Bharati, P., & Chaudhury, A. (2004). An empirical investigation of decision-making satisfaction in web-based decision support systems. *Decision Support Systems*, 37(2), 187-197. doi:10.1016/S0167-9236(03)00006-X

- Bharati, P., & Chaudhury, A. (2006). Product Customization on the Web: An Empirical Study of Factors Impacting Choiceboard User Satisfaction. *Information Resources Management Journal*, 19(2), 69-81. doi:10.4018/irmj.2006040105
- Carnoy, M. (2004). ICT in education: Possibilities and challenges. *Lección inaugural del curso académico*. Barcelona: UOC.
- Chervany, N. L., Dickson, G. W., & Kozar, K. (1972). *An experimental gaming framework for investigating the influence of management information systems on decision effectiveness*. MISRC Working Paper No. 7112, Management Information Systems Research Center, University of Minnesota, Minneapolis, MN.
- DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research*, 3(1), 6095.
- DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean Model of information system success: A ten year update. *Journal of Management Information System*, 19(9), 9-30. doi:10.1080/07421222.2003.11045748
- Doll, J., & Torkzadeh, G. (1988). The measurement of end-user computing satisfaction. *MIS Quarterly*, 12(2), 259-274. doi:10.2307/248851
- Gallagher, C. A. (1974). Perceptions of the value of a management information system. *Academy of Management Journal*, 17(1), 46-55. doi:10.2307/254770
- Ge, M., & Helfert, M. (2015, December). Impact of Information Quality on Supply Chain Decisions. *Journal of Computer Information Systems*, 53(4), 59-67. doi:10.1080/08874417.2013.11645651
- Gelderman, M. (1998). The relation between user satisfaction, usage of information systems and performance. *Information & Management*, 34(1), 11-18. doi:10.1016/S0378-7206(98)00044-5
- Goldstein, P. J., & Katz, R. N. (2005). Academic analytics: The uses of management information and technology in higher education. *Educause*, 8, 1-12.
- Goslar, M. D., Green, G. I., & Hughes, T. H. (1986). Applications and implementation decision support systems: an empirical assessment for decision making. *Decision Sciences*, 17(1), 79-91. doi:10.1111/j.1540-5915.1986.tb00214.x
- Gueutal, H. G., Surprenant, N., & Bubeck, K. (1984, December). Effectively Utilizing Computer-Aided Design Technology: The Role of Individual Difference Variables. In *ICIS* (p. 13).
- Gürkut, C., & Nat, M. (2016, October). Student Information System satisfaction in Higher Education Institutions. In *HONET-ICT, 2016* (pp. 113-117). IEEE. doi:10.1109/HONET.2016.7753432
- Huang, K. T., Lee, Y. W., & Wang, R. Y. (1998). *Quality information and knowledge*. Prentice Hall PTR.
- Iivari, J. (1987, December). User information satisfaction (UIS) reconsidered: an information system as the antecedent of UIS. *Eighth International Conference on Information Systems* (pp. 57-73). Pittsburgh, Pennsylvania.
- King, W. R., & Epstein, B. J. (1983). Assessing information system value: An experimental study. *Decision Sciences*, 14(1), 34-45. doi:10.1111/j.1540-5915.1983.tb00167.x
- Laudon, K. C. (1986). Data quality and due process in large interorganizational record systems. *Communications of the ACM*, 29(1), 4-11. doi:10.1145/5465.5466
- Mahmood, M. A. (1987). System development methods-a comparative investigation. *MIS Quarterly*, 293-311. doi:10.2307/248674
- Miller, J., & Doyle, B. A. (1987). Measuring the effectiveness of computer-based information systems in the financial services sector. *MIS quarterly*, 107-124. doi:10.2307/248832
- Mir, K., & Mehmood, A. (2016). Examining the Success Factors of Online Student Support System at AIOU. *Pan-Commonwealth Forum 8 (PCF8)*, KLCC, Malaysia.
- Negash, S. (2004). Business intelligence. *The communications of the Association for Information Systems*, 13(1), 54.
- Nyhan, B., Parker-Stephen, E., Peffley, M., Piston, S., Reifler, J., Sood, G., Thornton, J., Waldman, P., & Wolak, J. (2015). The roles of information deficits and identity threat in the prevalence of misperceptions.
- Padayachee, I., Kotze, P., & van Der Merwe, A. (2010). ISO 9126 external systems quality characteristics, sub-characteristics and domain specific criteria for evaluating e-Learning systems. *The Southern African Computer Lecturers' Association, University of Pretoria, South Africa*.
- Petter, S., DeLone, W., & McLean, E. R. (2013). Information systems success: The quest for the independent variables. *Journal of Management Information Systems*, 29(4), 7-62.
- Price, R., & Shanks, G. (2005). A semiotic information quality framework: development and comparative analysis. *Journal of Information Technology*, 20(2), 88-102.

- Rezaei, H., Karimi, B., & Hosseini, S. J. (2016). Effect of cloud computing systems in terms of service quality of knowledge management systems. *Lecture Notes on Software Engineering*, 4(1), 73.
- Sherifi, I. (2015). Impact of information systems in satisfying students of the university: Case study from Epoka University. *European Journal of Business and Social Sciences*, 167-175.
- Srinivasan, A. (1985). Alternative measures of system effectiveness: associations and implications. *MIS quarterly*, 243-253. doi:10.2307/248951.
- Swanson, E. B. (1985). A note on information attributes. *Journal of Management Information Systems*, 2(3), 87-91. doi:10.1080/07421222.1985.11517739
- Tian, M., & Xu, G. (2017, April). Exploring the determinants of users' satisfaction of WeChat official accounts. In *Information Management (ICIM), 2017 3rd International Conference on* (pp. 362-366). IEEE. doi:10.1109/INFOMAN.2017.7950409
- Vessey, I. (1994). The effect of information presentation on decision making: A cost-benefit analysis. *Information & Management*, 27(2), 103-119. doi:10.1016/0378-7206(94)90010-8
- Wang, R. Y., & Strong, D. M. (1996). Beyond accuracy: What data quality means to data consumers. *Journal of management information systems*, 12(4), 5-33. doi:10.1080/07421222.1996.11518099
- Zmud, R. W., Blocher, E., & Moffle, R. P. (1983, December). The Impact of Color Graphic Report Formats on Decision Performance and Learning. In *ICIS* (p. 3).

<http://www.ejmste.com>