The Measurement of Factors Influencing User Satisfaction in a FLMS

M.Haghshenas[1], M.Nassiri Yar[2], R.Shahbazi[3], A.Sadeghzadeh[4]

PhD Student, Dept of Media Management, University of Tehran, Iran[1]

M.Sc. Graduate, Dept of IT Management, University of Tehran, Iran[2]

M.Sc. Student, Dept of IT Management, Alzahra University, Tehran, Iran[3]

M.Sc. Graduate, Dept of Electronics & Telecoms Engineering, University of Bradford, UK[4]

ABSTRACT: User satisfaction in computer based information systems is very important for developers and administrators. The success of computer based systems is generally associated with user satisfaction. Delivery of information and learning materials in e-learning systems are heavily based on usage of information technology and services. Considering e-learning systems as a part of information based systems, studies have taken place to measure user satisfaction.

  The satisfaction models determine the success metrics for e-learning user satisfaction. Those models are considered as a function of interaction between users and system or provided services via these systems. End results and outcomes fitting to user expectations and requirements are defined as the success criteria. Therefore there is an emerging need for investigating the factors affecting users' performance in e-learning systems. Satisfaction is one of these factors that affect usability of the system which also directly affects users' performance. The present paper examines key factor perceptions of choosing a Flash Learning Management System (FLMS) and their impact on user satisfaction as an overall strategy to meet the challenges faced by authoring tools in a globalized education market. FLMS is a software platform for e-learning that is designed to create basic e-learning courses and support a variety of media and file types, such as text, graphics, video, and audio. Most include assessment and test creation features. The analysis is focused on an evaluation of factors of choice considered in choosing FLMS as a study destination and the importance of these factors in influencing user satisfaction. The results showed that FLMS users' satisfaction was positive and significantly affected by main factors in this system.

KEYWORDS: FLMS, e-learning, Authoring Tools, User Satisfaction, Online Learning

I. INTRODUCTION

   In the case information technology systems, satisfaction is an outcome of a function or an interaction occurring when the results fit the expectations of individuals; or is a function of how well a product or event fits their requirement; or solutions within an acceptable range. Satisfaction also can be also defined as "being successful in the designated tasks". User satisfaction also has other dimensions like "output quality, man machine interface, staff and services, and various user constructs such as feelings of participation and understanding" [1].

   Educational effectiveness and learning are national issues, and online education has become a major topic in the last decade. Based on data from 2,500 colleges and universities, the annual Sloan Report describes recent online enrollment in significant numbers: Over 4.6 million students, mostly at the under graduate level, were enrolled on at least one online course in 2008. As a percentage of total enrollments, online enrollment has increased from 9.6 percent in 2002 to 25.3 percent in 2008 [3].

   Delivery of the information and learning materials in e -learning systems are a heavily based on usage of information technology and services. Considering e-learning systems as a part of information a system there are also studies to measure and models the user satisfactions for e-learning systems [1].

Constructing theory and the measurement methods for user satisfaction is investigated by researchers and these efforts resulted in some models showing the components of users' satisfaction [6, 7].

This research serves three purposes. First, the aim is to understand the user' needs and expectations, their perception of the created e-learning content with FLMS, and the standards of the construction of e-content. Then it is intended to calculate the satisfaction index and identify the users' changing attitudes towards e-learning courseware. Finally, based on the measurement of Satisfaction Index, different content can be compared with each other to improve their quality.

II. RELATED WORK

In the review of literature for the current study, it was noted that few studies on student satisfaction define satisfaction in learning systems. The Sloan Consortium defines student satisfaction as, "Stu-dents are successful in the learning and are pleased with their experience". A similar definition is given by Sweeney and Ingram (2001). They define satisfaction as, "the perception of enjoyment and accomplishment in the learning environment." Both definitions focus on accomplishment and success in learning, and pleasure and enjoyment with the experience. Thurmond, Wambach, Connors, and Frey (2002) describe student satisfaction as "a concept that reflects outcomes and reciprocity that occur between students and an instructor" [4].

Students spend considerable time and money, as well as exerting substantial effort in obtaining a quality education and should perceive their post-secondary educational experiences as being of high value. Student satisfaction is important because it influences the student's level of motivation, which is an important psychological factor in student success. Meeting and exceeding the students' expectation not only satisfies students but also lead them to become advocates who provide a free promotion source for the university [4].

Sinclaire (2011) reflects learners' evaluation of the quality of all aspects of the educational program. And there is evidence that student satisfaction is positively related to retention and a decision to take one or more additional courses. Lastly, student satisfaction is important because satisfied students represent a public relations asset for a college or university. If students are viewed as customers of college education, their satisfaction is important to recruitment efforts. Therefore, there is a need for more understanding of factors that affect student satisfaction with blended learning [4].

Chun-Chun Lin a, Hsueh-Ying Wu b, Yong-Fu Chang (2011), in their survey about The critical factors impact on online customer satisfaction reported that Information quality, System quality and Service quality have a positive influence on online user satisfaction. The online system managers should develop not only good information system features that include information quality, system quality, and service quality, but also marketing features consisting of product quality, delivery quality, and perceived price, which can influence user satisfaction positively.

Matsatsinis, Grigoroudis and Delias proposed a multi-criteria model to evaluate users' satisfaction on e-learning program using linear programming to measure a satisfaction index and to compute criteria weights. In another study researchers used Kano two-way quality model to measure e-learning system satisfaction of users. Additionally DeLone and Mclean proposed a model for the information systems in order to understand the system success relating to user satisfaction with the components systems quality, information quality, use, user satisfaction and net benefits. Lee-Post interpreted the success model of DeLone and Mclean was into an e-learning success model stating the related metrics of the model [1].

In her recent study Da shi used the ACSI for the measurement of the CSI of e-learning courseware. ACSI is based on a model that links customer expectations, perceived quality, and perceived value to customer satisfaction. Customer Satisfaction Index (CSI) is a quantitative measuring tool. In the early 1980s', some developed countries had already began to adopt it for their national economy or industry measurement. Sweden is the first country which built its national CSI system in 1989. In 1994, the U.S. built its American Customer Satisfaction Index followed by Germany, Canada, Japan, Korea, Brazil, Argentina and Switzerland. It is an important tool providing benchmarking for companies, industry trade associations, and government agencies. Benchmarking of CSI is the process of finding a

company that is superior in a particular area, studying what it does, and gathering ideas for improving your own operations in that area [2].

III. FACTORS INFLUENCING USER SATISFACTION

The purpose of introducing factors influencing user satisfaction into e-learning is to measure the users' attitudes toward e-learning and the performance of e-learning. Because the quality of e-learning depends on the user' satisfaction, the e-learning institutions should keep track on these factors, release their factors results publicly, and finally improve the quality of education services. Even though the call center and online question-answering are important in e-learning, the courseware plays a key role in the quality of e-services of e-learning.

This Article will measure the factors influencing user satisfaction of constructed electronic content with the flash learning management system. Before the measurement of factors influencing created e-learning courseware with FLMS, it is necessary to identify the purposes of this system [2].

The most important requirements in learning and e-learning approaches are tools used to design and codify e-learning contents. Sometimes, these tools are placed in a learning content management system and create a proper course for e-learning; so there is a need for an authoring tool to facilitate such work. The definition of an authoring tool is "a program that helps you write using hypertext or multimedia applications and enable you to create a final application merely by linking together objects, such as a paragraph of text, an illustration, or a song. By defining the objects' relationships to each other, and by sequencing them in an appropriate order, authors (those who use authoring tools) can produce appropriate and useful graphics applications.

The name FLMS of the software platform for e-content construction is an acronym of flash learning management system. The purpose of the development of this system is to allow creation of training courses for learning, to provide access to them anytime, anywhere via internet and to support professionals. To prepare this software, the end user requirements were taken into account, and then dominant attributes to compete with similar software and time, financial and technical restrictions and finally the fundamental features were recognized.

Some of the influential features in this software are as follows: to add signs, notes, to zoom in pages, to complement the book contents, to create an interactive environment, reportage of the user activities, creating username, searching abilities and using the standards of e-learning [1,5].

IV. METHODOLOGY

Several factors influence user satisfaction in flash learning management system. Bollinger and Martindale (2004) have identified three key factors central to student satisfaction: instructor, technology, and interactivity. Abou Najj, Nachouki and Ankit (2012) have identified other factors such as course management, instruction, courses, culture, demographic factor and gender, which also contribute toward students' satisfaction in the blended- learning environment.

This Article will take the below model as its model to measure the factors influencing user satisfaction in flash learning management system.

User satisfaction is considered an important factor in measuring the quality and performance of FLMS. It results from a combination of factors. In this study a model is proposed by the aggregation of these factors into four groups:
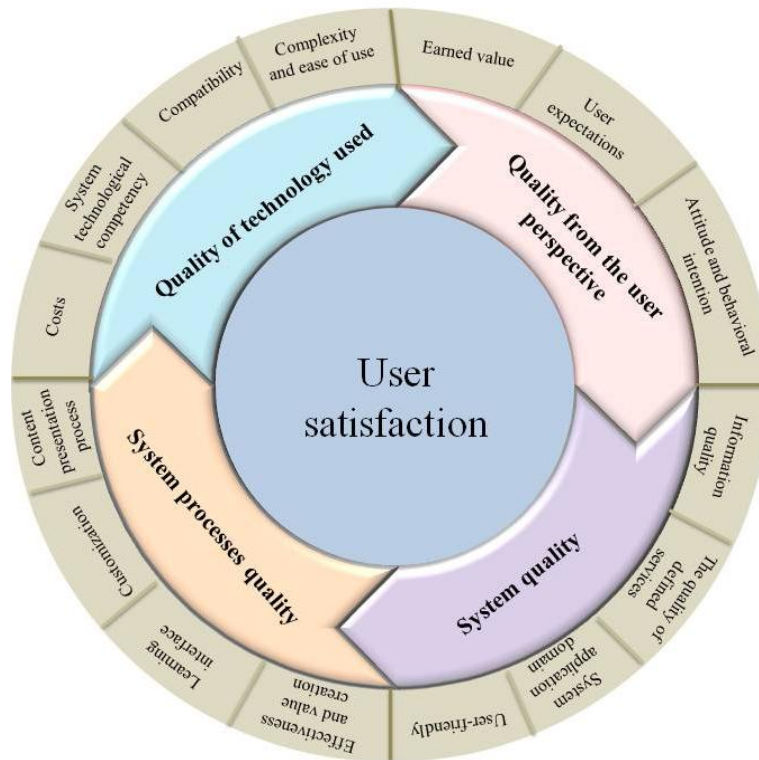
Fig. 2. Factors influencing User satisfaction in flash learning management system

A. *System quality*

- **User-friendly**: easy to use or learn to use
- **System application domain**: the success and acceptance of the above system usability and quality is essential. The scope of the system, in improving productivity, return on investment and the cost of its development is effective.
- **The quality of defined services**: today, services are considered the heart of creating value. Services are the results of customer needs. The quality of services is divided into 3 categories as described below:
  - Tangibility: the appearance of the facilities, equipment and communication tools
  - Reliability: ability to perform the promised services reliably and accurately
  - Accountability: desire to help customers and present services promptly.
- **Information quality**: indentifying user views on the quality of information is vital and extremely effective in developing the system. Problems such as poor data quality and not matching with user needs leads to the system being reviewed and revised.

B. *Quality from the user perspective*

- **User expectations**: assessing user expectations from the system leads to a more creative and productive usage. Focus on some appropriate changes will lead to improved user experience which in turn will lead to a more successful system.
- **Attitude and behavioral intention**: represents the intensity of intention and users willingness to use the system. This index is based on criteria including system knowledge; desire to use the system, and type and user perspective to use the system in the future.

- **Earned value**: trust is one the main factors in insuring the growth and development of the system. Trust is a foundation in communications and information systems. It is in fact, a valuable capital for any business which reduces risks, causes satisfaction and creates long term commitment from the users.

C. *Quality of technology used*

- **Complexity and ease of use**: here, complexity refers to the difficulty in using the system which influences the level of system usage. This criterion is measured by factors such as level of understanding of the system.
- **Compatibility**: compatibility should also be considered when designing the system. User lifestyle type, appropriate governance, having the required knowledge to use the system is assessed here.
- **System technological competency**: also referred to as updated technology assess the level of modern technologies used in the system
- **Costs**: one of the most important deciding elements in accepting a system. Therefore, the cheaper the system, the more likely it will be accepted.

D. *System processes quality*

- **Effectiveness and value creation**: value creation processes make a significant difference on user awareness, understanding, persuasion and level of system usage.
- **Learning interface**: a leaning environment should encourage users to learn more. This attraction could be presented as a user friendly and always accessible system.
- **Customization**: the system will always become more popular if it can be customized according to user preferences.
- **Content presentation process**: content should be presented in a way to intrigue users. Content simplicity will enable easier understanding which will in turn cause the popular usage of the system. The quality of content presented should also be taken into account.

V. QUESTIONNAIRE DESIGN

The key point of measuring user satisfaction of this system is to design a questionnaire (benchmarking) based on the above model. Afterwards, the questionnaire will be used to collect data. The measuring indicator of user satisfaction index is usually divided into several sub-indicators. Each sub-indicator is derived from its upper indicator.

This Article comprises 4 levels of indicators, with one indicator in level one which is represented as λx, 4 indicators in level two and 15 indicators in level three and 3 indicators in level four which are represented as λxy and λxyz and λxyzt respectively. User satisfaction is the indicators in level one. Based on this indicator of level one, this thesis develops indicators of level two and indicators of level three and level four. The questions in the questionnaire are actually these indicators of level three and level four.

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 2, February 2015

TABLE I. MEASURING INDEX SYSTEM

Level one	Level two	Level three and level four
User satisfaction (λ_1)	Quality from the user perspective (λ_{11})	Earned value (λ_{111}) User expectations (λ_{112}) Attitude and behavioral intention (λ_{113})
	Quality of technology used (λ_{12})	Complexity and ease of use (λ_{121}) Compatibility (λ_{122}) System technological competency (λ_{123}) Cost (λ_{124})
	System processes quality (λ_{13})	Effectiveness and value creation (λ_{131}) Learning interface (λ_{132}) Content presentation process (λ_{133}) Customization (λ_{134})
	System quality (λ_{14})	Information quality (λ_{141})
		The quality of defined services (λ_{142})
		Tangibility (λ_{1421}) Reliability (λ_{1422}) Accountability (λ_{1423})
		System application domain (λ_{143}) User-friendly (λ_{144})

VI. SCALING

Measurement of factors influencing user satisfaction in FLMS is a quantitative research, which is based on the statistical analysis, and targets at reflecting the interviewees' attitudes. Therefore, quantifying and scaling the questionnaire will be the next step. From the statistical perspective, the more points the scale has, the more accurate the result will be. If the scaling-point is more than 4points, the answer for the questions will obey normal distribution, and those data could be used for parametric tests. But if the scale of the questionnaire takes more than 4points, the users may feel bored when they answer the questions. That will have negative influence on the reliability and validity of the questionnaire. The scaling this thesis takes is as following:

TABLE ll. THE S CALE OF INDICATORS

Scale	Excellent	Good	OK	Bad
	10	8	6	4

If the interviewee strongly agrees with the question, he or she will mark excellent which stands for 10 points. On the other extreme end, the interviewee strongly disagrees with the question, he or she will mark worst which stands for 4 points. The points reflect his or her attitude toward the question.

VII. WEIGHING

- Formula

Base on the sub-indicator provided in table I, this thesis takes the following formula to analyze the data collected.

$S = \lambda_1 S_a$

$S = \lambda_1 (\lambda_{11} S_{a11} + \lambda_{12} S_{a12} + \lambda_{13} S_{a13} + \lambda_{14} S_{a14})$

$= \lambda_1 [\lambda_{11} (\lambda_{111} S_{a111} + \lambda_{112} S_{a112} + \lambda_{113} S_{a113}) + \lambda_{12} (\lambda_{121} S_{a121} + \lambda_{112} S_{a122} + \lambda_{123} S_{a123} + \lambda_{124} S_{a124}) + \lambda_{13} (\lambda_{131} S_{a131} + \lambda_{132} S_{a132} + \lambda_{133} S_{a133} + \lambda_{134} S_{a134}) + \lambda_{14} [(\lambda_{141} S_{a141} + \lambda_{142} (\lambda_{1421} S_{a1421} + \lambda_{1422} S_{a1422} + \lambda_{1423} S_{a1423}) + \lambda_{143} S_{a143} + \lambda_{144} S_{a144}]]$

eq. (1)

In formula (1), S is the final result of factors influencing User satisfaction in e-learning courseware of FLMS. λn is the weight of each question; Sx represents the mean of each question. Sx times its weight, and then they were sum up.

- Calculation of weight λ and S

To calculate S, users that used the FLMS were taken into account, and then satisfaction indexes were used based on LIKERT scale to measure satisfaction levels. Results were divided into three rows and S shows user satisfaction level on each row. Then, to calculate λ, the Delphi Principle was adopted to identify the weight. For example, when calculating the value of $\lambda 11$ to $\lambda 14$, the experts were asked to rank the λ in terms of their importance. The most important was ranked 1, the second was ranked 2, and the rest may be deduced by analogy. If the number of the experts is n, and each of them has already ranked the importance, table III can help to calculate all the weight.

TABLE III. THE IMPORTANCE OF FACTORS

Experts	Quality from the user perspective	Quality of technology used	System processes quality	System quality
Expert 1	a_1	b_1	c_1	d_1
Expert 2	a_2	b_2	c_2	d_2
….	….	….	….	….
Expert n	a_n	b_n	c_n	d_n
Total	Σa	Σb	Σc	Σd
Mean	$\Sigma a/n$	$\Sigma b/n$	$\Sigma c/n$	$\Sigma d/n$
Reciprocal				
ΣM	$\Sigma M = M_a + M_b + M_c + M_d$			
λ	$\lambda a = Ma/\Sigma M$	$\lambda b = Mb/\Sigma M$	$\lambda c = Mc/\Sigma M$	$\lambda d = Md/\Sigma M$

VIII. SAMPLING

This thesis investigated 100 FLMS users randomly. These users are home based. They have regular online access, so they usually learn the courses in their spare time. Therefore, the courseware plays an important role in their e-learning. Their learning depends on frequent courseware use. Therefore, their attitude and evaluation toward courseware could be true and trusted.

In order to guarantee the validity and reliability of measurements, 5 experts were invited to rank and mark. All of these experts came from top e-learning education institutes in Iran. The experts ranked all of the questions. Based on the principles provided in table III, the following results were obtained as shown in table IV.

IX. RESULT AND CONCLUSIONS

After the data collection and calculation, the final result of user satisfaction of e-learning courseware is 7.85. The results of each of the indicators are as following.

TABLE IV. SCORE OF EACH INDICATOR

Level one	Level two	Level three and level four
$\lambda_1 = 0.92$ $S_a = 8.54$	$\lambda_{11} = 0.55$ $S_{a11} = 9.74$	$\lambda_{111} = 0.34$, $S_{a111} = 10$ $\lambda_{112} = 0.37$, $S_{a112} = 9.46$ $\lambda_{113} = 0.29$, $S_{a113} = 9.81$
	$\lambda_{12} = 0.04$ $S_{a12} = 7.43$	$\lambda_{121} = 0.16$, $S_{a121} = 7.69$ $\lambda_{122} = 0.19$, $S_{a122} = 3.15$ $\lambda_{123} = 0.06$, $S_{a123} = 2.31$ $\lambda_{124} = 0.59$, $S_{a124} = 9.62$

	$\lambda_{13} = 0.3$ $S_{a13} = 6.50$	$\lambda_{131} = 0.2$, $S_{a131} = 6.34$ $\lambda_{132} = 0.08$, $S_{a132} = 4.26$ $\lambda_{133} = 0.33$, $S_{a133} = 6.17$ $\lambda_{134} = 0.39$, $S_{a134} = 7.33$
	$\lambda_{14} = 0.11$ $S_{a14} = 8.48$	$\lambda_{141} = 0.34$, $S_{a141} = 9.1$
		$\lambda_{142} = 0.18$, $S_{a142} = 9.59$
		$\lambda_{1421} = 0.14$, $S_{a1421} = 8.61$ $\lambda_{1422} = 0.59$, $S_{a1422} = 9.97$ $\lambda_{1423} = 0.27$, $S_{a1423} = 9.25$
		$\lambda_{143} = 0.17$, $S_{a143} = 5.19$ $\lambda_{144} = 0.31$, $S_{a144} = 8.98$

Results indicate that the highest user satisfaction mark from FLMS based on the Quality from user perspective (λ_{11}) was 9.74 whereas other indexes; Quality of technology used (λ_{12}), 'System processes quality (λ_{13}) and System quality (λ_{14}) respectively attained 7,43, 6.50 and 8.48. Finally, total satisfaction mark gained from user satisfaction in using FLMS was 7.85. Therefore, users' quality requirements must be improved by improving these indexes. Also, due to great influence the System quality and Quality of technology used indexes have on system costs and applications, special attention must be paid to them to enhance overall satisfaction.

REFERENCES

1. Ilker Yengina, Adem Karahocab, "E-learning Success Model for Instructors' Satisfactions in Perspective of Interaction and Usability Outcomes", World Conference on Information Technology, Volume 3, pp 1396–1403, 2011.
2. Da Shi, "The measurement of the CSI of e-learning Courseware", International Conference on E-Business and E-Government, pp 5586 – 5589, 2010.
3. Jollean K. Sinclaire, "Student satisfaction with online learning: Lessons from organizational behavior", Research in Higher Education Journal, pp1-20, 2011.
4. Mahmoud Abou Naaj, Mirna Nachouki, and Ahmed Ankit, "Evaluating Student Satisfaction with Blended Learning in a Gender-Segregated Environment", Journal of Information Technology Education: Research Volume 11, 2012.
5. M.Haghshenas, M.Khademi, "Evaluation of Flash Learning Management System", (IJITR) International Journal of Innovative Technology and Research Volume No. 1, Issue No. 3, pp201 – 204, April - May 2013.
6. Khalifa, M. & Vanessa, L.State of research on information system satisfaction.Journal of Information Technology Theory and Application, (JITTA), 5:4, 2004.
7. Applegate, R. Models of User Satisfaction: Understanding False Positives, online librarian at St. Scholastica, Duluth, Minnesota RQ 32.4, pp 525-39, 1993.

BIOGRAPHY

Maryam Haghshenas is born in 1985 and has earned B.Sc. degree in Computer Hardware engineering from Islamic Azad University, South Tehran branch, Tehran, Iran in 2007. She then received a M.Sc. degree in IT management at Islamic Azad University, Science & Research branch, Tehran, Iran in 2011 and is currently a PhD student of media management in university of Tehran in Iran. She is IT expert in MAGFA ITDC as an affiliate of the Industrial Development and Renovation Organization of Iran. She has more than 60 papers presented at national and international conferences and has been published in prestigious journals. Ms. Haghshenas is a member of Young Researchers Club at Islamic Azad University, Science &Research Branch in Iran.

Mojtaba Nassiri Yar was born in Tehran in 1983. He graduated with a B.Sc. degree in 2006 in industrial management from the University of Tehran. His master's degree was completed in IT management in 2009. He is IT expert in MAGFA ITDC. He has published three papers in the IT management field and has written a book on IT service oriented and knowledge based projects management. He currently manages data center projects at national level and teaches IT engineering management courses at Payam Noor University, Tehran.

Roghayeh Shahbazi was born in 1987 and has graduated with a B.Sc. degree in Applied Mathematics from Arak University, Iran in 2010. She then graduated with a M.Sc. degree in IT management at Alzahra University, Tehran, Iran in 2014. Her M.Sc. project was about the adoption of cloud computing and relevant investment returns. She is an IT expert in MAGFA ITDC. Activity fields of MAGFA include the implementation of national projects in BI and KM fields. In addition, she has over 3 years experience in IT consultancy.

Abouzar Sadeghzadeh was born in 1985 and graduated with a B.Sc. honors degree in electronics and telecommunications engineering from the University of Bradford, UK in 2006. He then completed a M.Sc. degree in radio frequency and communications engineering the following year from the same university. His M.Sc. thesis is titled "Mobile Information System" which concerns mobile technology and its uses. Upon completing his studies he worked for Huawei Technologies as a project manager before joining various other companies in IT fields namely IT consultancy in MAGFA ITDC (Information Technology Development Center).