

The Importance of Website Innovation on Students' Satisfaction of University Websites

¹Ali Rezaeean, ¹Sona Bairamzadeh and ²Alireza Bolhari

School of Management, Shahid Beheshti University, Tehran, Iran

²Young Researchers Club, West Tehran Branch, Islamic Azad University, Tehran, Iran

Abstract: In today's highly developed academic societies, universities have recognized the importance of having websites to be able to benefit from appropriate academic communications. In addition, students' satisfaction from a university website shows to some extent university's web success. The purpose of this study is to investigate the importance of university's website innovation and to propose a satisfaction model. The survey was conducted among 270 university students. Results of the empirical analysis revealed that greater innovation has a significant impact on users' trust and satisfaction. More than that, innovation is the most important factor influencing the satisfaction. Also students' trust increases as they perceive the system is usable. Finally, trust has a positive influence on satisfaction.

Key words: University website • Satisfaction • Innovation • Usability • Trust • Perceived usefulness

INTRODUCTION

Website is a primary user interface for net-enabled businesses [1], information provision and promotional activities [2-4]. While websites might appear cold and distant compared to traditional methods, they also offer novel and interesting possibilities. Because of these facts and the relative lack of literature on the issues involved, there have been research projects entered on analysis of the consumer's perceptions of these establishments [1, 5] and on studying the influence of the website attributes that affect the conduct of the potential buyer [6-8].

In order to decrease the usability difficulties of university websites, the year 2000 observed many schools switching to a new design framework. The new scheme classified resources and information for different groups according to their specific roles and interests such as prospective students and current students [9]. According to Gleason [10], the most powerful campus portal is the enterprise information portal that "provides a single, intuitive and personalized gateway to access and to integrate campus-specific information and applications with unstructured data from on and off campus."

This study proposes a model to investigate the students' satisfaction of university websites. A

preliminary version of the model was proposed by authors [11]. The proposed model includes website innovation, usability, perceived usefulness, trust and satisfaction. Some of the model's constructs are described as follow.

Usability: Usability is defined as the extent to which a system supports its users in completing their tasks efficiently, effectively and satisfactorily. Usability may also include an aesthetic component. On the web, usability extends to factors such as speed, clarity, intuitiveness of navigation, ease of use, readability and personalization [9].

For Nielsen [12], website usability involves the ease with which the user can learn to manage the system and memorize the basic functions, the efficiency of design of the site, the degree of error avoidance and the general satisfaction of the user. More recently, it has been suggested that website usability "is a quality attribute that assesses how easy user interfaces are to use" [13].

In general terms, usability considers the following factors [14]:

- The ease of understanding the structure of a system, its functions, interface and contents observed by the user.

¹useit.com/alertbox/20030825.html

Corresponding Author: Alireza Bolhari, Young Researchers Club, West Tehran Branch, Islamic Azad University, Tehran, Iran
Tel: +98-9122170799.

- Simplicity of use of the website in its initial stages.
- The speed with which the users can find the item they are looking for.
- The perceived ease of site navigation in terms of the time required and action necessary to obtain the desired results.
- The ability of the user to control what they are doing and where they are, at any given moment.

Park and Lim [15] state that usability of interfaces can be seen as one of the factors that influences end-user satisfaction.

Website Innovation: New technologies coupled with various application tools make websites full of innovations and attractions. It has been witnessed that lots of websites such as Google, Facebook and Youtube hit the top of success and new web-technology makes them more intelligent, much easier to use and interactive [16].

There are a few academic researches on innovativeness of websites. Loiacono *et al.* [17] identify innovativeness of websites as a construct of website quality measurement in marketing researches and defines innovativeness of a website as “the creativity and uniqueness of a website”. They also suggest that in order to increase website’s quality, one can “use a creative and differentiating approach to the website” in the field of innovativeness.

Usefulness: Mawhinney and Lederer [18] state that user satisfaction is strongly related to the perceived usefulness of the information system. Calisir and Calisir [19] investigated the impact of different factors on

end-users’ satisfaction in ERP systems. They state that the most noticeable aspect of their model is that both perceived usefulness and learnability are determinants of end-user satisfaction with ERP systems. Among them, perceived usefulness has the strongest impact on end-user satisfaction.

MATERIALS AND METHODS

The proposed model is shown in Figure 1. The hypotheses of the research are as follow:

Hypothesis 1: Website innovation has a positive impact on the satisfaction.

Hypothesis 2: Website innovation has a positive impact on the trust.

Hypothesis 3: Website innovation has a positive impact on the perceived usefulness.

Hypothesis 4: Usability has a negative impact on the satisfaction.

Hypothesis 5: Usability has a positive impact on the trust.

Hypothesis 6: Usability has a positive impact on the perceived usefulness.

Hypothesis 7: Perceived usefulness has a positive impact on the trust.

Hypothesis 8: Trust has a positive impact on the satisfaction.

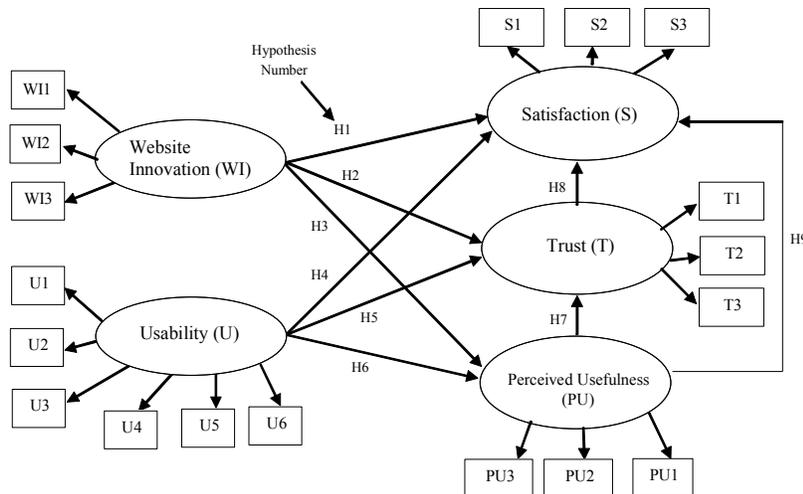


Fig. 1: The Conceptual Model

Table 1: Profile of the respondents

Characteristics	Frequency	%
Gender		
Female	114.0	42.2
Male	156.0	57.8
Age		
18-21	48.0	17.7
22-25	148.0	54.8
26-29	66.0	24.5
30-35	8.0	3.0
University Majors		
Science	22.2	60.0
Engineering	50.4	136.0
Medicine	8.2	22.0
Humanism	12.2	33.0
Art	7.0	19.0
Website Usage Experience (Year)		
less than 1	19.0	7.0
1-3	188.0	69.7
More than 3	63.0	23.3
Total	270.0	100.0

Table 2: Statistics of model fit

Fit indices	Recommended value	Results in this study
χ^2/df	≤ 3.00	2.800
Root Mean Squared Error of Approximation (RMSEA)	≤ 0.08	0.082
Adjusted Goodness of Fit Index (AGFI)	≥ 0.80	0.830
Normed Fit Index (NFI)	≥ 0.9	0.900
Comparative Fit Index (CFI)	≥ 0.9	0.950
Goodness of Fit Index (GFI)	≥ 0.9	0.890

Table 3: The results of construct validity through confirmatory factor analysis

	Component				
	Website Innovation	Usability	Perceived Usefulness	Trust	Satisfaction
Website Innovation1	0.67	0.22	0.18	0.15	0.2
Website Innovation2	0.69	0.13	0.27	0.31	0.26
Website Innovation3	0.69	0.16	0.24	0.26	0.29
Usability1	0.25	0.83	0.15	0.06	0.06
Usability2	0.19	0.89	0.1	0.12	0.07
Usability3	0.19	0.81	0.19	0.18	0.03
Usability4	0.28	0.79	0.14	0.08	0.06
Usability5	0.21	0.78	0.12	0.22	0.12
Usability6	0.28	0.61	0.25	0.28	0.18
Percieved Usefulness1	0.24	0.18	0.78	0.23	0.16
Percieved Usefulness2	0.23	0.27	0.85	0.19	0.17
Percieved Usefulness3	0.21	0.32	0.65	0.18	0.25
Trust1	0.15	0.2	0.22	0.73	0.27
Trust2	0.09	0.29	0.24	0.79	0.21
Trust3	0.14	0.26	0.2	0.67	0.28
Satisfaction1	0.15	0	0.15	0.21	0.8
Satisfaction2	0.09	0.12	0.15	0.18	0.91
Satisfaction3	0.06	0.19	0.2	0.21	0.78
Cronbach's α	0.79	0.91	0.9	0.89	0.92
Cum. variance explained (%)	23.816	38.514	51.406	63.736	74.763

Hypothesis 9: Perceived usefulness has a positive impact on the satisfaction.

Questionnaire: A survey instrument consisted of 18 items was developed to measure five constructs of the model. A five-point Likert scale was used to measure respondent's agreement or disagreement from (1) "strongly disagree" to (5) "strongly agree".

The sample consisted of students who have used university websites. A total of 360 questionnaires were distributed, of which 270 were collected. Various minimum sample sizes for the Structural Equation Modeling (SEM) approach have been recommended. Taking into consideration of Bollen's [20] suggestion of a minimum sample size of 100, the sample size of 270 in this study is adequate.

Table 1 shows the profile of respondents. Data was collected over a month. Questionnaires were distributed either in hard-copy format or via email.

The proposed model was evaluated with applying SEM approach, using LISREL 8.53. SEM is a comprehensive statistical approach to test the hypotheses about relations among observed and latent variables [21].

Data Analysis: A variety of indices, generated by LISREL, were used to evaluate the model's goodness of fit:

Chi-square/degree of freedom with values of less than 3 indicating acceptable fit (χ^2/df), Root Mean Squared Error of Approximation, with values below 0.08 representing acceptable fit, Normalized Fit Index, Goodness of Fit Index and Comparative Fit Index greater than 0.9 and Adjusted Goodness-of-Fit Index greater than 0.8 and less than 0.1 are representatives of good fit (The results are shown in Table 2).

Validity and Reliability: Construct validity was evaluated through explanatory factor analysis (EFA). The results of the EFA for each of the constructs are shown in Table 3. As the loadings of items on the construct exceed 0.4, it is verified that the measured items show sufficient validity.

For reliability analysis, Cronbach's α for each of the five factors is shown in Table 3 and it is greater than 0.7 for each factor.

RESULTS AND DISCUSSION

This study has tried to investigate the factors affecting students' satisfaction of universities websites. The proposed model consists of website innovation, usability, perceived usefulness, trust and satisfaction. Of the 9 hypotheses, 7 were supported by data.

The results of testing the structural model are presented in Table 4 and a graphical presentation of the results is depicted in Figure 2.

Table 4 shows the R^2 for each endogenous variable. For satisfaction, $R^2 = 0.49$. For trust, $R^2 = 0.58$ and for perceived usefulness $R^2 = 0.58$. 38% of the variation in the website satisfaction can be explained by the proposed model. The proposed structural model explained 38% of the variance in the website satisfaction.

The results of the research hypotheses tests are shown in Table 5. Hypotheses 1, 2 and 3 assert that innovation has a positive influence on satisfaction (H1), trust (H2) and perceived usefulness (H3) respectively. Identical to hypotheses, results demonstrate that innovation has strong direct effect on satisfaction ($\beta = 0.40$), trust ($\beta = 0.50$) and perceived usefulness ($\beta = 0.53$). Usability has strong direct effect on trust ($\beta = 0.28$) and perceived usefulness ($\beta = 0.21$) but insignificant direct

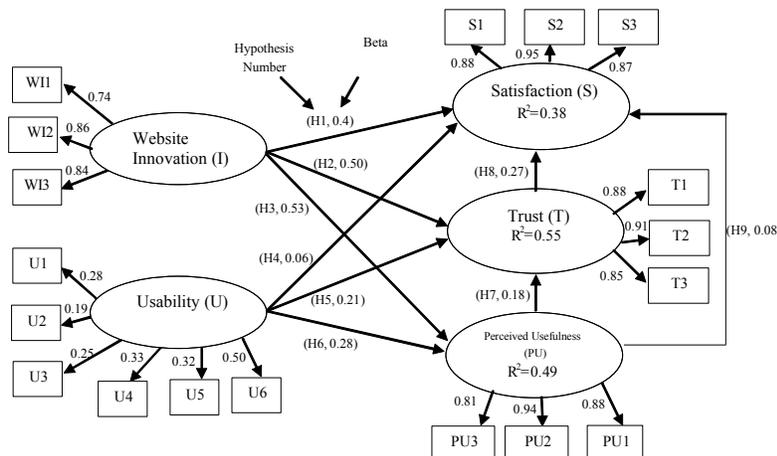


Fig. 2: The Research Results

Table 4: The results of testing the structural model

	Perceived Usefulness			Trust			Satisfaction		
	Direct Effect	Indirect Effect	Total	Direct Effect	Indirect Effect	Total	Direct Effect	Indirect Effect	Total
Website Innovation	0.53	-	0.53	0.5	--	0.5	0.4	0.16	0.56
Usability	0.28	-	0.28	0.21	0.05	0.26	0.06-	0.089	0.089
Perceived Usefulness	-	-	-	0.18	-	0.18	0.08	0.049	0.049
Trust	-	-	-	-	-	-	0.27	-	0.27
R ²	0.49	0.55	0.38						

Table 5: The results of the research hypotheses tests

Hypothesis	Construct 1	Impact	Construct 2	Beta*
H1	Innovation	Positive	Satisfaction	0.40
H2	Innovation	Positive	Trust	0.50
H3	Innovation	Positive	Perceived Usefulness	0.53
H4	Usability	-	Satisfaction	0.06
H5	Usability	Positive	Trust	0.21
H6	Usability	Positive	Perceived Usefulness	0.28
H7	Perceived Usefulness	Positive	Trust	0.18
H8	Trust	Positive	Satisfaction	0.27
H9	Perceived Usefulness	Positive	Satisfaction	0.08

*P<0.05

effect on satisfaction ($\beta=0.27$). Perceived usefulness has direct effect on trust ($\beta=0.18$). Trust has significant direct effect on satisfaction ($\beta=0.27$).

Interestingly, website innovation was found to be the most significant factor affecting students' perception of usefulness, trust and satisfaction. As mentioned earlier, there are a few studies on innovativeness of university websites and its effect on students' satisfaction. So, due to the results of the current study, website innovation should be highly considered in order to increase students' perception of usefulness, trust and satisfaction. In the following paragraphs, different ways of increasing innovativeness of websites are proposed and discussed.

Generally websites are not static products that be forgotten once developed. As the result, in order to be able to develop and enhance websites' usability, usefulness and services, a continuous innovation management process must be applied. December also [22²] states that innovation and novel technologies are key factors in the development of websites. He mentions that continuously undergoing innovative techniques within the websites not only fulfills the customers' needs but also goes beyond their needs.

A few universities have adopted the concept of "internet portal" from 2001. This was a simple but innovative concept; students have to login to the portal to have access to different applications. They will be

authenticated by the portal and then the students can access the customized electronic environment [12]. Since then, the concept of intelligent agents have come into the world of univesrity portals. Jafari and Sheehan [9] note the importance of intelligent agents. They believe that the structure of information and current resources in the web require a more intelligent and advanced technology to deliver smart, dynamic and customized portal services. The more the interaction of the user with portal, the more recognition of the user generates in portal [9, 23].

Intelligent agents are recognized by their capability to process knowledge about the situation, their environment and their objectives. To facilitate users' needs, intelligent agents can decide the most suitable actions to be taken by their behavioral specifications. These agents must therefore be able to represent and manage the particular rationale of a device or an application [24, 25]. In a dynamic, individual and smart teaching and learning environment, intelligent agents carry out tasks for either students or instructors [26]. Different types of intelligent agents are able to be integrated into campus portal environments. Jafari and Sheehan [9] have divided these intelligent agents into three categories: digital teaching assistants (TAs), digital tutors and digital secretaries. Each category is assumed to undertake certain tasks which are usually performed by a human being. Every category consists of one or several intelligent agents

²december.com/web/develop/innovate.html

centered on particular jobs in a portal environment. The intelligent agents communicate with human beings with the aid of texts, graphics, speeches, voices and digitally-rendered facial expressions [9]. Various universities have redesigned courses for e-learning. A rising number of universities use course management softwares (CMS) to implement e-learning portals. Although e-learning has provided for learners a suitable virtual access all around the world, a number of deficiencies limit the benefits, mainly because of the communication, pedagogy, collaboration and course administration. In a distance-learning situation, for instance, the instructor can no longer benefit from a face-to-face communication. The collaboration channels are limited according to the capabilities of the available tools in the CMS [26].

The impact of usability on satisfaction was not supported by data. Gummerus *et al.* [27] state that the effect of usability on satisfaction will decrease gradually as they get accustomed to working with a website. Riegelsberger and Sasse [28] mention that low technical characteristics of a website leads to dissatisfaction and vice versa. As Donahue *et al.* [29] believe, usability has always been a key factor in online transactions. The same as what Roy *et al.* [30] found, usability has a significant impact on trust. This means that usability is an effective factor in shaping the students' perceptions.

As mentioned earlier, this study is of the scarce studies investigating the effect of innovation on perceived usefulness, trust and satisfaction in university websites. So it is recommended to researchers to undertake further researches to investigate the proposed relationships. The proposed model explains 38% of the variance in the students' satisfaction of university websites. As a result, further researches may focus on other variables which may have an effect on satisfaction such as culture and information technology infrastructures.

One of the limitations of this study is that it was carried out in a single country. As a result, further investigations may be applied in other countries. Careful considerations must be taken in generalisation of the results.

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