Barcode Technology Acceptance and Utilization in Health Information Management Department at Academic Hospitals According to Technology Acceptance Model

Asghar Ehteshami

Health Information Technology Research Center, Isfahan University of Medical Sciences, Isfahan, Iran

Corresponding author: Ass. prof Asghar Ehteshami. Health Information Technology Research Center, Isfahan University of Medical Sciences, Isfahan, Iran. E-mail: ehteshami@mng.mui.ac.ir

ABSTRACT

Nowdays, due to the increasing importance of quality care, organizations focus on the improving provision, management and distribution of health. On one hand, incremental costs of the new technologies and on the other hand, increased knowledge of health care recipients and their expectations for high quality services have doubled the need to make changes in order to respond to resource constraints (financial, human, material). For this purpose, several technologies, such as barcode, have been used in hospitals to improve services and staff productivity; but various factors effect on the adoption of new technologies and despite good implementation of a technology and its benefits, sometimes personnel don't accept and don't use it. Methods: This is an applied descriptive cross-sectional study in which all the barcode users in health information management department of the three academic hospitals (Feiz, Al-Zahra, Ayatollah Kashani) affiliated to Isfahan University of Medical Sciences were surveyed by the barcode technology acceptance questionnaire, in six areas as following: barcode ease of learning, capabilities, perception of its usefulness and its ease of use, users attitudes towards its using, and users intention. Results: The finding showed that barcode technology total acceptance was relatively desirable (%76.9); the most compliance with TAM model was related to the user perceptions about the ease of use of barcode technology and the least compliance was related to the ease of learning barcode technology (respectively %83.7 and %71.5). Conclusion: Ease of learning and barcode capability effect of usefulness and perceived ease of barcode technology. Users perceptions effect their attitudes toward greater use of technology and their attitudes have an effect on their intention to use the technology and finally, their intention makes actual use of the technology (acceptance). Therefore, considering the six elements related to technology implementation can be important in the barcode acceptance; because their chained relationship is clearly visible.

Keywords: Barcode, Technology Acceptance Model, Health Information Technology.

1. .INTRODUCTION

The increasing costs of technologies and health customers' knowledge about receiving care as well as their increasing expectations for high quality services, lead to increase the need for change forward to respond to resource constraints (financial, human, material) (1).

In health System, the variety of technologies used by end users who playing pivotal role in care delivery. Among these, health information technology (HIT) enables to improve practice and quality of administrative affairs in hospitals services. But, to achieve Optimized Performance, human-technology proper interaction is important. End users' perceptions, acceptance, and utilization of HIT are individually important. Because, their acceptance eventually effect on HIT and its properly using for health care. Human factors as well as structural and technological, is vital for successful HIT implementation (2-5).

According to Davis' Technology Acceptance Model (TAM), usage behavior of an IT depends on the intention to use of a particular system. In the adoption of a technology, namely two areas of TAM are very important: a) User perception of the technology usefulness; and b) Its ease of use (6-8).

In strategy formulation of technology infrastructure, the IT adoption by users should be noted; because, if hospital users do not accept implemented ITs, providing the health care services will fail. Therefore, Technology acceptance factors should be identified to assist hos-

pitals in formulating strategies to use and improve recently implemented systems (9).

Accordingly, as to the essential role of users in the barcode utilization in Isfahan Academic hospitals, this study attempted to identify human factors that affect the users to use barcode in health information management department.

2. METHODS

This is an applied descriptive cross-sectional study in which 9 Users of barcode technology filled barcode technology acceptance questionnaire in the medical records departments at three academic hospitals (Al-Zahra, Kashani and Feiz) in Isfahan University of Medical Sciences. The reliability of the questionnaire was confirmed by Cronbach's alpha equal to 0.948. Analysis of the obtained data with SPSS 16 software

Areas	Criteria	Score (%)	Std. Deviation	Area Mean (%)
Ease of learning	Learning in short time	73.3	33.1	71.5
	Easy to remember and use of commands	86.6	20	
	Role of user experience in Ease of learning	51.1	31.7	
	Facilitating usage due to Learning	73.3	31.6	
	Easy to learn to work with a variety of barcode technology	75.5	26	
	Ease of learning for the beginners	62.2	27.2	
	The need for technical specialists in learning	53.3	28.2	
	Barcode contribution to the learning process of user tasks	88.8	14.5	
	Feedback (Full and clear reflection of the work).	66.6	28.2	
	Clear and comprehensible working	84.4	21.8	
Capabilities	Work velocity	93.3	10	74.5
	Response time to user request	55.5	29.6	
	Speed of connecting with hospital information system	75.5	21.8	
	Reliability	84.4	16.9	
	Hardware defect rate	31.1	20.2	
	Preventing data entry errors	77.7	25.3	
	Increasing accuracy in data entry	93.3	10	
	Correction of erroneous input data	75.5	21.8	
	Flexibility in doing tasks	75.5	16.6	
	Compatibility with HIS	84.4	16.6	
	The possibility of doing user tasks	80	17.3	
	Speed of reading the label	77.7	18.5	
	Time saving	80	14.1	
	Cost saving	53.3	31.6	
	Efficiency of label printer	80	17.8	
User perceptions of the usefulness	User performance improvement	80	17.3	81.6
	Improving Effectiveness	80	17.3	
	Improving the quality of patient care	77.7	25.3	
	Reducing workload and Work Pressure	82.2	15.6	
	Contributing to achieving the objectives of the institution	82.2	12	
	Increasing work speed	86.6	10	
	Increasing work accuracy	82.2	18.5	

User perceptions about the ease of use	Logical sequence of work steps	75.5	16.6	
	Appropriate stages of doing tasks	77.7	12	
	Facilitating the work	91.1	14.5	83.7
	Availability	86.6	10	
	Hardware appropriate size	84.4	16.6	
	Hardware appropriate weight	86.6	14.1	
Attitudes toward using	Energy efficiency (human and electric)	80	22.3	
	User willingness to use	82.2	15.6	
	Attractive for the user	80	14.1	77.8
	User satisfaction	80	14.1	
	As Exciting	64.4	24	
	Usability in tasks	80	22.3	
UsingIntent	Users tend to use	88.8	20.2	
	Visually stimulating features	71.1	30.1	80
	Stimulating physical characteristics (size, weight or hardware)	75.5	27.8	
	Users tend to use to prevent errors	84.4	21.8	

Table 1. Barcode technology acceptance rate compliance with TAM

Areas	Ease of learning	Capabilities	User perceptions of the usefulness	User perceptions about the ease of use	Attitudes toward using	Using intent
Ease of learning		r=0.718 Sig.=0.029	r=0.501 Sig.=0.169	r=0.517 Sig.=0.154	r=0.223 Sig.=0.564	r=0.152 Sig.=0.696
Capabilities	r=0.718 Sig.=0.029		r=0.587 Sig.=0.096	r=0.514 Sig.=0.157	r=0.279 Sig.=0.496	r=0.213 Sig.=0.583
User perceptions of the usefulness	r=0.501 Sig.=0.169	r=0.587 Sig.=0.096		r=0.220 Sig.=0.570	r=0.797 Sig.=0.010	r=0.760 Sig.=0.017
User perceptions about the ease of use	r=0.517 Sig.=0.154	r=0.514 Sig.=0.157	r=0.220 Sig.=0.570		r=0.185 Sig.=0.634	r=-0.226 Sig.=0.559
Attitudes toward using	r=0.223 Sig.=0.564	r=0.279 Sig.=0.468	r=0.797 Sig.=0.010	r=0.185 Sig.=0.634		r=0.719 Sig.=0.031
Using intent	r=0.152 Sig.=0.696	r=0.213 Sig.=0.583	r=0.760 Sig.=0.017	r=-0.226 Sig.=0.559	r=0.712 Sig.=0.031	

Table 2. Pearson correlation between the all areas of barcode acceptance

led to calculate some parameters such as mean, standard deviation, frequency and percentage.

3. RESULTS

Data in Table 1 appears TAM areas that in this study were surveyed and their results. Table 2 shows the correlation between the surveyed areas. Important findings include the followings:

According to Table 1, the total observes rate of barcode acceptance in the IUMS academic hospitals was 76.9 percent. The most compliance with the technology acceptance model was related to the user perceptions about the ease of use of barcode Technology and the least compliance was related to the ease of learning barcode technology (respectively 83.7 and 71.5 percent).

The findings show users' perceptions about the ease of use the barcode and its usefulness as well as user's intent is desirable; but, the barcode is not ease of learning. Also, the users believe that the barcode technology capabilities are not desirable and therefore, their attitudes toward using barcode are not desirable also. As from Table 1, the users believe that hardware defect rate is high, There is a need for technical specialists in learning barcode technology and it doesn't lead to appropriate cost saving.

According to Table 2, we found significant correlations between some areas of barcode technology acceptance, as the followings: Ease of learning and barcode technology capabilities (r = 0.718, Sig.= 0.029), User perceptions of the usefulness and Attitudes toward using (r = 0.797, Sig. = 0.010), User perceptions of the usefulness and Using intent (r = 0.760, Sig. = 0.017), and, Attitudes toward using and Using intent (r = 0.712, Sig. = 0.031). But, we found no significant correlation between other areas.

4. DISCUSSION

As from Table 1, ease of learning barcode technology is relatively desirable. Also, Tavakoli and Kwak findings focused on ease to learn (9, 10). According to Table 2, there is significant correlation between ease of learning barcode technology and its capabilities; namely, the increased amount of barcode technology capabilities, it also increases the ease of learning. Furthermore, Ease of learning is directly related to attitude toward using barcode which this is consistent with the Yen's findings (11). Appears to increase the ease of learning barcode technology, we need to take help from technical experts and barcode technology designers and consult with the users to enhancethe functionality of barcode technology. In addition, in hospitals, barcode hardware buyers should be considered the ease of learning. Furthermore, technical experts should be fixed the users' problems during the working with barcode.

According to Table 1, barcode capabilities are relatively desirable. Capability has a direct and positive impact on the user perceptions about the ease of technologies using (12). According to Okumus, users understanding of technology's capabilities and alignment with their goals are a primary theme in technology acceptance (13); but, in our study there is no significant relationship between barcode capability and its perceived ease.

Behavioural control (set of factors that makes use of a technology, ease or prevent use of it) is one way of using technology. According to Yunus, technology capabilities have a positive impact on the willingness and intention to use that technology, and in our study, too (14). Inasmuch as technology capabilities has the impact of behaviour control and then behaviour control has on the intention and attitude toward use, training the benefits of barcode technology is important in its higher acceptance.

The degree of assurance that a technology can give to its users is considered as an important factor in the acceptance of a technology. According to Table 1, barcode technology's reliability is desirable and can be effective in barcode's capabilities acceptance by users.

Another important factor in the acceptance is the amount of technology usefulness which is not desirable in our study. According to Table 1, user perceptions of the barcode usefulness are desirable and has a significant direct correlation with user attitudes toward using and using intention. According to Hong, perceived ease of use has a direct and indirect relationship with perceived usefulness and attitude toward the use (15). According to Tavakoli also, if users have the sufficient satisfaction of the Technology, they will be able to use the technology (9). Besides, According to Bashiri, the positive and significant correlation between the structures of perceptions, intention and use appear that the extent and manner of use of the system are strongly related to user perceptions that shape their intention. So, in the information technology planning, it is necessary to pay attention to culture, because users perceive formation is gradual (16).

Sanayei suggests that perceived ease of use has a significant relationship with intention to use (17). Also, According to Davoody, although users mentioned challenges such as time limitation for using technology and its responsibility issues, they were positive towards technology and its potential usefulness in ease of understanding and support for collaboration (18).

In our study, predicted positive relationships between perceived usefulness and intention to use technology and attitude to use are consistent with Dulcic and Movahedi findings (19-20). Since, Perceived usefulness is an users' interpretation of a particular technology, presenting data related to Technology Benefits and training courses related to technology benefits can be important in terms of technology adoption for users.

Our findings indicate that user perceptions of the technology are desirableand their perceptions of the ease of use have direct correlation with attitude but no significant (r=0.634, sig. =0.185). In addition to, there is not a significant correlation between users' perceptions about the ease of use and perception about, the usefulness, which are consistent with Lee's findings (21). There is a reverse correlation between Perceived ease of users and their intention to use; namely, with the increasing amount of user perceptions about ease of use, Intentions and willingness to use the technology is decreased. This finding does not align with the findings of Hong, Dulcic, Movahedi, (15, 19-20).

Our findings showed that users with higher levels of education have less intention to use technology and more perceptions about ease of use. Also, women had lower intentions to use the technology and greater ease of understanding it than men. According to Sanayei, there is a weak correlation between ease of use and intention to use of technology. When the user imagines the system without the physical and mental effort his understanding of the usefulness of the system increases, likely. But, not increase his desire to use the system. So, it can be concluded that ease of use of a technology has not positive correlating with tend to use it (17). Perceived ease of use effects on users' attitudes and their attitudes on their intentions. Accordingly, Perceived ease of use can be effective on a greater tendency to use, indirectly. Also, one aspect perceived ease of use is the hardware and software features; therefore, considering the ease with barcode technology hardware and its comfortable integration with hospital information system can make an impact on its further adoption.

Our findings appeared that user attitudes have a significant direct correlation with his perceptions of the technology usefulness and intention to use it and aligned with the findings of Tavakoli, Farahat, Lee and Hong (9, 15, 21-22). We can conclude that to better barcode acceptance, software and hardware developers and buyers should pay more attention to users' attitudes and managers must consider the attitude of the users in management decisions as an important factor.

If users understand a technology usage only for its own sake and apart from its instrumental value, they will judge more positive about their ability to use the technology (11). Fore, users' attitudes toward a technology implementation and utilization may be very important in the acceptance and use of technology (23-26). Users' attitudes should be taken into consideration as a significant factor in the technology acceptance.

In our study, using intention had a significant direct correlation with perceived usefulness of technology and attitudes toward using it. Also, Tavakoli, Farahat, Lee and Hong concluded similarly (9, 15, 21-22). Capability of a technology effects on the behavioural intention and perceived usefulness, indirectly (11). This is in line with the present study findings. He also concluded that perceived usefulness and attitude toward using a technology have an effect on behavioural intention to use it. User perception of the usefulness of the technology and their Positive assessing of the desirability of technology raises the possibility of the technology usage. Behavioural intentions, also, is an important factor in actual use of technology (4). Accordingly, Intended use can be a significant impact on the acceptance and actual use of a technology (25, 26).

5. CONCLUSION

Ease of learning and barcode capability effect of usefulness and perceived ease of barcode technology. Users' perceptions effect on their attitudes toward greater use of technology and their attitudes has an effect on their intention to use the technology and finally, their intention makes actual use of the technology (acceptance). Therefore, considering the six elements related to technology implementation can be important in the barcode acceptance; because their chained relationship is clearly visible.

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