The resistance factors to using health information technology in Turkey

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Abstract

The primary goal of our study is to determine the types of resistance factors to IT are perceived by the healthcare staff. Furthermore, it was examined whether the resistance factors differ according to the individual characteristics for e.g. gender, profession, age, and IT experience of healthcare personnel or not. The questionnaire was distributed to the healthcare personnel of the hospitals in the different cities namely Ankara, Adana, Mardin and Diyarbakır in Turkey. Totally, 551 healthcare personnel were asked what kind of resistance factors to IT were played role when they were using health information systems. This study has revealed the most important resistance factors which have been perceived by the personnel and so required precautions can be taken according to individual differences in order to avoid them. Thus, the hospital management can prioritize the resistances and develop necessary strategies so that they can lead and apply the information systems and future technology as well. Place and Duration of Study: 2800 surveys were distributed at four hospitals whose names are Adana Numune, Aşkım Tüfekçi, Ankara Numune, Diyarbakır Genesis and Mardin Kadın Doğum in April and collected in July 2016. After detailed literature review, 24 resistance factors were defined and hypotheses were set. A survey was designed to test the hypotheses and surveys were distributed to the hospitals in different cities. Collected surveys were statistically analyzed by using Kruskal Wallis method after controlling data validity. According the test results, gender does not play role in all examined the resistance factors apart from the factor "complexity of IT". The position of healthcare was not related with the factors "need for IT training and the complexity of IT". The IT experience did not effect on the factors "perceived poor performance and complexity of IT. This study will provide foresight to the managers in coping with the barriers of implementing information systems at the hospitals. Additionally, it will give ideas to managers how to manage the change during the implementation of IT. Paying attention to the most important factors can facilitate decision making in IT implementation. The managers will be informed about the affects of individual characteristics such as age, gender, and position on resistance. So they can minimize the training expenses in IT usage by doing customized training plan.

Introduction

Along with the rapid development of technology, organizations are buying new technologies and want to implement them rapidly to gain competitive advantage. It is required almost to keep up with new technologies to survive and compete through them. Competition can be possible by attracting the customers with competitive prices and by providing them with high quality services[1].

It is almost universally accepted that the information technologies have positive effects on the business performance and quality of life. With declining market shares due to rivalry in the business, advances in technology and new regulations have increased the business owners' IT awareness. Thus, organizations have been in need of change to survive in this arena[2]. The benefits of the information technology and systems appear to be overwhelmingly positive so that managers could have operated the processes by rising the quality of the output and while cutting down cost and shortening time of the business by the help of IT.

The most known information technologies and systems used in health systems are hospital information systems, electronic patient records (EMR), e-Health, RFID technology and clinical decision support systems (CDS).

For example; EMR systems show patients' radiological images on the computer and also provide a digital knowledge interface for patients' socio-demographic and communication information. This system includes problem lists, medications, allergies, laboratory results, and physician's notes about the patients. In this way patient information can be quickly restored[3], accessed and used in clinical decision by the physicians[4].

Problem statement: Although the technology provides many advantages to organizations, unfortunately most of them fail to implement the technology in their organizations. According to Beer and Nohria (2000)[5], 70% of all change initiatives resulted in failure. Thus the managers of the organizations should be able to predict the causes of these failures in order to reduce the

potential damages in installations of IT systems by leading successful change management process.

However, the IT which facilitate the tasks of healthcare personnel especially physicians' tasks such as preparing physicians' orders and prescriptions, accessing the results of laboratory etc., were not diffused yet widely[6] and the use of IT in hospitals is still low[7]. There are many reasons for this and these causes could be innovation-based, organization-based and/or individual-based. Reasons of not using IT in hospitals could be resulted from: the complexity of innovation, the size and structure of the organization[8], management approach of the organization[9,10]. One of the most important barriers to the successful implementation of innovation was probably the human resistance to change[11,12]. This can be in different ways such as employee sabotages, job accidents, and increase in the demand on workers ' compensation claims, decrease in productivity, absenteeism, increase in the consumption of health expenses, etc[13].

Additionally, Zwick (2002) suggests that employees' resistance to innovation generally changes resting on the form of innovation and the rules of the organization. They do not harm the organization but can change the innovation plan or slow down the innovation process[14].

Purpose of the research: The manager of IT should focus on finding out the potential conflicts and the user resistance which could cause the failure in the pre-implementation stage of the technology[11].

If the resistance to innovation in organizations was predictable, any precautions could be taken before the implementation of innovation. Thus, it allows saving time for preparation for change and decreasing the risk of failure[15].

The primary aim of this study is to determine the potential resistance factors of the healthcare personnel in using hospital information systems. The further aim is to analyze the existence of influence items for instance the age, position, gender and IT-trial on major resistance factors.

In this sense, this research could contribute both to the hospital managers and also scientists by providing a feedback for how to deal with a change and offering a framework for showing the affects of demographic factors on the resistance factors.

Research Methodology

Sampling: The questionnaire was distributed to the healthcare personnel of the hospitals in the different cities namely Ankara, Adana, Mardin and Diyarbakır in Turkey.

While the number of questionnaire sent to the hospitals was 2800, only 819 of them were returned. After eliminating records due to missing data, 551 surveys were used in total in our analysis. While the largest proportion of respondents was from Adana Numune Hospital (177), 173 answers were collected from Ankara Numune Hospital. Other hospitals and survey reply rates were: Mardin Kadın Doğum Hospital (90), Diyarbakır Genesis Hospital (31) and Adana Aşkım Tüfekçi Hospital (80).

Measurement and Method: In this study, no external resistance factors likewise regarding market or government policies have been taken into consideration. The twenty-four different resistance factors to the healthcare information systems, which frequently mentioned in the literature[8-10,16-36], were listed to use as questionnaire.

Dent and Goldberg (1999) have examined the studies of the following authors Kreitner[17], Griffin[18], Aldag and Stearns[19], Schermerhorn[20], Dubrin and Ireland[21] and summarized the existing resistance factors[16]. The results regarding resistance factors of their studies were also included in the list in Appendix.

The frequencies of the resistance factors mentioned in the literature were asked in the questions of our survey in order to find out the reasons of respondents' usage of hospital information systems. The answers were either "yes" or "no", thus the data was in a nominal scale. If the factors were checked as "yes", then it meant that the resistance factors existed.

Nonparametric tests were used for the hypotheses testing since the available data was categorical and non-normal. The results of this analysis were analyzed by Kruskal Wallis-test to see whether these resistance factors were affected by individual characteristics such as age, position, IT experience and gender.

This study revealed that the most important determiners are dissimilar from the Literature result mentioned above. According the importance level factors are listed as: poor IT performance (X1), scare of making mistake (X2), inadequate IT interest (X10), need for IT training (X11), and complexity of IT (X13). While these most important factors were hold as independent variables in our analysis, IT experience, position, age and gender were used as dependent variables in statistical analysis. Some hypotheses are assumed as follows:

HX1a: The perceived poor performance of IT is not related to IT experience.
HX1b: The perceived poor performance of IT is not related to the position of personnel
HX1c: The perceived poor performance of IT is not related to age of personnel
HX1d: The perceived poor performance of IT is not related to the gender.
HX2a: The scare of making mistake is not related to IT experience
HX2b: The scare of making a mistake is not related to the position of the personnel.
HX2c: The scare of making a mistake is not related to the age of the personnel.

HX2d: The scare of making a mistake is not related to the gender.

HX10a: Inadequate IT interest is not related to IT-Experience.

HX10b: Inadequate IT interest is not related to the position of personnel.

HX10c: Inadequate IT interest is not related to the age of personnel.

HX10d: Inadequate IT interest is not related to the gender.

HX11a: Need for IT training is not related to IT-Experience.

HX11b: Need for IT training is not related to the position of the personnel.

HX11c: Need for IT training is not related to the age of personnel.

HX11d: Need for IT training is not related to the gender.

HX13a: Complexity of IT is not related to IT-Experience.

HX13b: Complexity of IT is not related to the position of personnel.

HX13c: Complexity of IT is not related to the age of personnel.

HX13d: Complexity of IT is not related to the gender.

Results and discussion

Resistance factors: The twenty-four resistance factors derived from literature (see Appendix) and the number of responses by healthcare personnel was shown in Figure-1. Each independent resistance variable was evaluated by 551 personnel. The chart illustrates that the healthcare personnel think that the most important resistance factor is the variable X10 namely "inadequate IT interest" with the highest frequency of 316. On the other hand, according to the personnel the variable X24 has the minor effect on resistance to IT and only 49 of them think that "the values, norms and beliefs" affect the technology usage.

The second highest resistance factor is "the scare of making mistake with the technology" (X2) with 284 responses. Due to
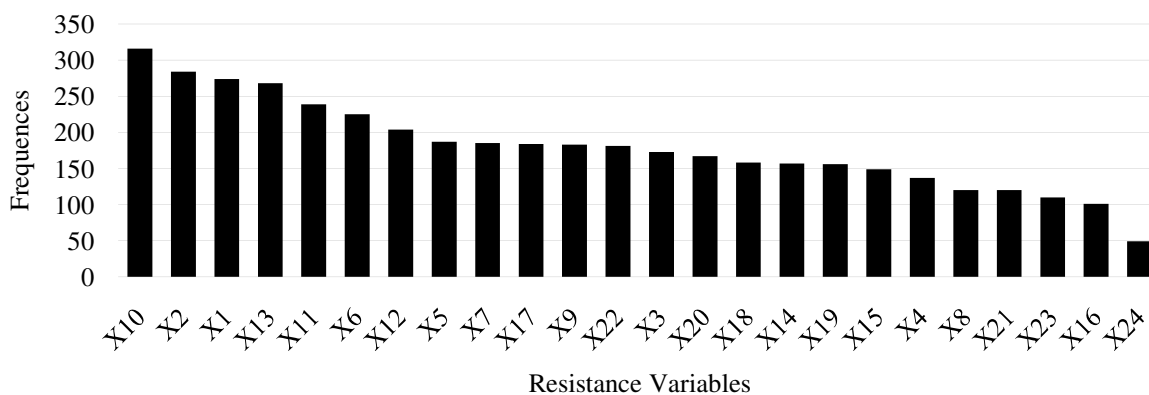
the scare of making mistake, the personnel is not eager to use the technology.

The following major resistance factor is the X1 variable, which is related the "performance of the technology". Almost half of the respondents (274) think that "the poorer the performance of the IT is, the more they will reject it".

In summary, the higher the frequency is, the more important the resistance factor will be. In this study, detailed analysis regarding to respondents' characteristics were carried out by top five resistance factors in order to focus on the problems and find out the substantial solutions. The first five factors were: X10 (inadequate IT interest), X2 (scare of making mistake), X1 (poor performance of IT), X13 (IT complexity) and X11 (Need for IT training).

Descriptive statistics: Table-2 presents the relations of respondents' characteristics with resistance factors. Firstly, the personnel are categorized according to the IT experience level. According to the findings, the personnel who is experienced more than six years in IT thinks that the major resistance factor is resulted from the lack of interest in IT. However, the poor performance of the information technology and systems seems to be more important according to the other groups related to IT experience. It can be said that the more experienced in IT, personnel have less fear of IT.

Second, the genders are compared according to the evaluations of resistance factors. The most important difference between the gender groups appears on the factor regarding to the complexity of IT. The female personnel think that this factor is more important than others differing from the male personnel.

X1 Performance of IT [8,9,22,23,29]
X2 Scare of making mistake [9,17, 21,24, 25,27]
X3 Fear of losing data security [22, 24]
X4 Dislike of technology [8, 27, 28]
X5 Fear of work loss [8, 17,18,19, 20, 21, 34]
X6 Fear of change of work process [25]
X7 Fear of decrease in salary [34]
X8 Fear of authority-loss [8, 10, 22, 25, 26, 34]

X9 Inadequate IT experience [8,29]
X10 Inadequate IT interest [9]
X11 Need for IT training [8, 9, 10, 17,22, 25, 29, 31]
X12 Fear of overworking [10,24,25,30]
X13 Complexity of IT(technology) [8, 9, 29, 30, 36]
X14 New IT is time-consuming [22]
X15 Contrary to traditions [24, 27, 31, 32]
X16 Unshared goals of organization [28, 31]

X17 Need for change is unknown [24, 34]
X18 Lack of information sharing [10,34]
X19 Unreadiness for change [17]
X20 Lack of teamwork / cooperation [8, 10, 7, 18,19,20, 24, 25, 28, 29, 36]
X21 Lack of trust in top-management [17, 18,19,20, 25]
X22 Lack of management support [8, 9, 22, 25, 29, 30, 32, 33, 35]
X23 Lack of technical support [8]
X24 Incompatibility with social norms &beliefs [8,24, 30, 31, 33]

Figure-1: The Frequency Distribution Chart of the Innovation Resistance Factors.

Table-2: Descriptive Statistics of Top Five Innovation Resistance Factors.

YEAR		Total	Poor IT performance (X1)		Scare of making mistake (X2)		Inadequate IT interest (X10)		Need for technology training (X11)		Complexity of IT (X13)	
			NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
IT EXPERIENCE	Under 1	51	23	28	17	34	30	21	29	22	27	24
		100,0%	45,1%	54,9%	33,3%	66,7%	58,8%	41,2%	56,9%	43,1%	52,9%	47,1%
	1-2	136	77	59	45	91	71	65	86	50	62	74
		100,0%	56,6%	43,4%	33,1%	66,9%	52,2%	47,8%	63,2%	36,8%	45,6%	54,4%
	3-4	82	42	40	33	49	46	36	53	29	48	34
		100,0%	51,2%	48,8%	40,2%	59,8%	56,1%	43,9%	64,6%	35,4%	58,5%	41,5%
	5-6	56	25	31	32	24	31	25	33	23	32	24
		100,0%	44,6%	55,4%	57,1%	42,9%	55,4%	44,6%	58,9%	41,1%	57,1%	42,9%
	Over > 6	226	110	116	140	86	57	169	111	115	114	112
		100,0%	48,7%	51,3%	61,9%	38,1%	25,2%	74,8%	49,1%	50,9%	50,4%	49,6%
GENDER	Male	134	66	68	60	74	64	70	83	51	81	53
		100,0%	49,3%	50,7%	44,8%	55,2%	47,8%	52,2%	61,9%	38,1%	60,4%	39,6%
	Female	417	211	206	207	210	171	246	229	188	202	215
		100,0%	50,6%	49,4%	49,6%	50,4%	41,0%	59,0%	54,9%	45,1%	48,4%	51,6%
AGE	18-24	82	40	42	37	45	47	35	50	32	49	33
		100,0%	48,8%	51,2%	45,1%	54,9%	57,3%	42,7%	61,0%	39,0%	59,8%	40,2%
	25-34	172	84	88	62	110	101	71	104	68	82	90
		100,0%	48,8%	51,2%	36,0%	64,0%	58,7%	41,3%	60,5%	39,5%	47,7%	52,3%
	35-44	201	97	104	116	85	77	124	121	80	105	96
		100,0%	48,3%	51,7%	57,7%	42,3%	38,3%	61,7%	60,2%	39,8%	52,2%	47,8%
	45 +	96	56	40	52	44	10	86	37	59	47	49
		100,0%	58,3%	41,7%	54,2%	45,8%	10,4%	89,6%	38,5%	61,5%	49,0%	51,0%
POSITION	Physician	163	94	69	102	61	49	114	91	72	74	89
		100,0%	57,7%	42,3%	62,6%	37,4%	30,1%	69,9%	55,8%	44,2%	45,4%	54,6%
	Nurse	313	143	170	144	169	144	169	173	140	166	147
		100,0%	45,7%	54,3%	46,0%	54,0%	46,0%	54,0%	55,3%	44,7%	53,0%	47,0%
	Others	75	40	35	21	54	42	33	48	27	43	32
		100,0%	53,3%	46,7%	28,0%	72,0%	56,0%	44,0%	64,0%	36,0%	57,3%	42,7%
TOTAL		551	277	274	267	284	235	316	312	239	283	268
		100,0%	50,3%	49,7%	48,5%	51,5%	42,6%	57,4%	56,6%	43,4%	51,4%	48,6%

When the age groups are taken into consideration, the most striking situation arises in the age group 45 and above. 90% of the people in this group think that they resist to the hospital information systems due to lack of interest in IT. Similarly, the age group of 35 and 44 also thinks the same about this resistance factor.

Young healthcare employees in the 25-34 age group consider that the most important factor is the scare of making mistake. Likewise, personnel in the age range of 18-24 also find this most important. The result is that the complexity of technology and the performance of the technology do not vary to the age groups.

The physicians (70%) show resistance due to lack of interest in the information technology (X10) mostly. Except physicians and nurses, the other health personnel see the scare of making mistake (X2) is as an important resistance factor. The nurses do not find difference between these three resistance factors (X1, X2, X10).

Hypotheses Testing Results: The previously established hypotheses have been tested in this section and the results are listed in the Table-3.

According to Table-3, it could be seen that ten hypotheses are rejected. It can be said from the Table 3 that asym. p values and Chi-square (χ^2) values show that the factors " the interest in IT" and "need for IT training" do not vary to the gender. But gender plays an important role in defining the resistance factor at a significance level of 05. There is relationship between the inadequate interest in IT and IT-experience.

Chi-square value is 48,270 and asym. p is (p< ,05) significant. Similarly, the position and age of the personnel impact on the lack of interest in IT. The interest in IT affects on IT-experience, the position of healthcare personnel and the age of them, while the gender does not play a role.

On the other hand, IT experienced people emphasize more than others on the need for IT training. In addition, among the independent variables, only the position of the healthcare personnel has an effect on the perceiving the technology performance.

Conclusion

In our study, physicians, nurses and other health care personnel in five hospitals in Turkey were taken into consideration for investigating how the resistance factors differ from age, occupation, IT experience and gender. Not all results from this study are compatible with the results from the literature. For example, authors mostly emphasized the factors "fear of authority loss" and "lack of cooperation with teamwork" as important resistance factors in theory. In our study, however, the most important resistance factors have emerged as "inadequate interest in the technology" and "poor IT performance".

While our result related to "poor IT performance" as a major resistance factor is confirmed by Featherman and Pavlou[22], according to a study done by Kruse et al.(2016) about electronic health record adoption, the most common barriers were found as "the poor technical support and technical concerns", "resistance to changing work habits" and " lack of training"[37].

According to Czaja and Sharit, the users who are trained in computer found computers as more engaging, more helpful, and less cautionary than the inexperienced users[38]. Their finding is consistent with our result and this shows the positive correlation between interest of IT and IT- Experience.

Furthermore, our findings related to IT interest are agreed with the result of Kruse et al.[37] The perceived "IT complexity" with health information systems inhibit to use the technology. This result was also supported by many studies [23, 39]. The perceived ease of use and perceived usefulness are the components of TAM- model which is established by Davis and they play important roles in the resistance of physicians' using EMR[23].

Moreover, our study is compatible with the results of Cassidy and Eachus[40] so that the trained groups are also more IT experienced than the others. Our finding about "gender and need for IT training relation" is supported by the same study. Finally, in this study it is found that "age and need for IT training relation" is consistent with literature[41].

According to our study, IT- Experience, age and position has no relation with IT complexity of the system. But one of the studies denotes that the physicians have difficulties working with the EMR technology such as navigation difficulties (e.g. the number of clicks) because of their lack of IT Experience[24].

The performance of the IT can be improved. This could be achieved by taking the idea of young healthcare personnel. In addition, the health care personnel, especially middle aged and older must be encouraged to increase their knowledge about IT. Most of the female personnel see IT-complexity as a barrier for using information systems. Therefore, cognitive ergonomics can be used by IT and IS developers in designing more user-friendly information systems. It seems somewhat confusing that the most experienced personnel in the hospital refuse to use information systems due to inadequate interest in this technology. Mostly because of bad IS implementation experiences have caused this lack of interest to IT.

This study has some limitations since only five factors have been analyzed in five hospitals. But it is not certain that whether these results are confirmed by the hospitals located in other countries. Thus, the number of hospitals in different countries could be added to find out more significant results. Furthermore, the financial barriers such as initial cost and/or implementation cost or external barriers such as government policies can be taken into account in future studies as resisting factors. Since

this study focused on only users' perspectives on health information systems, those factors were excluded.

Acknowledgement

Table-3: Hypotheses Results.

Hypotheses	Chi-Square	df	Asymp. Sig.	Accepted?
H_{X1a}: The perceived poor performance of IT is not related to IT experience.	3,701	4	,448	YES
H_{X1b}: The perceived poor performance of IT is not related to the position of the personnel.	6,142	1	,013	NO
H_{X1c}: The perceived poor performance of IT is not related to age of personnel	3,803	4	,433	YES
H_{X1d}: The perceived poor performance of IT is not related to the gender	,073	1	,787	YES
H_{X2a}: The scare of making mistake is not related to IT experience	37,836	4	,000	NO
H_{X2b}: The scare of making mistake is not related to the position of the personnel.	11,760	1	,001	NO
H_{X2c}: The scare of making mistake is not related to the age of the personnel.	19,620	4	,001	NO
H_{X2d}: The scare of making mistake is not related to the gender.	,959	1	,327	YES
H_{X10a}: Inadequate IT interest is not related to IT-Experience.	48,270	4	,000	NO
H_{X10b}: Inadequate IT interest is not related to the position of personnel.	11,281	1	,001	NO
H_{X10c}: Inadequate IT interest is not related to the age of personnel.	71,577	4	,000	NO
H_{X10d}: Inadequate IT interest is not related to the gender.	1,888	1	,169	YES
H_{X11a}: Need for IT training is not related to IT-Experience.	9,855	4	,043	NO
H_{X11b}: Need for IT training is not related to the position of the personnel.	,013	1	,908	YES
H_{X11c}: Need for IT training is not related to the age of personnel.	16,459	4	,002	NO
H_{X11d}: Need for IT training is not related to the gender.	2,034	1	,154	YES
H_{X13a}: Complexity of IT is not related to IT-Experience.	4,373	4	,358	YES
H_{X13b}: Complexity of IT is not related to the position of personnel.	2,495	1	,114	YES
H_{X13c}: Complexity of IT is not related to the age of personnel.	3,915	4	,418	YES
H_{X13d}: Complexity of IT is not related to the gender.	5,841	1	,016	NO

Appendix: The resistance factors to the innovation in the literature

RESISTANCE FACTOR	8 Frambach and Schillewaert (2002)	9 Hadjimanolis (2003)	10 Keen (1981)	16 Kreitner (1992)	16 Griffin (1993)	16 Aldag and Stearns (1991)	16 Schermerhorn (1989)	16 Durbin and Ireland (1993)	17 Featherman and Pavlou (2003)	20 Davis (1985)	25 Ram (1989)	26 Lluch (2011)	27 Lapointe and Rivard (2005)	28 Laukkanen et al. (2009)	29 Markus (1983)	30 Levi and Lawn (1993)	31 Goktan (2005)	32 Walston (2011)	33 Carayannis et al.	34 Shoham et al(2012)	35 Chuang (1999)	36 Gil et. al (2005)	37 Roger (1995)	Frequency
Poor technology performance	1								1	1						1								4
Scare of making mistake		1		1				1			1	1		1										6
Fear of losing data security									1		1													2
Dislike the technology	1													1	1									3
Fear of work loss	1			1	1	1	1	1													1			7
Fear of changes in work process												1												1
Fear of decrease in salary																					1			1
Fear of authority-loss	1		1						1			1	1								1			6
Inadequate of experience with IT	1															1								2
Inadequate IT- Interest		1																						1
Need training	1	1	1	1					1			1				1		1						8
Fear of overworking		1									1	1						1						4
Technology complexity	1	1												1		1	1						1	6
Technology is time-consuming									1															1
Contrary to traditions											1		1						1	1				4
Unshared goals of organization															1		1							2
Lack of information sharing											1										1			2
Need for change is uncertain			1																		1			2
Suprise/Unreadiness for change				1																				1
Lack of teamwork / cooperation	1		1	1	1	1	1				1	1				1	1					1		11
Lack of trust in top-management				1	1	1	1							1										5
Lack of management support	1	1							1			1					1	1	1	1		1		9
Lack of technical support	1																							1
Incompatibility with social norms and beliefs	1										1						1	1		1				5

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