

Effect of Information Technologies Investments to the Future Plans: A Research in Health Institutions

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Abstract. Information Technologies is a factor that take place at the center of the lives of companies and human lives and that have the greatest positive share in easing the lives. While reaching information is considered to be the most important skill both for companies and people, the tool used in reaching and storage of information is technology. The development of the technologic developments in the world without slowing down, affects the service industry as well as all the other industries. Health institutions that have a great share in service industries have to follow the innovations and technological developments closely in order to survive in competitive market conditions and therefore they should make their plans in in accordance with these developments. In accordance with these statements, the aim of the study is; to search whether the information technology investments of health institutions in order to ensure customer satisfaction and sustainability correspond to the future plans or not. For that purpose, health institutions located in cities Gümüşhane and Trabzon in Eastern Black Sea Region, constitute the universe of the research. The data of the universe is obtained by survey data acquisition technique. Reliability and validation analyses were applied with definitional statistical analyses to the data obtained and the optimal scale structure for the structural model is attained. Goal oriented structural model is analyzed with structural equation model and AMOS 20 and SPSS 20 package programs. In accordance with the factors obtained as a result of the research it is stated that; factors such as information structures of the health institutions, information technology usage levels of the health institutions, information technology perceptions of the health institutions, the usage level of health institutions during decision making processes and technology compliance of health institutions are effective on the future plans of the health institutions.

Keywords. Information Technologies, Health Institutions, Technology, Patient Satisfaction, Planning.

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1. Introduction

When the world markets are examined globally, the orientation of all the companies to information and informatics attracts attention. Especially the health sector, which is one of the biggest in service industry, shows great improvement both in the world and in Turkey. A well-organized healthcare system may only be possible when the future plans are put into practice within the intended goals. The greatest item that may help in realization of these plans is informatics. Well-directed predictions and accurate calculations may only be

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realized with the help of these systems and expert technologies. In accordance with this, the objective of the research is; to search whether the information technology investments of health institutions in order to ensure customer satisfaction and sustainability correspond to the future plans or not. In accordance with the research objective, a research is conducted in cities Gümüşhane and Trabzon near Eastern Black Sea Region and the results are evaluated with the help of various statistical analyses and a structural model.

2. Literature Review

Howard (1999), stated in his research where he studied the argument that “there is a change in the ‘customer’ services due to the increase of the competition in healthcare services” that the hospital managers may apply a customer service plan in order to increase the customer loyalty and satisfaction. Reconstruction of healthcare services in United States of America led to an increase in the market competition. In the aforementioned research (Howard, 1999), the prediction stating that customer complaints may be decreased to a large extent and customer satisfaction may be increased with formal customer service training programs is tested. The findings obtained demonstrated that such information programs both increase customer satisfaction and decrease customer complaints as well as leading to an increase financial performances of the hospitals. (Yağcı & Duman, 2006).

Austin, & Boxerman (2003) stated that in healthcare management, information technologies are used effectively especially in patient record keeping stage and then, their usage increased in fields such as accounting and materials management in line with the requirements. After 1980’s, information sharing developed by means of electronic data networking. It is stated that the usage in healthcare will be effective as the software developments increase.

Brewin (2004), especially emphasized in his study that although the investments done in information technologies at first stage are quite high, in the long run they have high return of investments. Although high returns should not be expected, by means of information technologies, the legal cases that may be opened in the future due to the health detriments will be decreased to the minimum.

Bernstein, McCreless & Côté (2007), emphasized in their study that development and maintenance of business operations in healthcare industry depends on the investments in information technologies. Moreover, they explained the five factors that affect the routine success of information technologies in healthcare in their study.

Özata (2009), included 32 university hospital samples in his study, where aims to determine the activity level of university hospitals and to specify the importance of healthcare information systems in increasing activity levels of hospitals. As a result of the research, it is stated that the information systems affect the activity level of the hospitals positively.

Ömürbek & Altın (2009) have conducted a study about the hospitals located in city of İzmir, in order to usage level information technologies and healthcare information systems in healthcare industry.

Yücel (2010) studied healthcare information systems differentially through practices applied; and evaluated the effects of the healthcare information systems on employees and the risks for the hospitals. In the study, a cognitive model is developed in order to undesired effects of healthcare information systems and the model is applied to two hospitals in America.

In the study conducted by Işık & Akbolat in (2010), presented that the healthcare employees consider themselves more competent, while using Office programs, operating systems and hospital information systems with computer

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hardware, in the study they conducted on 554 healthcare employees in order to reveal the information technologies and hospital information systems usage skills and to evaluate their views about the benefits of the hospital information systems.

Phipps, Pottas & Korpela (2014) conducted a study in order to determine the factors effecting the adaptation and compliance of healthcare systems to hospital information systems in South Africa. In the study, they give place to the reasons of the resistance to compliance to new technologies and suggestions for encouragements to use these technologies in the future.

Ahmadi, Nilashi & İbrahim (2015) tried to determine the factors that effect the future decisions of the hospital managers during the hospital information systems adoption process with the help of a model about the compliance of technology, environment conformity and recently developing human, environment and technology conformity.

Villalba-Mora et al. (2015) conducted a study that aims to determine the usage level of hospital information systems and factors that effect the employees during the process they use these systems. The data collected from the employees by survey method was subject to descriptive statistical analyses. Then, a main component analysis and a logit model are used in order to explain the acceptance and usage effect of the technology. As a result the utility level that the users perceive is determined however, the financial problems have arisen to affect the usage level the most.

Ahlan & Ahmad (2015) tried to attract attention to the fact that these systems are not being used widely when quality, activity, patient safety and health cost decrease are considered with the usage of information technologies in healthcare. In the study, some hospital information systems were examined and the reasons were studied. Moreover, some information is given about the problems that arise about the acceptance of the hospital information systems and how to overcome these problems.

3. Methodology and Findings of the Research

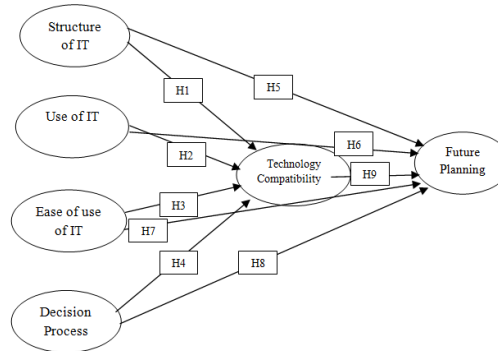
3.1. Research Objective

The main objective of the research is; whether the information technology investments of health institutions in order to ensure customer satisfaction and sustainability correspond to the future plans or not. For that purpose, it was aimed to determine how effective these factors such as software structure of health institutions, information technology usage of the health institutions, information technology perceptions of the health institutions, information technology usage during the decision-making process of the health institutions and technological compliance of the health institutions on the future plans of the health institutions.

3.2. Model and Hypotheses of the Research

The structural model that was conducted in accordance with the research objective is presented in Figure 1.

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Graph 1. *Structural Equation Modeling of Research*

The hypotheses that are studied within the scope of the structural model are stated below:

H1: The informatics structures of the health institutions have effects on the compliance of health institutions to technology.

H2: The information technology usage level of health institutions has effects on the compliance of health institutions to technology.

H3: Ease of use of information technologies of health institutions has effects on the compliance of health institutions to technology.

H4: The information technology usage level of the health institutions during the decision-making process has effects on the compliance of health institutions to technology.

H5: Informatics structures of the health institutions have effects on the compliance of health institutions to technology.

H6: The information technology usage levels of the health institutions has effect on the future plans of the health institutions.

H7: Ease of use of information technologies of health institutions has effects on the future plans of the health institutions.

H8: The information technology level during the decision-making process of health institutions has effects on the future plans of the health institutions.

H9: The compliance of health institutions to technology has effects on the future plans of the health institutions.

3.3. Sample Process, Method of Analysis

In the research the data is obtained through surveys. The surveys are applied to the managers and administrative staff of the private and public health institutions operating in Gümüşhane and Trabzon. The volume of the sample is measured as appropriate sample body 217, where corresponding 0,05 significance level as $z=1.96$ (sensitivity) = 0,05 and p and $q=0,5$ are taken (Yazıcıoğlu & Erdoğan, 2004:50). The survey is applied to 220 managers chosen with random sampling method by the researcher who conduct the article and applied through face-to-face interviews. Deficient and faulty ones are eliminated and 195 ones are taken into consideration. Survey form consists of two sections. The first section of the questions consists of 5 questions containing demographic features of the sample body. The second section consists of 33 variables that have 5-point likert scale in order to measure the opinions and attitudes of the companies within the sample body about information structures, information perceptions, usage level of the information systems during the decision-making, conformity to technology and future-oriented plans. The variables are as follows; 1. Strongly Disagree, 2. Disagree, 3. Neutral, 4. Agree, 5. Strongly Agree. The most appropriate sample structure for the structural model is reached by applying reliability and validation analyses together with definitional statistical analysis to the data obtained. Goal-

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oriented structural model is analyzed with structural equation and with AMOS 20 and SPSS 20 package programs.

3.4. Findings

3.4.1. Findings Concerning the Demographic Features

Demographic features of the participants are presented in Table 1.

Table 1. Demographic Features of The Participants

Gender	Frequency	Percent	Age	Frequency	Percent
Male	155	79,460	20 -30	79	40,5
Female	40	20,540	31-40	79	40,5
			41 -	37	19,0
Education	Frequency	Percent	Task	Frequency	Percent
Associate	120	61,6	Manager	77	39,5
Undergraduate	62	31,8	A. Manager	48	24,6
Graduate	8	4,1	Chief of Medicine	70	35,9
PhD	5	2,6			
Firm	Frequency	Percent			
Public	158	81			
Private	37	19			

As can be seen on Table 1, 81% of the health institutions are public, 19% are private hospitals and the 39.5% of the participants are managers, 24.6% are assistant managers, 35.9% are chief physicians. 61.6% of the participants constituting the sample of the research are college graduates, 31.8% are university graduates and 6.7% are post-graduates and have doctor's degrees.

3.4.2. Reliability and Validity Analysis Results

In the research, Cronbach Alpha Coefficient, which is one of the internal consistency analysis methods, will be used in order to measure the reliability of the scale. Cronbach Alpha Coefficient is the most commonly used method among the internal consistency analyses. Within this most commonly used method to measure internal consistency, Cronbach Alpha value that takes values between 0 and 1 is requested to be at least 0,70 and above (Altunışık et al., 2005). The general Cronbach Alpha coefficient of the variables included in the research model is found 0,952 and this coefficient presents that the scale is considerably reliable. A confirmatory factor analysis is used in order to test the validation of the research. Confirmatory factor analysis is a analysis method, which is used in order to determine the relationship between the implicit variable and the observed variables that are projected to form the implicit variables one by one (Şimşek, 2007).

Table 2. Confirmatory Factor Analysis Results of the Scale of the Research

Scales	χ^2	χ^2 /df	RMSEA	GFI	AGFI	CFI	NFI	TLI	RFI
Information Technology Structure	20,094	4,016	0,071	0,964	0,891	0,947	0,932	0,894	0,864
Use of Information Technology	20,468	2,274	0,081	0,967	0,923	0,969	0,947	0,949	0,912
Ease of use Information Technology	9,882	1,235	0,035	0,984	0,958	0,995	0,976	0,991	0,956
Information Technology Usage in the Decision-Making Process	19,141	2,393	0,085	0,969	0,918	0,978	0,963	0,958	0,930
Technology Compliance	6,308	1,575	0,054	0,987	0,951	0,992	0,979	0,980	0,947
Future Planning	3,048	1,145	0,023	0,986	0,957	0,998	0,987	0,989	0,952

The conformity scales of the confirmatory factor analysis may be seen in Table 2. The reason why this analysis is used at this stage is that the validation of the variables taking part in the content of the factor should be tested before they are

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concluded to the defined structural model. Moreover, another reason is to be able to reach the most appropriate measurement model for the model. When confirmatory scales are examined, as a result of the confirmatory factor analysis it is seen that χ^2 /df , RMSEA, GFI, AGFI, CFI, NFI, TLI and RFI values ensure the ideal confirmatory scales, it is concluded that most appropriate factor structure is reached for each scale in hand.

3.4.3. Structural Equation Analysis Findings

Goodness of Fit Measures determine at what rate the theoretical model, which is determined at the first stage of Structural Equation Model, explains the data obtained. These measures are the ones that make the decision whether the model should be accepted or rejected. As it can be seen below, the most commonly used goodness of fit measures are evaluated and presented in Table 3.

Table 3. Goodness Dimensions of Structural Model

Compliance Measurement	Ideally Compliance Value	Acceptable Compliance Value	Compliance Value of Factor
χ^2	(P>0,05)	0,000	692,120
χ^2 /df	$\chi^2 /df \leq 2$	$\chi^2 /df \leq 5$	1,705
RMSEA	0.00<RMSEA<0.05	0.05<RMSEA<0.10	0,060
GFI	0.95<GFI<1.00	0.90<GFI<0.95	0,924
AGFI	0.90<AGFI<1.00	0.80<AGFI<0.90	0,886
CFI	0.95<CFI<1.00	0.90<CFI<0.95	0,907
TLI	0.95<NFI<1.00	0.90≤NFI<0.95	0,894

When goodness of fit measures are examined, χ^2 /df , RMSEA, GFI, AGFI, CFI and TLI values ensure the ideal measures and therefore it can be stated that the model is within appropriate and acceptable measures.

Table 4. Standard Regression Loads

Variables	Regression Load	Variables	Regression Load
Compliance Technology	0,262	Compliance Technology	0,138
Information Technology Status		Use of Information Technology in the Decision-Making Process	
Compliance Technology	0,335	Future Planning	0,957
Use of Information Technology		Compliance Technology	
Compliance Technology	0,403	Future Planning	-0,196
Ease of use Information Technology		Use of Information Technology	

Standard loads are like the beta values of the regression and show the influence power of the relationships. The value of these loads should be at most 1 and at least 0 (Hair et al., 1998:614). In accordance with the standard regression loads presented in Table 4, the highest influence value is seen between the information conformity of the company and the future planning of the company. This means that the conformity of the company to the technology is 95.7% of the company's future plans.

Table 5. Evaluation of Hypotheses

Structural Relations	Standard Regression Loads	Standard Error	Critical Ratio	P Value	Hypothesis Result
Technology Compatibility Factor (R ² =0,520)					
H1	0,262	0,085	1,976	0,048	Accept
H2	0,335	0,066	4,130	0,000	Accept
H3	0,403	0,124	2,869	0,004	Accept
H4	0,138	0,058	1,913	0,046	Accept
H9	0,957	0,222	5,871	0,000	Accept
Future Planning Factor (R ² =0,978)					
H5	-0,069	0,093	0,514	0,607	Rejection
H6	-0,196	0,082	-2,060	0,039	Accept
H7	-0,258	0,145	-1,674	0,094	Rejection
H8	0,128	0,064	1,705	0,088	Rejection

The values that will be used in evaluation of standard and non-standard loads and hypotheses are presented Table 5. In Table 5, it is also evaluated whether these relationships are meaningful or not and whether they are in the desired form or not. In this evaluation, p values that are produced by AMOS program for each relation are used. Since the directions of the hypotheses are positively unidirectional, unidirectional test values are taken into consideration (Hair et al., 1998, p.613). Therefore, p values those are lower than 0,05 at the level of $p < 0,05$ are considered meaningful. 97.8% of the dependent variable “future plans of the hospital” can be explained by the independent variables that are used in the research. In other words, independent variables are very effective on the “future planning” factor that is the dependent variable. As a result of the statistical model analysis, how important the information technologies are for the hospitals and that now they are benefitting intensively from these technologies for the future plans can be seen clearly. When hypotheses are examined it is seen that H5, H7 and H8 hypotheses are rejected and all the other hypotheses are accepted.

4. Conclusion

The fast development of information technologies and the speed of information expansion led to a great change in business models. Where the companies used to benefit from information systems only in routine operations in the previous periods, they started to use information systems actively in all departments in today’s business models. The companies try to carry on all of their operations in conformity with the information technology techniques in order to gain competitive advantage. Especially getting accurate results in planning practices, which affects the sustainability that is one of the main goals of the company concerning the future, may only be possible with accurate and exact calculations. At this stage as the research also presents, it is not right to constitute and apply these plans without the information technologies. In accordance with this, in the research at which level the health institutions, which are located in Black Sea Region, are at information technology usage, their information technology perceptions, their usage levels of these technologies during the decision-making processes are identified and at which level they are effected from these technologies about their future plans is determined. The information technology conditions of the health institutions affect their technology compliance at the rate of 26.2%. In other words, when the company strengthens, improves the information technology structure by 1 unit, increases the technology compliance level by 0.262 units. An increase in the information technology usage of the health institutions by 1 unit, also affects their information technology compliance level by 0,335 units positively. H9, which is the main hypothesis of the research and which states “the compliance of health

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institutions to technology has effects on the future plans of the health institutions”, has been accepted with 95.7% degree of influence. The future plans of the health institutions are affected completely in a positive way as much as the health institutions’ technology compliance level increase. In other words, with the help of technology, the technology-oriented plans make for the future affect the company positively. Moreover, it is observed that the usage of the information technologies has a negative effect on the future plans of the hospital. This means that the current information technology usage of the hospitals is not at the desired level yet. Since the hospitals are inadequate yet about using the methods such as computer-aided design models, advanced simulation methods, they experience difficulties to find information experts who will apply these systems while constituting future investment plans. For this reason, information technology usage levels are not only limited to prosecuting routine operations and using major technologies. The level of information technologies usage has not carried to the desired level; the future plans are interrupted in this manner. When the fact that the information and technology increasingly continue to gain importance in the world is taken into consideration, it is clearly seen that the most important competitive tool is has become information technologies. The planning made can be put into practice at the desired level and therefore strengthens the competitiveness level of the companies. Accurate plans, which are constituted with the help of technology, definitely increase the implementation power and consistency of the companies. As it can be understood from these results, information technology is an important factor in the region that the research is conducted. For that reason, it has become a necessity for the companies to develop their infrastructures, which will strengthen this factor rapidly, in the 21st century. It can especially suggested to the health institutions located in this region to employ expert staff in order to improve their information technology usage levels. In another study, sample field may be extended and these results may be generalized to a greater universe.

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