Information Technology Infrastructures in Healthcare Reform Plan in Jahrom’s Peymanieh Hospital

Tahereh Arbab1, Mohammad Sadegh Sanie2, Abdolhossein Ayoubi3, Ali Mosallanejad4, Fatemehsadat Mousavifard5

1Information Technology Engineering (E-commerce) Department, Islamic Azad University, E-Campus, Iran.
2Dep. of Anesthesia and Critical Care, Assistant Professor at Jahrom University of Medical Sciences, Iran.
3Biomedical Engineering Department, Amir Kabir University, Tehran, Iran.
4Information Technology Engineering (E-commerce) Department, Islamic Azad University, E-Campus, Iran.
5English Literature Department, Islamic Azad University, Arak, Iran.

Abstract

This study is aimed to investigate the effects of Information Technology (IT) infrastructures in healthcare reform plan management implemented in Peymanieh Hospital, Jahrom, Iran. This is a descriptive and co relational study in which a total number of 230 employees of Jahrom’s Hospital were investigated by simple random sampling. The data were collected by researcher-made questionnaires. To confirm reliability, Cronbach’s alpha coefficients were obtained 0.82 and 0.86 for IT infrastructures and healthcare reform plan questionnaires, receptively. Content validity and reliability factor were also used to confirm validity of questions. The reliability factor of impact of IT infrastructures on healthcare reform plan was also achieved using confirmatory factor analysis and 8.52 LISREL indicating acceptable reliability. The data were analyzed using correlation and regression multivariate tests with SPSS 22. The results showed that Information Technology infrastructures include: technical, architectural or support and physical infrastructure. And management and operations processes played a significant role in healthcare reform plan.

Keywords: Management and operations processes, Information technology, Healthcare reform plan, technical, Architecture or support and physical infrastructure.

Introduction

Health views in today’s world have found a broader perspective and special attention is paid to non-medical expectations. The growth of expectations and attention of people to safety, quality and justice has increased pressures to create responsive health systems against performance. Putting the issue of justice in formulating analytic objectives and framework of health systems not only is significant with strategies due to demonstrating a commitment to justice, but also evidences show that people in different communities give a high priority to the issue of justice. Using primary health care strategies, in recent years helped achieving significant improvements in overall levels of population health and raising its indicators, but one of the most important concerns of policymakers is still implementing justice in health zones, and establishing access to health services. Iran’s Ministry of Health and Medical Education as the main custodian of the national health system receiving presidential supports, supports from his cabinet and the parliament has seriously begun healthcare reform plan with three approaches including, financial protection of population, creation of justice in access to health services, and improvement of quality of services in the second half of May 2014 across the country (Evaluation of Healthcare Reform Plan in Treatment Area, 2014).On the other hand, establishment of effective information and communication networks and development of information and communication channels among various units of the organization are managers’ important duties. Establishment of effective communication relying staff’s assistance leads to better understand their needs,
desires and motivations. The importance of communications is so that the significant part of managers and leaders’ working times is devoted to it [1].

Dissemination of the best practical methods based on technology and selection of appropriate targets is needed in efforts of problem solving related to health and treatment systems and development of information technology in this sector. In the direction of responding to information needs of professionals in the field of Medical Sciences as well as collaboration with technological advances in the field of informatics, tendency has increased to take advantage of information technology by specialists of this field to be informed from new scientific information, clinical issues, treatment, and educational problem solving [2].

Information technology is a branch of technology that enables researchers to use data and data processing in the fields of storage, transmission, management and control of data using hardware, software and network [3]. Health information technologies (HITs) consist of an enormously diverse set of technologies for transmitting and managing health information for use by consumers, providers, payers, insurers, and all other groups with an interest in health care [4].

Information technology is essential to handle the scale of the data that underlies personalized medicine, with the expectation of ensuring data integrity through all pieces of required functionality [5] HITs are advanced, complex, permeate the entire health care delivery process, and have a great potential to improve quality and reduce cost of health care [6]. The importance of HIT in enhancing a healthcare provider’s effectiveness, image, and quality of care is proving to be one of the most effective methods of transforming the healthcare[7].

**Information Technology Has the Following Infrastructures [8]:**

- Technical infrastructure: including hardware, software and networks;
- Architecture or support and physical infrastructures: including models, information processes, organizational structure, and location of the system establishment;
- Policies or quality of management and support services: including sourcing, audits, security, service level, and so on;
- Management and operations processes: support from infrastructure by internal or external providers, including planning and management of tools, sales management, providing technical support for all and soon.

The effects of information technology infrastructures, in this paper, including technics, architecture or support and physical infrastructures, on the other hand policies or quality of management and support services, and management and operation processes were considered as independent variables effective on healthcare reform plan dependent variables.

So, the Main and Secondary Objectives are as Follows

**The main objective**
Optimal use of IT in implementation of healthcare reform plan

**The secondary objective**

- Quick, inexpensive, stable, and secure access to maximum individuals’ overall health records using IT.
- Equal access to health counter resources and services
- Development of medical sciences knowledge in direction of health improvement and safety maintenance of people using IT.
- Development of e-governing services in health system.

In general, special objectives of IT in health system is more flexible in investment programs including electronically enhancing developing innovation capability, facilitating achievement and changes in health information, electronically increasing flexibility of transferring information, and their applicability[9].

In addition to these objectives, health information technology’s has an impact on patient’s experience which can be seen in quality, communication, and safety, technology tools, technology as an enabler; and finally, the electronic health record (EHR) and access. It is important to note, that these impacts occur after Information technology infrastructure is well settled [7].
Statistical Sample
The statistical sample in this study is consisted of administrative and service staff, nurses, general practitioners, and specialists of Jahrom’s Peymanieh Hospital. The number of this population is 575 individuals. The sample size is calculated using the following formula, since the study was conducted as an experimental survey [10].

\[ n_0 = \frac{Z^2 pq}{d^2} \]
\[ n = \frac{n_0}{1 + \frac{n_0}{N}} \]

Where,

\( N \): community size which here is 575 people
\( n \): the number of samples
\( d^2 \): error amount is considered 95% while the probability of mistake is placed at level of 0.05.
\( Z \): the normal variable amount of unit is equal to confidence level of \( 1-\alpha \) which is 1.96.
\( P \): the ratio of selection success, estimation of variable quality ratio using previous studies (victory is considered 0.5 in this study)
\( q=1-p \): the ratio of failure of selection regarding the amount of \( P \) is 0.5. In this case, the amount of variance reaches to the maximum amount of itself, namely 0.25.

Since society variance is unknown, the above formula is used. Based on the calculations, approximately 230 people of 575 existing people in the statistical society are obtained as the sample. According to the statistical society, the sampling method was a completely random one which was performed in different working shifts of the Hospital.

Research Tools
Questionnaire is one of tools which was used in this study for field investigation and surveys. The used questionnaires in this study were researcher-made questionnaires related to information technology infrastructures that were effective in implementation of healthcare reform plan, and the questionnaire of healthcare reform plan was considered for investigation of goals and explanation of impacts of IT infrastructures on healthcare reform plan. Validity and reliability of measurement scales: to measure scales of IT infrastructures, 3, 4, 4, and 6 questions were considered for variables of technical infrastructures, support or architectural and physical infrastructures, policies or quality of management processes and support services, management processes and operations, respectively. And 20 questions were considered for healthcare reform plan according to a set of guidelines of healthcare reform plan in treatment area of Treatment Deputy, Statistical and Information Technology Office of Ministry of Health.

An adequate accuracy was performed in designing of questionnaires so that the questions be simple and to have enough clarity. A number of 30 questionnaires were prepared and distributed to determine their reliability. The questionnaires were consisted of 40 questions that reduced to 37 ones after exploratory factor analysis. To approve reliability, Cranach’s alpha coefficient for questionnaires was obtained 0.82 and 0.86 for IT infrastructures and healthcare reform plan, respectively, which are indicative of reliability and confidence to the research tool. Content validity and reliability factor were also used to test the validity of questions. Experts and academic viewpoints were also used for assessing the validity of questionnaires content.

At this stage, necessary reforms were performed with various interviews and obtained the mentioned individuals. And so the researchers became assure that the questionnaires measure the same desired features they wanted. The questionnaire reliability factor test was confirmed regarding impact of IT infrastructures on healthcare reform plan using confirmatory factor analysis which is obtained using 8.52 LISREL. This shows acceptable validity of the questionnaires.

Methodology
Data analysis of the questionnaires in two descriptive and inferential parts was performed using SPSS22.

Mean and standard deviation, as well as correlation with Pearson correlation and simultaneous multiple regression were respectively used for data analysis at descriptive and inferential statistics levels. Moreover, all variables were studied prior to
the statistical analysis using Kolmogorov-Smirnov Test for detection of normality of distributions.

**Results**

**Normality Test of Data**

Normality test is one of the most common cases of application of distribution matching. According to Table 3 that Table 2 shows Pearson correlation coefficients and the significance level among the variables for obtaining an overview of the relationships among them as a correlation matrix.

Table 2: Correlation coefficients results among the study variables

<table>
<thead>
<tr>
<th>Rows</th>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Technical infrastructure</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Architecture or support and physical infrastructures</td>
<td>0.330**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Policies or quality of management and services</td>
<td>0.109</td>
<td>0.106</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Management and operations processes</td>
<td>0.449</td>
<td>0.050</td>
<td>0.307**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Healthcare reform plan</td>
<td>0.731**</td>
<td>0.724**</td>
<td>0.086</td>
<td>0.166</td>
<td>1</td>
</tr>
</tbody>
</table>

Significance level: **: p<0.01, *: p<0.05

Table 2 shows that technical, architecture or support and physical infrastructures at significance level of 0.01 and management and operations processes at significance level of 0.05 have positive and significant relationship with healthcare reform plan. However, policies or quality of management and support services do not show a significant relationship with healthcare reform plan.

**Discussion**

IT infrastructures have influence on healthcare reform plan. To investigate IT infrastructures impacts on healthcare reform plan, after calculation of correlation coefficients which its results are presented in Table 2, simultaneous multivariate linear regression test was used, and related results are presented in Table.

Table 3: Multiple linear regression test

<table>
<thead>
<tr>
<th>Variable Scale</th>
<th>Predictor variable</th>
<th>B</th>
<th>β</th>
<th>t</th>
<th>P (Sig)</th>
<th>R²</th>
<th>F</th>
<th>dF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthcare reform plan</td>
<td>Constant coefficient</td>
<td>1.047</td>
<td>7.952</td>
<td>0.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Technical infrastructure</td>
<td>0.364</td>
<td>0.591</td>
<td>16.533</td>
<td>0.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Architecture or support and physical infrastructures</td>
<td>0.445</td>
<td>0.518</td>
<td>16.148</td>
<td>0.000</td>
<td>0.806</td>
<td>234.182</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Management and operations processes</td>
<td>0.083</td>
<td>0.086</td>
<td>2.594</td>
<td>0.010</td>
<td>0.898</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Policies and quality of management and support services</td>
<td>0.061</td>
<td>0.048</td>
<td>1.374</td>
<td>0.171</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It becomes clear according to Table 3 that the variables of technical, architecture or support and physical infrastructures as well as management and operations processes can significantly influence on implementation of healthcare reform plan (p<0.01). According to R² (coefficient of determination) in the above analysis can conclude that 80.6% of
variations in healthcare reform plan are explained by the variables of technical, architecture or support and physical infrastructures and management and operations processes. It was found based on the significant level of regression (P (regression)=0.000) that the considered model has the ability to generalize to community. Using the results of the above Table, regression line equation can be written as follows:

Technical infrastructure: X₁, architecture or support and physical infrastructures: X₂, management and operations processes: X₃, and healthcare reform plan: Y.

\[ Y = 1.047 = 0.364X₁ + 0.445X₂ + 0.083X₃ \]  

Therefore, by observation of regression line equation can conclude in this study that the variables of technical, architecture or support and physical infrastructures, and management and operations processes of information technology infrastructures have been effective on healthcare reform plan and are able to confirm the assumption of this research. But, policies and quality of management and support services because of having greater error than 0.05 do not enter to the regression equation and do not show significant influence on healthcare reform plan. These results are consistent with previous finding related to correlation.

Conclusions

Successful implementation and use of IT systems in health system or any other systems is under influence of various factors such as economic, social, cultural, and political factors. Recognition of effective factors in IT applications leads to increased accuracy and acceleration in deployment of this technology [11].

According to the obtained results of this research, IT infrastructures including, technical, architecture or support and physical infrastructures, and management and operations processes on implementation of healthcare reform plan show positive and significant impact. Today, organizations operate in environments which are constantly changing in terms of economic, political, social, and technological aspects. This is very concerned especially in organizations like hospitals which are associated with public health. Organizations, in this invasive perspective, should be continuously reconfigured and adjusted to maintain competitive conditions, increased productivity, changing workforce, as well as emergence of global environment, and growing attention to population health. Studies indicate that one of the main reasons for differentiation of organizations from each other is the degree of using IT in organizational activities.

In other words, organizations that have widely and optimally used IT have sustainable competitive advantage and from viewpoints of beneficiaries, they have more differentiation compared to other organizations. Use of IT in health system or any other organizations or systems depends on various factors that acceleration in application of this technology happens by recognition of these factors. IT infrastructures are among these factors.

The results of this study like other studies’ results show that technical, architecture or support and physical infrastructures, and management and operations processes are IT infrastructures that have had a significant impact on healthcare reform plan. This means that if executives of healthcare reform plan in hospitals pay attention to IT infrastructures, they will achieve more success.

Also, according to the obtained results, recognition of capabilities and infrastructures of information technology as well as awareness of its requirements for implementation of final healthcare reform plan are essential to plan for optimal IT utilization and to facilitate transfer of data and successful implementation of this plan.

So, in order to improve the implementation of the plan and to achieve to better results, successful implementation and operations of information technology in health system, further recognition of various and effective infrastructures of information technology including technical, architecture or support infrastructures and physical infrastructure, management and operations processes are recommended. Without obtaining necessary training, use of IT and preparation of its infrastructures cannot optimally be effective in healthcare reform plan. This technology can help to fill the gap between demand for information and its availability in the plan; but it needs increased awareness and skills of staffs in using information-communication-electrical resources. Using IT and paying
attention to its infrastructures as well as use of its instances such as e-mail, blog assistants, e-talking and short message services can achieve to better results in presentation of optimal application services of IT in hospitals. Also, reduced bureaucracy and information technology strategic program designing to use IT correct and accurate with regard to its effective infrastructures have particular importance. Those managerial strategies that managers adopt, as well as organizational structure and human resources can influence on application of IT in organizations and achievement to better results and higher performance of healthcare reform plan. On the other hand, presence of a regular strategic plan for application of IT and allowing its implementation namely its required infrastructures is considered as organization tools and can appropriately act effective in acceleration of applying this technology in hospitals.

References

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