

## Weighting the IT Tools Based on Their Importance in Improving Operational Performance of the Hospitals; Using AHP

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### ABSTRACT

Application of IT tools in healthcare organizations is an effective way to improve operational performance. Hospitals increasingly use IT tools in several aspects of their operations. In fact, IT tools are able to decrease the time and cost and increase accuracy in doing tasks and operations in hospitals. This study aims to rank IT tools in hospitals based on their importance in improving operational performance. In the first step, review on the literature showed IT tools can be applied in hospitals in three clusters including administrative, clinical, and strategic. Also, in each cluster there are several items which explain application of IT tools in a specific operation. In the next step, this study collected opinions of 20 experts (doctors and IT administrators) with experiences in Iranian hospitals to calculate weights of IT tools. AHP method was applied to evaluate the weights and rank the tools. Finally, it was achieved that application of IT tools in clinical cluster has the most contributory role in enhancing the operational performance of the hospitals. Administrative cluster and strategic cluster have respectively the next important roles. Furthermore, in each cluster the important items were identified. Finally, this study suggests the hospitals to consider usage of IT in clinical cluster as the most contributory area and recommends them put their efforts more in this field.

**KEY WORDS:** Information Technology, Healthcare organizations, Operational performance, AHP.

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### INTRODUCTION

Information Technology (IT) can be a very helpful tool in an organization's effort to realize a competitive advantage (Glaser, 2007). The way in which application of IT tools influence productivity and performance of companies is an important question in organizational research (Baker et al., 2008). Specifically, there are some clear evidences which indicate effective application of information technologies instead of traditional methods is a way for enhancing the performance of the organization. The healthcare industry is widely recognized as information-intensive and IT is considered to be an intrinsic component of the success of healthcare organizations such as hospitals (Leidner, et al., 2010). Healthcare institutes are notably information-intensive and therefore must benefit through applying information technology tools in an advanced level (Smith et al., 2000). With purpose of increasing the performance, hospitals, similar to other types of organizations in the service sector, are recently endeavoring to apply IT tools. Authors such as Glasser and Hess (2011) believe that application of IT tools in different area of operations helps hospitals to improve operational performance. In fact, When the IT is used to automate existing activities and operations in hospitals such as financial management, clinical, and other administrative transactions, it is able to decrease the processing time and costs and also improve the accuracy (Watcharasriroj and tang, 2004). Menachemi et al. (2006) stated that IT tools in healthcare organizations, e.g. hospitals, can be applied in three operational sectors consisting administrative, clinical,

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and strategic functions. Bhattacharjee *et al.* (2007) explained that usage of IT tools in hospitals assists different operations including clinical operations, administrative operations, and strategic operations which finally end in high operational performance. On the other hand, there is a general agreement among researchers that the driver of IT impact is not the investment in the technology, but the actual usage of the technology is the effective factor which influences the performance of the healthcare organizations (Devaraj and Kohli, 2003). In other words, this is the real application of IT tools in different area of operations that enables the health care organizations to improve their performance.

This study aims to calculate the weights of IT tools in three operational clusters, including administrative, clinical, and strategic clusters, based on their contributions in improving operational performance. This attempt can generate information for hospitals which helps them to improve their operational performance through effective application of IT tools. In other words, this weighting achieves that using IT tools in which cluster is more useful and contributory for hospitals. The knowledge obtained from the results can be a reliable basis for decision-makers in hospitals to put their attempts on the more useful items.

#### **Application of IT tools in administrative area**

According to Menachemi *et al.* (2006), using IT tools in administrative cluster covers such activities as billing, payroll, and supply chain management information systems. Particularly, according to Baker *et al.* (2008), activities such as registration, billing, scheduling, and customer relationships management can be conducted by IT tools in hospitals to serve the patients better than traditional methods. Also, operations such as benefit administration, personnel administration, and time and attendance can be done more accurate by IT tools in hospitals which help them to handle their tasks. It seems application of IT tools in administrative area helps healthcare organizations to increase their operational performance.

#### **Application of IT tools in clinical area**

Among the most important components of healthcare information systems are the functions that support clinical management of patients (Janna *et al.*, 2005). According to Menachemi *et al.* (2006), using the IT tools in clinical cluster means the application of these tools to improve patient care and includes pharmacy and laboratory information systems, computerized physician order entry (CPOE) systems, as well as electronic health records. Further, according to Sequist *et al.* (2005), the application of IT tools empower the hospital to store clinical data on physical examination findings (e.g., blood pressure), laboratory and radiology results, and medication prescriptions. This not only help the hospital in correct decision making through reminders and alerts but also contribute them in team working, time management, and task allocations. Furthermore, Esmaeilzadeh *et al.* (2010) divided the application of IT tools in clinical cluster into two main parts. Firstly, IT tools as the electronic medical records helps hospitals to make, store and recover the information and charts of the patients. Secondly, IT tools as the clinical decision support instrument give professionals useful advice. In fact, there are some knowledge-based systems which use patient data as an input and by the use of series of reasoning techniques can generate diagnostic and treatment options as well as care planning (Walter and Lopez, 2008).

These abilities help the hospital to respond any changes in patient or operational condition (Glasser and Hess, 2011). All these benefits finally end in high operational performance of the hospital in servicing the patients.

#### **Application of IT tools in strategic area**

It has become almost impossible to make a strategic decision without involving information technology (IT) in modern hospitals (Meyer and Degoulet, 2010). Menachemi *et al.* (2006) stated using IT tools in strategic cluster embraces such activities as managed care software, nurse staffing systems, and executive information systems. Furthermore, Bhattacharjee (2007) stated that several activities in strategic area such as outcome and quality management, cost accounting, flexible budgeting and decision support can be effectively conducted by IT tools in hospitals which finally help them to improve their performance. All these indicate application of IT tools in strategic area helps organization in healthcare sector to enhance their performance.

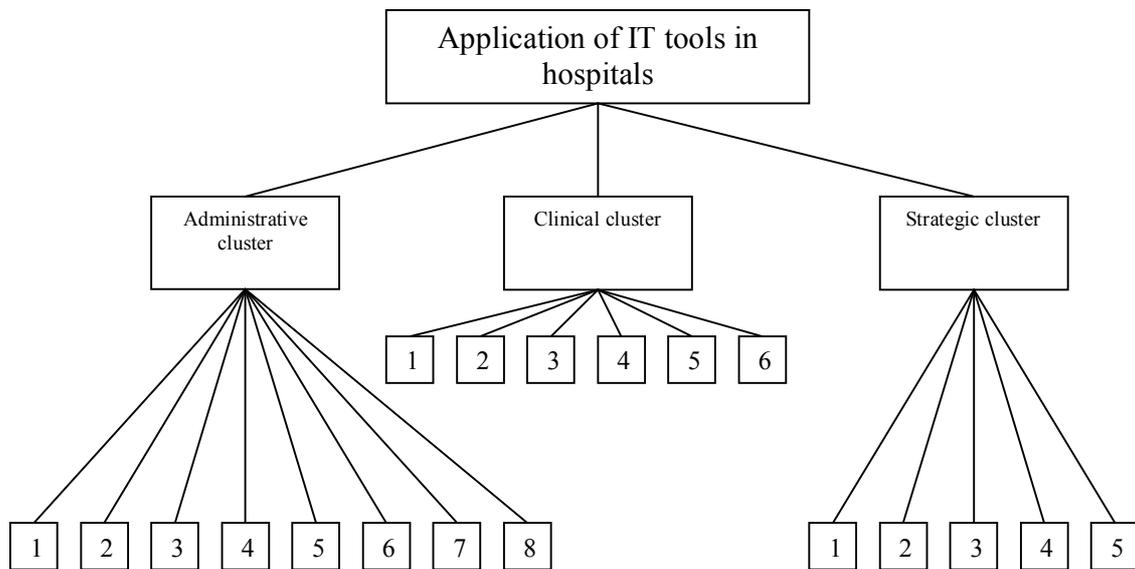
### METHODOLOGY

Based on the review on the literature, several activities which are usually conducted by applying IT tools in hospitals are presented in table1. In this part, these activities are ranked based on their contributions to the hospitals in improving their operational performance. Through this ranking, finally, this is achieved that application of IT tools in which cluster is more useful and contributory for hospitals. This study obtained opinions of 20 experts (including doctors and IT administrators) who have experiences in Iranian hospitals and medical centers to rank the items. Analytic Hierarchy Process (AHP) technique is applied to rank the items.

Table 1. Activities which are conducted through the application of IT tools in hospitals and medical centers

Application of IT tools in administrative area	Application of IT tools in clinical area	Application of IT tools in strategic area
1. Patient scheduling	1. Electronic medical record	1. Outcome and quality management
2. Patient registration	2. Pharmacy information system	2. Cost accounting
3. Patient billing	3. Radiology and laboratory information system	3. Flexible budgeting
4. Customer relationship management	4. Telemedicine system	4. planning system
5. Benefits administration	5. Clinical decision support system	5. Decision support systems
6. Time and attendance	6. Clinical data repository	
7. Personnel administration		
8. Supply chain management		

Also, figure 1 shows the hierarchical structure of the usages of IT tools in hospitals.



#### AHP procedure

The technique was developed by Saaty in 1980. According to Bui (1987), AHP has its foundation on the concept of priority. According to Badri and Abdulla (2004), the AHP is developed based on three principles including constructing hierarchies, establishing priorities and logical consistency. According to Chin et al. (1999) and Bayazit (2005), AHP procedure involves four steps including:

1. Building the AHP model
2. Collecting data (expert opinions) using pairwise comparisons

3. Calculating normalized priority weights for the factors

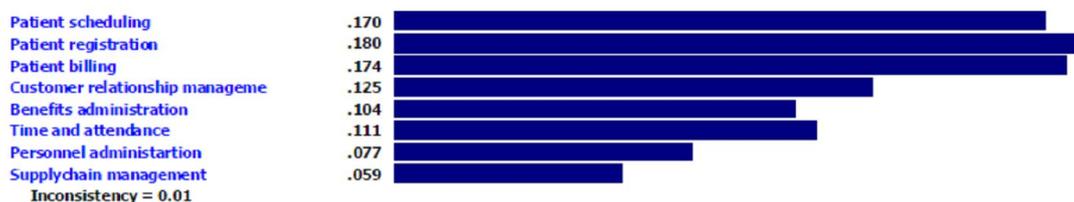
4. Analyzing the priority weights

Chen *et al* (2007) stated that in AHP procedure a CR is usually used to assess overall consistency of pairwise comparison matrices which should be less than 0.1.

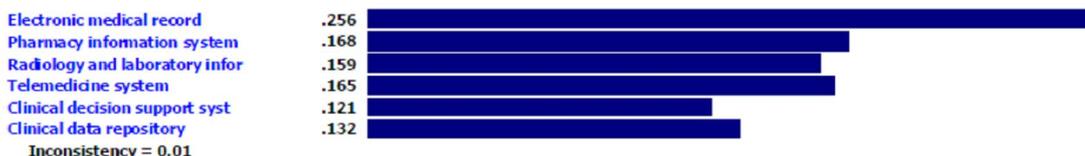
However, in order to conduct AHP technique, Expert Choice software is usually applied by researchers. This study applied Expert Choice software to perform AHP method based on opinions of the experts with experiences in Iranian hospitals.

### RESULTS

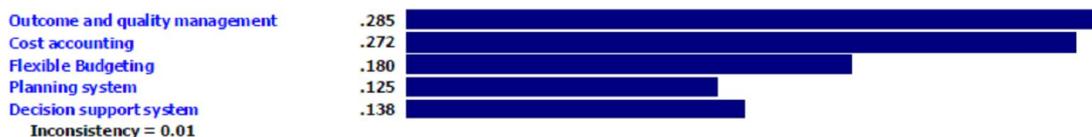
Based on the opinions of the experts in Iranian hospitals and medical centers, the AHP technique was conducted. Results of the AHP technique show that patient registration (0.180), patient billing (0.174), and patient scheduling (0.170) are respectively the most contributory usages of IT tools in the administrative cluster in hospitals, because they have the highest weights. Also, it is shown that the inconsistency index (CR) is 0.01 which is less than 0.1 and acceptable.



Further results of the AHP method indicate that electronic medical record (0.256), pharmacy information system (0.168), telemedicine system (0.165), and radiology and laboratory information system (0.159) are the most contributory benefits of application of IT tools in the clinical cluster in hospitals. Also, we can easily see that the inconsistency index (CR) is 0.01 which is less than 0.1 and acceptable.



Also, the AHP analysis shows that outcome and quality management (0.285), cost accounting (0.272), and flexible budgeting (0.180) have the highest weights and consequently provide the highest benefit for hospitals through application of IT tools in the strategic cluster. Further, the results indicate that the inconsistency index (CR) is 0.01 which is less than 0.1 and acceptable.



Finally, results of AHP indicate that application of IT tools in the clinical cluster is the most important area of usage of information technologies in hospitals and medical centers. Also, the inconsistency index (CR) is 0 which is less than 0.1 and acceptable.



### DISCUSSION AND CONCLUSION

This study tries to investigate the role of IT tools in enhancing operational performance of the healthcare organizations. Particularly, this is an attempt to rank and weight the IT tools applied in hospitals based on their importance in enhancing operational performance. Review on the existing literature showed that IT tools can be applied in three clusters. Firstly, IT tools can be applied in the administrative area in the hospitals. Hospitals can apply IT tools effectively to facilitate administrative activities such as registration, scheduling, billing, and customer relationships management which finally end in improved operational performance. In the second cluster, or clinical area, IT tools can be applied by hospitals in two different parts; IT tools not only can be used to make, store and recover the patient's data, but also can be used to give advice to the professionals. In the third cluster, or strategic area, IT tools help hospitals in activities such as flexible budgeting, cost accounting, decision support, etc. From the discussion, it is understood that effective application of IT tools in the administrative, clinical, and strategic clusters have several benefits for hospitals which contribute them to increase their operational performance.

In the next step, the AHP technique was applied to rank IT tools in each cluster by using experts' opinions. Results of the AHP technique showed the most contributory IT tools in each cluster. Also, after conducting the AHP technique, it was obtained that application of IT tools in the clinical cluster has the highest weigh and consequently is the most important area in enhancing operational performance. Usually, the results of the AHP method are useful for organizations in determining the allocation of the resources (Cheng et al., 2002). Consequently, this is recommended for hospitals to consider application of IT in the clinical cluster as the most contributory area and put their efforts more in this field.

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