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Relationship between Maintenance Knowledge Management in Healthcare Facilities with Quality Aspects of Accreditation Canadian International in Mashhad Razavi Hospital

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ABSTRACT

Since building maintenance at the hospital plays a key role as a support activity and an acceptable level of performance without an effective maintenance management support, is inaccessible. In Razavi hospital, Maintenance Knowledge Management System (MKMS) has been implemented for optimal managing of facility maintenance and improving the accreditation standards. This research contains two phases: in phase one, we evaluates the effect of this system on the aspects of intellectual capital, including human capital, structural capital and relational capital by collecting data with interviews, questionnaire and review of documents and records. In phase two, we have studied the connection between intellectual capital and Accreditation Canadian International. Then we gave the adapted questionnaire out and resultant data were analyzed by Structural equation modeling technique and Smart PLS software. We used Cronbach's alpha test for evaluating the reliability, also we have used Kolmogorov-Smirnov test for determining the normality of questionnaire. The results in this research indicate a positive correlation between aspects of intellectual capital and maintenance knowledge management system.

KEYWORDS: Knowledge Management; Accreditation; Intellectual Capital; Maintenance; Healthcare Facilities; Accreditation Canada International

1. INTRODUCTION

Considering the preservation and promotion of social health and assignment of its solemn responsibility to healthcare system it is obvious to any expert that this important issue becomes possible just through providing coordinated and desired services by various subsystems of this system. One of the key sectors of any organization especially hospitals, is the installation (which is called its heart) because it could be dare said that by its malfunction or incapability, all system is malfunctioned. Installations maintenance in hospital, plays a key role as a support activity. Also, considering the costs of healthcare especially construction and maintenance of hospitals, it is necessary that a comprehensive management and consideration to be governed. Therefore, the importance a management system based on the knowledge in this field in hospital, is specified.

The accreditation means the systematic evaluation of healthcare services provided by the centers with specified standards. The standards which emphasizes on frequent quality improvement, the patient being an axis and the improvement of patient and staff security. The health care policy and understanding what is related the care quality and emphasizing on fundamental principles for integration of healthcare system development and its dynamism, forms the basis of accreditation methods of hospitalization, Accreditation Canadian International. This standard is one of the most effective methods for healthcare services organization is for the assessment and the improvement of services quality. Since, Razavi professional Hospital is one of claims to attain accreditation standards at international and national level, therefore, in this hospital knowledge management system in this field has been used for the optimized management of hospital installations maintenance and the improvement of accreditation standards. In this research, we have studied and evaluated the impacts of this system's application on the performance of technical department of Razavi hospital, in order to achieve the objectives of this field and the strategic objectives of the hospital through comparing before and after system application and its impact on the improvement of quality dimensions of accreditation international Canadian. Since in various papers, the direct and positive relationship between knowledge management and the dimensions of intellectual capital has been approved, therefore in this research first the impact of maintenance knowledge management on intellectual capital aspects (including structural, human resources and customer capital) has been evaluated and then it has been dealt the relationship between stated quality dimensions in Canadian accreditation standards.

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1. RESEARCH LITERATURE

1.1. Knowledge Management

Knowledge management, is a fast evolving approach and has great consideration on recent challenges for the increase in efficiency and the improvement of the impact of some business- oriented procedures along with frequent innovation [1]. The need for knowledge management based on business society understanding growth stems of this reality that the functional knowledge in organizational performance and access to the benefits of sustainable competition is considered an important element [2]. It also includes the methods through which organization, manages its knowledge assets which include : gathering, saving, transfer, application, updating and creation of knowledge [3]. Egbu [4] believes that knowledge management is referred to a changing procedure and the type of effective management of the knowledge for benefit. In order to manage, many models which show the various knowledge management dimensions, resulted that Mertin Model, as the a general model as for procedures [5] : creation, saving, publication and knowledge application could be better model for present research.

2.2. Knowledge Based Repair and Maintenance Management System

To lead the scattered information in Repair and Maintenance system, a smaller or subsystem is required which is called repair and maintenance knowledge management software system [6]; because without using computer, gathering and appropriate utilization of information, will be difficult and probably impossible. Several soft wares have been provided to the markets which have the responsibility to receive preliminary information, issue agenda for repair and maintenance, save and record repair and maintenance activities and measurement of various indices. Today, repair and maintenance soft wares which are called CMMS, are of the great importance in repair and maintenance management and also The improvement of the repair and maintenance unit level of the organization. Repair and maintenance Software, provides the possibility to implement Deming Cycle and application of knowledge management in the organization. In application of a repair and maintenance, this issue is of great importance that the software is not applicable alone and first the repair and maintenance system of the organization shall be systematically applied, then the possibility of software application is provided in the organization [7]. Establishment and application of an appropriate repair and maintenance software in a set that can support Deming cycle and repair and maintenance knowledge management and causes the improvement of repair and maintenance capabilities. Moreover, the increase in management reports and information for appropriate management is and essential issue. Knowledge based repair and maintenance software system, is a system that is implemented according to the technology of soft wares under the web and service- oriented and is designed according to repair and maintenance knowledge management cycle. The cycle of repair and management knowledge, is defined as, Fig. 1.



Fig. 1. Repair and Management knowledge management cycle

1.2. Intellectual Capital

"Stewart believes, intellectual capital is a set of knowledge, intellectual assets, experience and organizational competition and learning which can be applied to create wealth [8]. In fact, intellectual capital of all staff includes organizational knowledge and its capabilities to create value added and causes frequent competitive advantages[9]. General definition which has had wider acceptance and it has been accepted by the academic society, is Bontis [10] classification which includes three components: human capital, constructional capital and relational capital or customer. Intellectual capital model which has been confirmed and used, is a model that Pathirage has been provided in a paper, Fig. 2, [7].



Fig. 2. Intellectual Capital Framework

In this intellectual capital model includes 3 key variables: human, constructional and relational (customer) which these capitals are interacted with each other. Human capital, is considered the basis of intellectual capital and main element in implementation of the responsibilities [11]. Human capital is the knowledge supply of an organization [12]. Bontis, describes human capital as organizational group capability in extraction of the best solutions out of individual knowledge of its staff [10]. This capital is the source of innovation and it has strategic value in the organization, therefore the organization can provide a competitive environment by the creation of an environment to share knowledge and to evaluate the staff, and consequently causes the increase in innovations by the improvement of this valuable capital [13].

Structural capital despite human capital is rooted in the unique texture of the organization and it is not changed by a staff leaving the organization [7], and it includes organizational structure, its culture, systems and procedures which is dependent on the situation in and outside organization and its strategically viewpoint [14].

Customer capital deals with invisible capital outside organization. Outside forces, have role in determining market power and situation. This capital applies on total communications and confidence among customers, colleagues, suppliers, and partners and contractors which through involving in organizational procedures, resolving the problems of cooperation sections, the increase in knowledge and understanding customer needs, delegation, commitment and creation of an environment to share knowledge, knowledge management goals are achieved [15]. In other words, customer capital is considered as a bridge and organizer of intellectual capital operation and a determiner in conversion of intellectual market to the market value [11]. Chen believes, the most important and fundamental part of intellectual capital, is human capital and two other capitals are a subordinate of human capital. In fact, their growth and development is limited without human capital.

1.3. Accreditation Canada International

The accreditation means systematic assessment of the centers providing healthcare services with specified standards. The standards emphasize on frequent quality improvement, patient –orientation, patient and staff safety improvement. Healthcare policy, understanding what is related to healthcare quality, concentration on fundamental principles for the correlation of health care system development and its dynamism form the fundament of "Accreditation".

One of the methods of hospital accreditation is Accreditation Canada International. The first program for Accreditation Canada international, was created in 1958 which is developed more than 50 years, and its name was changed to Canadian Accreditation community. Non- governmental and private organization has been invested by its members. Canadian Accreditation is the most effective method for the assessment and improvement of the services quality in health care organizations through using below procedures:

- Creation of a structured approach for quality improvement
- Helping organizations to follow up daily routine quality
- Applying quality on cultural organization

The quality dimensions of this standard include 8 cases: access, safety, society –oriented, environment, services continuity, customer- oriented, effectiveness, performance [16].

2. MATERIAL AND METHODS

2.1. Research Methodology

Present research method is essential in objective and it is also functional. Also, based on information gathering strategy, it is of descriptive –correlative type. In terms of location, is placed at items (library studies) level and field study (natural) level. Also, the research time- schedule is sectional. In order to gather data, also "the evaluation of inorganizational documents "questionnaire and comments received from experts have been used. On the other hand, in order to analyze and test statistics hypotheses, descriptive statistics indices and structural equation modeling techniques will be used, also SPSS and PLS Smart Soft wares will be used to explain and analyze variables and test existing hypotheses in research model.

2.1.1 Theoretical Pattern

In this research, the theoretical framework has been used, also this has been used in Mahmoodsalehi and Jahanyan [17] study. This model has been designed based on [8, 18, 11, 19 and 20].

As it is pointed out in Rao and Osei-Bryson [21] study, the final function of business of an organization is impacted through the interaction of three dimensions of intellectual capital (Human resources, constructional and customer capital). In this paper, the impact intellectual capital on business function has been tested through embedding knowledge management as the mediator factor and the results show that intellectual capital will follow the functional improvement, if the knowledge management system is used. Also in this research we have considered the Canadian Accreditation quality dimensions as the aspects of functional improvement and also we have studied the relationship between intellectual capital and these quality dimensions, in case the knowledge management system used. Fig. 3.



Research stages include two stages: At the First stage, the impact of the application of knowledge management system on intellectual capital dimensions has been evaluated. The hypothesis "The application of knowledge management system causes the promotion of intellectual capital aspects, Intellectual capital questionnaire [22] has been used, in order to test this hypothesis, in this way this questionnaire has been distributed among statistics population and then the knowledge management system has been established in the installation department of hospital and after 10 months form the application of this system, the same questionnaire was distributed among the same particular people. Therefore, pre-test and posttest were used with intervention factor of knowledge management system and it was analyzed by SPSS software. The results of this stage show that this intervention factor has caused the promotion of the intellectual capital [22]. Second Stage; At this stage, we have dealt with the relationship between intellectual capital and Canadian Accreditation quality dimensions. The hypothesis of this stage is "Intellectual capital questionnaire have been accommodated with Canadian accreditation measures text, in order to test this hypothesis (this accommodation was approved by 6 experts) and then a questionnaire that its questions include the selected questions of intellectual capital and Canadian Accreditation Measures (in cases that they have been accommodated), and then it was distributed in statistics population and the results were analyzed through using Smart PLS [23].

2.2. Material

In this research, two methods: Field and library methods have been used to gather information. In field study method after the evaluation of different methods and gathering professors view, the questionnaire was has been recognized as the most appropriate tool. SPSS and Smart PLS have been used for this research's data analysis at descriptive –illative level.

Targeted statistics population of this research, include: senior managers, all middle and technical and operational managers, Advisors and contractors, Installations staff for electricity, building and smart control center in Razavi Hospital, Mashhad. In structural equations method, 10 to 20 samples should be considered for each latent variable that the minimum number of samples are 200. Considering that intellectual capital has 3 latent variables and Canadian accreditation structure has 8 latent variables, so for this reason our total sample population is not so large and, its amount is 250 people, therefore, we consider the statistics sample as statistics population, so that calculating invalid questionnaires, we can reach the desirable answer.

The variables of this research are divided into the following:

Independent variable: Intellectual Capitals

Mediator Variable as moderator: Maintenance knowledge management

Dependent variable: Canadian Accreditation International

Dimensions which are remembered as latent variable, those are variables that are not directly observable. For this reason, to measure latent variables of items are used. These items are observable variables. Each one of the items which are raised as question, make a question. Independent variable of intellectual capital, itself has 3 latent variables, structural capital, human capital, communicational capital (customer). Dependent variable of Canadian Accreditation has 8 latent variables: focus on group, accessibility, security, job condition, patient -orientation, continuity of services, efficiency and effectiveness. Regarding middle variable "Maintenance knowledge management", considering research method used in this research, we considered no latent variable.

3. RESULTS

The impact of knowledge management system on intellectual capital dimensions (human capital, structural capital and communicational): T- Test has been used in order to compare before and after the intervention, the results showed that before and after the implementation of maintenance knowledge management system, there is a positive and significant difference in human capital, structural and communicational capitals (P=0.001).

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Test			Number	Range	Minimum	Maximum	Average	Standard deviation
Human	capital	before	200	21	35	56	47.26	4.12
system								
Human ca	apital after	system	200	21	37	58	50.64	3.99

Table 2. The impact of knowledge management system on structural capital								
Test			Number	Range	Minimum	Maximum	Average	Standard Deviation
Human	capital	before	200	34	40	74	62.55	5.3
system								
Human c	apital after	system	200	36	47	83	70.5	6.8

1 abic c	. The impact of	KIIOWICuge	management	on communicat	ional capital (C)	ustomer)
Test	Number	Range	Minimum	Maximum	Average	Standard Deviation
Human capital before system	200	15	24	39	30.39	3.32
Human capital after system	200	16	24	40	32.65	3.27

Table 3 The impact of knowledge management on communicational capital (Customer)

As it is observed in tables 1 to 3, the average points of human capital, structural and communicational components parts has been increased after the application of knowledge management system.

3.1.1 Reliability

As it is specified in Table 4, the amount related to these criterions meaning Cronbakh's Alpha and Combining Reliability of variables in all 6 variables, is higher than 0.7 which indicates an appropriate reliability of the model.

Research Variables	Combinated reliability	Cronbakh Alpha
Effectiveness	0.9837	0.9778
Human	0.9906	0.9889
Communicational	0.9914	0.9899
Society - Oriented	0.9808	0.9755
Work Environment	0.9876	0.9853
Structural	0.9921	0.9907

Table 4. The amounts combined reliability an	nd variables Cronbakh's Alpha
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3.1.2 Convergent Validity

Considering the appropriate amounts are for Cronbakh Alpha 0.7, for combined reliability 0.7, and for E.V.E 0.4, and all the standards in load factors measurement part which have an appropriate reliability status and confirmed Research Convergent reliability.

Table 5.	The amount of E.V.E for the variables
Research Variables	E.V.E
Effectiveness	0.9377
Human	0.9378
Communicational	0.9428
Society - Oriented	0.9110
Work Environment	0.9192
Structural	0.9470

3.2. Structural Model Fitness

After the assessment of measurement model fitness is then the time for research structural model fitness. As it was mentioned before the structural model section despite other measurement models, it does not deal with (observable variables) and just the latent variables are assessed along with their relations (Fig. 4.)



Fig. 4. Structural Model Fitness

3.3. T-Values

Several standards are used in order to evaluate research structural model fitness, which the first and most basic standard, are T-values (Fig. 5.). T values are the most preliminary standard for the measurement of the relationship between variables in model (structural section). In case that the amount of these numbers become more than 1.96, it is the sign of the accuracy of the relations between variables and consequently the confirmation of the hypotheses at 0.95 confidence level. However, it should be considered that the numbers only show the accuracy of the relations and the intensity of the relations among variables could not be measured by those numbers.



Fig. 5. General Model Fitness

3.4. CONCLUSION

In the present research, considering the output results of the software and the averages before and after intervention can be resulted that knowledge management system application can cause the improvement of different aspects of intellectual capital. As we observed in Razavi Hospital caused the changes in routine works of technical section. The procedures of service request from sections' authorities became systematic and this caused the facilitation and follow – ups of the issues in sections, which itself followed by the customer's greater confidence and satisfaction which in fact, they are the authorities of the sections.

The recorded information in system are accessible to everyone, therefore, the staff can use their colleagues' recorded reports and incase of the repeated problems occur, use previous experiences. In fact, this method helps that people's tacit knowledge to be accessed by other ones as explicit knowledge, and that will be shared.

Along this system, Staff professional training shall be also considered, so that the human capital can be empowered which it obviously leads to the improvement of the other areas.

3.5. Suggestions

It is suggested that through investment on professional training and educating staff in this field, we can forward greater steps in order to optimize the defined indices in this field. Considering the results of this hypothesis assessment and to study Canadian accreditation standards, for more safety of the staff and patients, it is suggested that the sizes of installations equipment also to be considered in the text of the standards along with medical equipment, because it can be said that medical appliances will not work in case of the deficiency of this section.

It is suggested that considering the results of interviews and the questionnaire's results, there should be more researches on the knowledge share and use better methods. It is suggested that search and evaluate other strategies for the improvement of intellectual capitals, because we can have the significant improvement in objectives and performance through the improvement of each dimensions of this capital.

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