



Designing a model for knowledge documentation in the Iranian medical university libraries by using structural equation modeling

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Abstract

Background: Organizational knowledge management requires a structure or framework to identify, extract and document knowledge. The review of knowledge management sources shows that since the late 1980s, several cycles have been introduced in the field of knowledge management, and the Mayer and Zack cycle has been one of the most important cycles. The purpose of this study was to design a model for documenting organizational experiences based on the view of point of Iranian libraries managers in medical sciences universities by using Mayer and Zack model.

Methods: The research method was survey and correlation schemes are used. The population of the study consisted of 209 managers and heads of central and hospital libraries. Sampling was a stratified random sampling method. data gathering was done in 2022 by questionnaire. path- analyses and structural equation modeling was used to data analyses. RMS-Theta measure was used to test the model.

Results: The results of the partial least squares test showed that the gathering knowledge and Knowledge refinement has a significant effect on knowledge documentation. Knowledge refinement had the highest and knowledge application had the lowest impact on knowledge documentation.

Conclusion: The results confirmed the effects of knowledge collection and refinement on knowledge documentation. Therefore, it is possible to rely on the designed model and effective factors of knowledge documentation and generalize the obtained results for knowledge documentation in libraries and information centers.

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Highlights

What is current knowledge?

Review of the literature showed that, there is not organized knowledge documentation in Iran's medical science libraries. and these libraries use the knowledge documentation of experts to share and transfer their tacit and objective knowledge, but this kind of knowledge documentation is not based on a specific model.

What is new here?

1. Agility and mechanization of the process of extracting, modeling, representing and documenting of experimental and specialized knowledge of managers and the experts of medical university libraries in Iran.
2. Creating a new context for the design of the organizational promotion system based on the competence of knowledge.
3. Creating and strengthening the knowledge culture among managers and experts of libraries of medical sciences universities of Iran.

Introduction

Knowledge is one of the most valuable assets of an organization. Knowledge is a combination of experience, values, information and insights of experts that offers a framework for evaluating and integrating new experiences and information (1, 2). In an organization, the knowledge held by the organization's human resources, and their valuable experiences can be transformed into new knowledge in the form of processed information (3).

If an organization has a strong knowledge management (KM), the chance of achieving success of that organization increases by giving importance to the role of knowledge, and this increases organizational productivity (4). KM is the explicit and systematic management of vital knowledge and processes related to the creation, organization, dissemination, use and discovery of knowledge (5). KM includes all the methods that the organization manages its knowledge assets, including how to collect, store, transfer, apply, update and create knowledge (6).

Effective KM increases the productivity of the organization. Knowledge can be the most essential asset of the organization and a vital tool to ensure its survival and increase its competitiveness (7). Organizations need KM to protect intellectual assets and create value within the organization (8).

According to opinion of Todorović et al. (2015), documentation means recording all processes of the organization, which is one of the tools of

knowledge management and causes effective efficiency, exchange of information and communication, sufficient use of experiences and lessons learned in the organization (9).

Shafiee et al. (2017) stated that documenting knowledge means systematically making available the information of scientific experiences and collections (10). In addition, Navidi & RiahiNia (2017) as well as Makvandi et al (2019) stated in their studies that documentation is one of the tools for acquiring knowledge from experts, and in other words, converting their hidden knowledge into open knowledge (11, 12).

KM is one of the key issues in higher education that has played a significant role in scientific progress and upgrading the scientific level of universities (13). Academic libraries are among the knowledge-oriented organizations in which a lot of knowledge is produced by managers and experts. A part of this knowledge is recorded in the form of documents, reports, etc., which actually has the status of objective knowledge. While the other part of it, which is formed in the form of experiences, skills and decisions of its employees, is hidden in the minds of the employees, and its transfer and application is done less. In these centers, due to the lack of transparency in the technical processes of knowledge registration, there is no specific model for documenting the knowledge of employees. This issue has caused a large part of the knowledge and experience of its managers and employees to be destroyed (14).

Therefore, it is necessary for university libraries to write and document the knowledge and experiences of their managers and employees in order to achieve their goals, improve their services and perform their duties correctly. The evaluation of knowledge and information science resources shows that the collection, documentation and preservation of organizational knowledge in Iran's medical sciences libraries is not in a good condition. In addition, due to the uncertainty of the process and the way of documentation, the organizational knowledge in these libraries has not been used in an optimal way. The present research was conducted with the assumption that Meyer and Zack's organizational life cycle model (including collection, refinement, storage, distribution and application of knowledge) has an effect on the documentation of organizational knowledge in the libraries of Iranian medical sciences universities. The main goal of the present study was to provide a practical model for documenting experience in the libraries of medical sciences universities in Iran based on the organizational life cycle model of Meyer and Zack (1996) (15). In addition, the most important effects of gathering, refining, storing, distributing

and applying knowledge on the documentation of knowledge in the studied society have been investigated.

collection, respectively. The results of Table 1 showed that the aforementioned variables had good diagnostic validity according to the Fornell-Larcker test.

Table 1. Differential validity (based on Fornell-Larcker test)

Variables	Knowledge distribution	Knowledge storage	Knowledge refinement	Knowledge application	Collecting knowledge
Knowledge distribution	0.718				
Knowledge storage	0.478	0.814			
Knowledge refinement	0.621	0.738	0.819		
Knowledge application	0.665	0.563	0.730	0.780	
Collecting knowledge	0.474	0.571	0.707	0.525	0.648

Table 2. Effects of endogenous variable

Effects of endogenous variables	Direct effect	T value (bootstrap)	Unexplained variance
Collecting knowledge	(R2= 0.469/ Q2= 0.252) 0.002***	2.98	0.271
Knowledge refinement	(R2= -0.602/ Q2= 0.181) 0.001***	0.318	0.306
Knowledge storage	(R2= 10/ Q2= 0.352) No significant: 0.558	0.600	0.288
Knowledge distribution	(R2= 0.245/ Q2= 0.099) No significant: 0.130	1.670	0.241
Knowledge application	R2= 0.154/ Q2= 0.253) No significant: 0.174	0.930	0.252

Bootstrapping based on n = 5.000 subsamples ***> 0.05, (based on t (4999), one-tailed test).

Table 3. The results of the evaluation of research model hypotheses

Hypothesis	Path coefficient (Beta)	Significant (T-value)	Reject/Confirm
Collecting knowledge has significant effect on documenting knowledge.	2.98	0.469	Confirmed
Knowledge refinement has significant effect on documenting knowledge.	3.11	0.602	Confirmed
Knowledge storage has significant effect on documenting knowledge.	0.60	0.100	Rejected
Knowledge distribution has significant effect on documenting knowledge.	1.67	0.245	Rejected
Knowledge application has significant effect on documenting knowledge.	0.93	0.154	Rejected

Methods

The present research was carried out by survey method and type of correlation design. Also, the method of path analysis and the model of structural equations was used to do it. The statistical population of the present study was made up of 209 managers, heads and assistants of central and hospital libraries all over Iran in September 2022, and finally 132 people were selected by stratified random sampling method. To estimate the sample size, Krejci and Morgan's formula was used with an error level of 0.05. The sample size was estimated to be 132 people, but 123 of them (92%) responded to the distributed questionnaires. The scale used in the questionnaire responded for this study was a 5-point Likert scale. For evaluation of the content validity, the opinions of experts were used, and for evaluation of the reliability of the items and its constructs, Cronbach's alpha coefficient, combined reliability, and the extracted average variance were used. SPSS version 26 software was used to describe the data and path-structural modeling based on partial least squares approach (Smart PLS 3.3) was used to analyze the data. In the descriptive statistics section, concentration indices and dispersion indices (including variance, standard deviation, minimum, maximum, skewness and elongation) were used. In the modeling section, to evaluation the reflective measurement model, the reliability and validity tests was used. In addition, to evaluation the quality of the structural model, the coefficient of determination (R2), the significance of the path coefficients (Beta) and redundancy (Q2) were applied and. Finally, for the overall test of the model, the rms-theta index was used.

Results

Reflective measurement model

The test of the reflective measurement model was conducted in two stages: reliability test and validity test. According to the results of this research, all factor loadings of the reflective measurement model were higher than 0.4 and significant at the 95% confidence level. In the reliability model related to reflective measurement models, values higher than 0.7 indicate the internal consistency of reflective measurement models. The composite reliability values for the variables of knowledge collection, knowledge refinement, knowledge storage, knowledge application and knowledge distribution were equal to 0.89, 1, 0.92, 0.92 and 0.88 respectively, which shows the internal consistency of the reflective measurement models.

To evaluate the internal validity of research variables, higher values of 0.5 indicate the similarity or internal validity of the reflective measurement model. The average variance index obtained from the software output is equal to 0.76, indicating the convergent validity of these variables. This index was 0.72, 0.81, 0.82, 0.78, and 0.65 for the variables of knowledge distribution, knowledge storage, knowledge refinement, knowledge application, and knowledge

Structural model quality test

According to the results of the current research, the R2 value obtained for the variables of knowledge gathering, knowledge refinement, knowledge storage, knowledge distribution and knowledge application were 0.29, 0.18, 0.35, 0.10 and 0.25, respectively. The quality of the structural model was also calculated by the Redundancy-CV (Red-CV) index. According to the results of the software output, the Red-CV index for the model variables was positive and its quality was proven.

The quality of the reflective measurement model was calculated by Communality-CV (Com-CV) index. This index actually measures the ability of the path model to predict the observable variables through their corresponding latent variable values. According to the results of the present study, the Com-CV index for the variables of knowledge gathering, knowledge refinement, knowledge storage, knowledge distribution and knowledge application was equal to 0.30, 0.33, 0.55, 0.38 and 0.50, respectively. All these values were positive and the quality of the reflective measurement model was confirmed.

In Table 2, the effects of endogenous variables are calculated. The Q2 index specifies the predictive power of the model in the dependent variables. According to the results, the first and second hypotheses of the research (including knowledge gathering and knowledge refinement, respectively) were confirmed, while the third, fourth and fifth hypotheses (including knowledge storage, knowledge distribution, and knowledge application, respectively) were not confirmed.

In Figure 1, the path coefficients of hidden variables (constructs) on knowledge documentation are displayed. According to that, the path coefficients of the collection variables (p-value=0.002) and knowledge refinement (p-value=0.001) were significant, while other variables were not significant.

Another indicator confirming the equations in the structural model is the significance of the path coefficients. The significance of the path coefficients is a big contributor to the sign of the beta coefficient of the model. If the obtained value is higher than 1.96 in the 95% confidence level, that relationship or hypothesis is confirmed. The results of the research (Figure 2) showed that some of the coefficients of the path of gathering and refining knowledge were significant and the research hypotheses related to them were confirmed at confidence level of 95%. Among the five stages of Mayer and Zack's model, the step of knowledge gathering and knowledge refinement were effective on knowledge documentation, while the impact of other variables, including knowledge storage, knowledge distribution, and knowledge application, on knowledge documentation in the studied society was not confirmed.

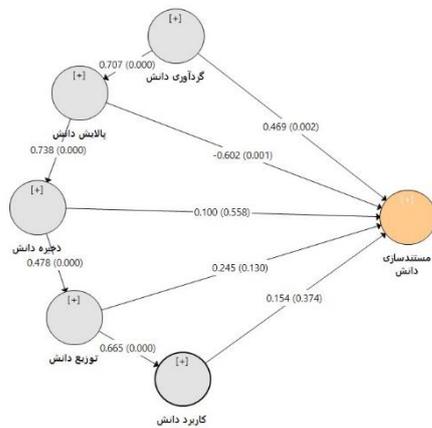


Figure 1. Path coefficients ($P < 0.05$) [A: Collecting knowledge, B: Knowledge refinement, C: Knowledge storage, D: Knowledge distribution, E: Knowledge application]

Overall model test

After the being obsolete of Goodness of Fit (GOF), two other indicators were used for the overall model test which including: (1) Standardized Root Mean Square Residual (SRMR) and (2) Root Mean Square theta (RMS-Theta) Indexes. If the SRMR index value is less than 0.1 or 0.08, it indicates the appropriate level of this index.

The basis of the RMS-Theta index is the correlation between the error variables or the residues. The smaller correlation amount led to the smaller RMS index, so it is more desirable. The minimum RMS value is zero and its cutting point is 0.12, and it is expected to be less analyzed for models (16, 17). The SRMR index of this model was 0.09 and the correlation index between the error variables or residues (RMS-TTAA) was 0.12, indicating the overall utility of the model. In the present study, the results of the overall model of the model in Table 2 showed that the collection and refining variables of the knowledge were approved by the meaning of the path coefficients at the level of 0.05. While, the storage, distribution and knowledge variables were not confirmed ($P > 0.05$) (Table 3).

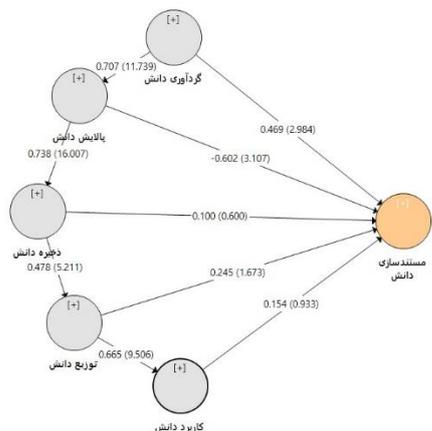


Figure 2. Significance of path coefficients ($t\text{-value} > 1.96$) [A: Collecting knowledge, B: Knowledge refinement, C: Knowledge storage, D: Knowledge distribution, E: Knowledge application]

Discussion

The results of the structural equation modeling test showed that, according to library managers, knowledge collection as one of the stages of Meyer and Zack's model had an impact on knowledge documentation. These results were similar to the study of (18) regarding the acquisition, collection and production of knowledge. Also, the results of the knowledge gathering section of the current research with the studies of (10, 15, 19-23) were similar. The difference between the results of the present study and the findings of the aforementioned studies is in the technique used to collect information, statistical tests, and structural equation modeling method. In the aforementioned studies, qualitative methods and content analysis were mainly used. One of the reasons for confirming knowledge collection as one of the effective steps on documentation by library managers can be librarians' familiarity with the principles of collection and information gathering. Another reason could be that collecting and providing information is one of the daily tasks of libraries and librarians. The third reason can be the existence of explicit rules and regulations for collection and collection of information in libraries.

In knowledge refinement, codified knowledge documents are described and prepared for easier retrieval. The results of the current research showed that according to the managers of the studied libraries, knowledge refinement has an effect on knowledge documentation as one of the steps of the Meyer and Zack

model. These results are in agreement with the results of studies by (10, 15, 19, 22-24), who confirmed the positive and significant effect of knowledge refinement, was similar. While, with the results of the studies of (18, 20, 21, 25, 26) who in the results of their study, the refining factor knowledge and its positive and meaningful role in documenting knowledge had not been confirmed, there was a discrepancy.

Another variable of Meier and Zack's model is knowledge storage. The results of the present study showed that the effect of knowledge storage on knowledge documentation was not confirmed, although knowledge storage had proper correlation coefficient with knowledge documentation, but according to the significance test of the coefficients, this correlation was not confirmed. Therefore, it is possible that the knowledge storage variable had an effect on knowledge documentation through other variables, but it was not directly effective.

The results of the present study were similar to the studies of (23, 27), who considered factors other than knowledge storage to be effective in documenting. While with the results of the studies of (10, 15, 18, 19, 21, 22, 25, 28), was inconsistent. The researchers of above-mentioned studies believe that knowledge storage is an effective variable in knowledge management

Two other variables of Meyer and Zack's knowledge documentation model include knowledge distribution and application. The results of the present study showed that the managers of medical science libraries believed that the distribution and application of knowledge do not affect the documentation of knowledge. In term of above mentioned variables, the results of the present study were similar to the studies of (20, 23), While the findings of this study was inconsistent with the results of the studies by (10, 15, 18, 19, 22, 28). Among the reasons for disconfirming the role of distribution and application of knowledge on documenting knowledge, according to the managers' viewpoint of the studied libraries, the following reasons can be mentioned: 1) the existence of ambiguity in the concept of knowledge for the studied society, 2) lack of distinction between data, information and objective knowledge and tacit, 3) lack of specific methods and patterns to store, distribute and use tacit knowledge in libraries and 4) lack of familiarity of librarians and library managers with documenting objective and tacit knowledge.

Conclusion

Organizations are forced to learn from their own experiences and those of other organizations, and therefore, circulating information containing science, knowledge and experience among people is one of the secrets of the success of today's organizations. Taking into consideration that documenting and transferring experiences is one of the basic factors in organizational learning, it is necessary to use the implicit and explicit experiences and knowledge of individuals and organizations in an appropriate way. The results of the study showed that documenting knowledge in the libraries of Iran's universities of medical sciences, from the point of view of the managers of these libraries, includes the collection and refinement of knowledge.

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Ethical statement

Written informed consent was obtained from all subjects prior to participation in the study. The study was approved by the Ethics Committee of Kermanshah University of Medical Sciences (ethical approval code: IR.KUMS.REC.1399.1188)

Conflict of interest

The authors declare that there is no conflict of interest regarding publication of this article.

Author contributions

Omid Chehri, data gathering, performed the literature review and was a major contributor in writing the manuscript. Alireza Isfandyari-Moghaddam analyzed and interpreted the data. Seyed Aliakbar Famil Rohani analyzed and interpreted the data. Faramarz Soheili analyzed and interpreted the data. All authors read and approved the final manuscript.

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