Providing a Model for Recording Human Capital Experiences Based On Knowledge Handbook in Marine Educational and Research-Oriented Organizations

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Abstract

The main purpose of this study is to provide a model for recording human capital experiences based on a knowledge handbook in marine educational and research-oriented organizations. Other objectives of this research are to find the complication of efficient implementation of learning management in marine educational and research-oriented organizations and to achieve a model for acquiring tacit knowledge of experts in the form of a knowledge handbook. In this direction, challenges and solutions to improve the situation and implementation of this model are presented. The present study is applied in terms of purpose and qualitative and quantitative in terms of the data collection method. This research has been done in two stages: the requirements for implementing a knowledge handbook and the step-by-step model for developing a knowledge handbook. Finally, both models were evaluated based on the structural equation approach with PLS software, and with the approval of experts, the validation steps were performed and a suitable solution was provided. The organization knowledge handbook implementation requirements model includes 5 main components of organizational leadership, Staff culture, technology, Staff learning, and system process, which are explained by 53 items; Also, the model of compiling the knowledge handbook of the organization includes approaches of recognizing and selecting the appropriate expert, organizing discourse sessions, reasoning the results, localization of knowledge and the phase of suggestions.

Keywords: Knowledge Handbook; Research-Oriented Organizations; Lessons Learned; Knowledge Management; Human Capital

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Introduction

The nature and dynamism of marine educational and research-oriented organizations requires a practical and modern perspective on organizational learning and attention to the evolutionary theory of learning economics(Astafieva et al., 2020). In this view, technology is essentially a kind of competence that has a high degree of skill and tacit knowledge and cannot be easily transferred(Ardoin et al., 2020). In this view we must use the term learning economy; because rapid economic change and the current technology-driven state that specialized knowledge is a short-term resource. But learning resources provide the ability to adapt to changing economic and technological conditions and provide the foundation for long-term competitive advantage; therefore, the term learning economy is very appropriate for the current dynamic conditions of marine educational and research-oriented organizations, which emphasizes access to the storage of specialized knowledge. Given the dynamism and scope of marine educational and research-oriented organizations in society, the maintenance and development of knowledge bases of society (as its most valuable assets), depends on the rapid and continuous learning of its people.

Organizational specialists are a treasure trove of valuable and learned experiences in the organization. Separation of each person from the organization means leaving a lot of experience and knowledge out of the organization, which requires a lot of money, rework and mistakes again(Jensen et al., 2020). The results of a survey conducted in Europe show that half of the organizations participating in the study lost key employees who had 43% of organizational knowledge, and their departure actually led to a setback in the organization. Also, 13% of them have lost employees who have caused problems for the organization. Most organizations believe that most of the knowledge they need is in the organization, but identifying, retrieving and applying it has been their main problem(Eken et al., 2020).

The variety of lessons learned in different parts of each organization requires people to think of a different scenario for each type of lesson learned. The solution helps to manage the lessons learned to identify and prioritize the types of lessons learned in the organization. Design the best methods and techniques for using the above cycle, depending on how people work in each area of work, as well as existing work processes and systems. Designing methods for identifying lessons learned, how to acquire and validate them, designing the appropriate structure for organizing them, and creating sufficient facilities for accessing and reusing lessons learned are topics that provide advice and guidance for each type of lesson learned. The most formal way to learn lessons is to use a learned lesson process. The lesson learned process is a process of deliberately using observations arising from an activity to achieve a lesson learned. To be aware of the amount of knowledge of individuals in the organization, these two questions must first be answered: What are knowledge-based investments? How should these assets be managed to maximize the return on profit?

In knowledge organizations, especially universities; there are knowledgeable and elite people, and since the presence of these people is temporary and they leave the organization after a while, a model should be provided that enumerates these lessons learned. Therefore, according to what was mentioned, the purpose of this study is to provide a model for recording human capital experiences based on manuals in research-based educational organizations. Carrying out this plan makes it possible to maintain organizational knowledge and share it among the members of the organization and especially the newly hired employees. Another advantage of this plan is the training of employees towards fully specialized training tailored to the work needs of each individual.

Knowledge handbook is a practical tool in the discussion of learning statistics. This tool is completed solely on the basis of experts' tacit knowledge, and what is recorded in this tool is applied knowledge, given the cycle it takes to turn tacit knowledge into explicit; It has a very high validity and reliability and as a valuable treasure and an important achievement in the field of knowledge management, it is possible to avoid wasting time and money by referring to it and use it as a comprehensive document in the organization(Telford, 2018). What distinguishes the knowledge handbook from other knowledge management tools; Existence and expression of key points and solution of a problem after reviewing the theoretical issues related to projects is deeply gained from the valuable experiences of experts in dealing with project issues and challenges and recording these points in the knowledge handbook according to the cycle for which taken; It is fully and explicitly stated. In fact, a knowledge handbook, like other handbooks, has the ability to quickly and easily provide key points about a topic; But what distinguishes this handbook is the combination of experts' tacit knowledge with relevant discussions and environmental parameters about the problem in the real world, and what may not be noticeable until the project is actually done.

2. Literature

2.1 Knowledge and organization management

"knowledge" is used interchangeably in the literature and practice with other concepts such as intangible assets, capabilities, and skills(Evans et al., 2017). Adjei and Dei Explain that the part of knowledge that is easier to define is the collection and integration of different information(Adjei and Dei, 2015).

Ramohlale (2014) defines knowledge as a mixed flow of experience, credibility, and textual information and expert insights that provide a framework for estimating and sharing new experiences and information.

Knowledge is associated with understanding, and this understanding helps to distinguish between tacit and explicit knowledge(Ramohlale, 2014). Tacit knowledge is based on the axis of action that is obtained through personal experience, often its nature is subjective and is the manifestation of beliefs and values. This knowledge can be transmitted through community and interaction between individuals(Zazkis and Leikin, 2010). Explicit knowledge is encrypted knowledge and academic knowledge that is obtained through information systems, copying, coding and recording and sorting information by organizations(Ragsdell et al., 2016).

The increasing complexity of the compact parts of knowledge and the fact that expertise is distributed in organizations require organizations to participate in shared knowledge development processes(Rönkä, 2020). To be successful, tacit and specific knowledge must also be shared. Potential barriers to coordination costs and a reluctance to share tacit knowledge, although more partners can increase knowledge, but coordination costs are likely to outweigh these benefits. Sharing tacit knowledge is not something that organizations want to do(Ranucci and Souder, 2015, Nisar et al., 2019). However, it is possible that they do not necessarily need to disclose all of their tacit knowledge to their partners, but rather transfer a limited portion of the project(Evers and Chappin, 2020).

Knowledge management is used to exploit the intellectual capital in an organization using information technology(Abualoush et al., 2018). Early in the development of knowledge management, Davenport and Prusak (1998) provided a well-cited definition for it: the process of absorbing, processing, sharing, and using knowledge effectively. This is a simple, clear and general definition(Ketcha Djiffouet, 2019).

According to Rowley (2000), knowledge management is the development of a company's knowledge in order to advance the goals of the

organization. Managed knowledge includes explicit, documented knowledge, and subjective and tacit knowledge. Management requires all the steps involved in identifying, sharing and creating knowledge(Dei and van der Walt, 2020b). This requires the creation of systems and repositories of knowledge and sharing and facilitating the sharing of knowledge and organizational learning. Organizations that are successful in knowledge management are more likely to consider knowledge as an asset and develop organizational norms(Dei and van der Walt, 2020a). Kundu (2013) provided another definition of knowledge management: A discipline that promotes an integrated approach to identifying, recording, evaluating, marketing, and sharing all of an organization's information assets(Bairi et al., 2013). These assets may include individuals, systems, databases, and documents. Ramohlale (2014) introduces the ultimate knowledge management policy of organizing, sharing and collecting knowledge(Ramohlale, 2014).

The current business environment is defined by the short life cycle of the product(Lin and Chen, 2017). Therefore, organizations that want to continue to succeed in an ever-changing market need to revise existing business models and emphasize innovation toward sustainability. In addition, not only to address current challenges but also future challenges, organizations are required to regularly monitor developments in the market and society(Lopes et al., 2017). Knowledge management can help identify, acquire, apply and disseminate critical knowledge, which in turn can be beneficial to the sustainability of the organization. For example, knowledge management can support organizations in developing business models of cyclical economies that can be used to achieve sustainable organizational performance(Bashir and Farooq, 2019). In addition, knowledge exchange between organizations can enhance social change and thus help organizations to better achieve a sustainable approach(Wątróbski, 2019).

Knowledge sharing is the process by which knowledge is exchanged between two or more people. This knowledge can be encrypted or implicit. Encrypted knowledge is knowledge that can be formally written and expressed, but tacit knowledge includes the experiences and skills developed by individuals(Ragsdell et al., 2016). Tacit knowledge allows companies to compete profitably because it is difficult to copy, write and put together. Another distinction that can be made is between general and specific knowledge. General knowledge is the knowledge that basically constitutes most products and services in a particular sector(Bratianu, 2015). While specific knowledge is knowledge that enables organizations to offer products or services that are different from their competitors, this is part of the core capabilities of companies(Evers and Chappin, 2020).

2.2 Organizational knowledge and lessons learned

Knowledge is a mental concept and depends on one's understanding and social context; Therefore, it can be assumed that the organizational knowledge contained in the company documents such as rules, policies, records of actions and decisions, plans, depends on the understanding of the individual or team during the process of knowledge formation and updating(McClory et al., 2017).

Today, within the framework of the organization, the discovery of knowledge is attributed to researchers such as Draker (1993) who express knowledge as the source and power of management(Hebibi et al., 2019). Wiig (1997) has explained that knowledge is a kind of belief and Polanye (1958; 2009) has examined the distinction between tacit and explicit knowledge(Wiig, 1997, Hildrum, 2009). Davenport and Prusak (2000) have explained knowledge in organizations not only in documents and knowledge repositories but also in organizational procedures, processes, procedures and norms(Davenport and Cronin, 2000). Polanye's (1958)

study formed the basis of the authors of Nonaka and Takeuchi (2007) theory, who stated that although explicit or coded knowledge is objective, it can be easily communicated without deep experience(Dragicevic et al., 2020, Nonaka and Takeuchi, 2007). Polanye's (2009) claim that "... we can know more than we can say". Man creates knowledge by engaging himself with objects through a process. Thus, tacit knowledge is composed of cognitive and technical elements(Duffield and Whitty, 2015).

Projects fail due to lack of learning in the project team or lack of knowledge sharing. Therefore, knowledge management tools and techniques can be used for communication risks between project team members(Anbari et al., 2008). It is important for the organization to manage knowledge risk, which requires the identification, dissemination and application of knowledge related to potential organizational and project risks to help predict risk management and response analysis(Evers and Chappin, 2020).

In short, organizational knowledge is the knowledge of how to respond to the business environment, behaviors, and actions that are embedded and distributed in previous organizational works, systems, processes, and cultural customs. They are network elements that together create a specific organizational response(Hanna et al., 2020). The institutionalized literature on learned processes offers many changes to the three main stages of the process. Identification (registration), dissemination (transfer) and application (implementation)(Duffield and Whitty, 2015).

Identification: Techniques for identifying and recording common lessons are: Reflecting the lessons learned from the lesson. O'Dell and Hubert (2011) point out that there are common questions that focus on this: "What was supposed to happen? What really happened?" Why was there a difference or change? And who else should know this information? "These are identification methods and tools that are often confused with fully learned processes(O'Dell and Hubert, 2011, Sharkey, 2018).

Dissemination: Dissemination and transfer often refers to programming, authentication, storage, search, retrieval, sharing, and knowledge training(Wang et al., 2011).

Application: The application of knowledge often requires considerable effort, commitment, and understanding of the behavior of individuals for the organization and individuals, because this is where the learned application process is typically broken down(Duffield and Whitty, 2015).

Nakashima and Krupnik (2018) emphasize the need to understand cognitive psychology when examining the effectiveness of tacit knowledge in the learning process. Another challenge of organizational learning is that each person has a distinct learning technique, and this learning depends on the individual's ability to acquire and use it effectively and in a timely manner(Nakashima and Krupnik, 2018). Utilization is seen as the last piece of the puzzle learned in the lesson. "... The implementation of any [learned] system must be driven by a strategic business need (e.g. learning) that adopts a holistic view that takes into account the consequences of project processes, tools and people"(Carrillo et al., 2013).

The application is also in the form of a project learning roadmap, consisting of three main components: The main elements, which include the various processes that make a difference in the methods learned in the lesson, are conceptualized. Actions that include the actions required by both the company and the project team in that company An executive guide that is a kind of checklist to ensure the completion of steps and actions(Carrillo et al., 2013).

This literature offers countless technology solutions for storing, recording, and accessing lessons learned. It is important to determine what works for an organization and is constantly monitored and updated to keep it current and relevant(Duffield and Whitty, 2015).

2.3 Key factors in the success of knowledge management in knowledge-based organizations

2.3.1. Knowledge strategy

One of the success factors of knowledge management is having a clear and planned strategy. Knowledge strategy shows what path an organization chooses to achieve its knowledge management goals and what capabilities and resources it can employ. In the knowledge management literature, there is a consensus that an organization's knowledge strategy should be linked to that organization's business strategy(Goryainova et al., 2020).

2.3.2. Learning programs

To develop knowledge policies in any organization, employees must be fully and deeply familiar with the concepts of knowledge. Therefore, training programs are very important for the organization that is supposed to lead the knowledge management(Chatterjee et al., 2021).

2.3.3. Support and commitment of the senior manager

The success of any program with planning in the organization directly depends on the support and commitment of the senior manager. A knowledge management program also needs the support of the senior manager at all stages of design and implementation(Dehghani and Akhavan, 2017).

2.3.4. Business Process Reengineering

The process of "re-engineering" or re-engineering requires abandoning the old and traditional ways of doing business and finding new and innovative ways. New rules emerge from reengineered processes that will show how processes work optimally. Given the definition of reengineering, organizational processes are usually not well designed. Thus, it is necessary to review the existing processes of the organization for possible changes and successful acceptance of knowledge management efforts. Reengineering helps the organization to decentralize and systematically define a value-oriented structure. In this case, the knowledge management system can be properly implemented in an organization(Akhavan and Dehghani, 2015).

2.3.5. Expert Network

To develop knowledge in the organization, networks should be created to facilitate knowledge sharing among experts. These networks can be in the form of scientific committees, specialized working groups, knowledge teams and knowledge centers(Bechtol, 2020).

2.3.6. Knowledge sharing

Knowledge sharing plays an important role in the successful implementation and enforcement of the knowledge management system. Knowledge sharing can often be done either at a specific time or on a regular basis. Regular knowledge sharing at regular intervals and knowledge sharing at specific times can be done at the end of projects when a new technology emerges and so on. Of course, knowledge sharing among employees requires a strong culture, trust and transparency throughout the organization(Zahedi et al., 2020).

2.3.7. Organizational Culture

Without effective and widespread change in the behavior and culture of the organization, there is no possibility of a successful knowledge management program. This means creating an environment in which knowledge sharing can take place. Since most knowledge processes are more or less based on voluntary willingness and knowledge is largely personal, a culture of motivation, sense of belonging, empowerment, trust and respect should be promoted in the organization. Knowledge management in an organization requires a culture in which individuals are respected based on their knowledge holdings and the way they provide that knowledge to the organization(Zahedi and Khanachah, 2020).

2-3-8. Pilot (sample)

In an ideal situation, instead of implementing knowledge management immediately throughout the organization, it is better to run it in a pilot first to avoid potential problems.

2-3-9. Save knowledge

Knowledge storage (hidden and overt) of the organization is one of the most important elements of a knowledge management system. Skills databases, specialized databases, and in general the storage of hidden and overt knowledge of the organization are of great importance(Zeraati et al., 2020).

3. Proposed method

The statistical population of the research at this stage is the existing experts in the field of knowledge management consisting of 45 experts who are familiar with the concepts and principles of knowledge management and specialized areas in project-based educational organizations.

The present study is an expert interview in terms of practical purpose and method of collecting qualitative information. This research was carried out in two steps, the first step is to develop a model for the requirements of the knowledge handbook that provides the necessary basis for manuscript. The second step is the knowledge handbook model, which describes the executive and scientific process of developing a knowledge handbook in industrial organizations. In order to calculate the requirements for compiling a knowledge handbook, considering that some factors were not present in the literature, so an expert interview was conducted and effective factors were counted. Next, the included factors were combined from the literature interview and after compiling the initial list, the experts were asked to comment again and identify the main area of each of the factors. In the process, some deletions, some mergers, and some additions were added. Finally, the finalized cases were identified based on Table (1). In order to evaluate the validity of the model structure, considering that the number of statistical samples was 45 experts, the PLS method was used. The research tool in this section is a questionnaire consisting of 5 main dimensions and 53 components that have been approved by experts and its reliability is estimated at 89% by Cronbach's alpha.

For the second step, the initial model was first designed and provided to knowledge experts. Again, they were asked to comment on the model steps and the process of doing it. After forming an expert panel and making corrections, the final model in three steps (Figure 4). Was approved by the expert group. In order to validate, the final model of the knowledge handbook was reviewed in a selected project-based organization and its content validity was confirmed.

An expert was selected for the field of expertise and he was asked to introduce informants and technical experts. Their number was estimated at 10 people. The experts were then asked to come up with a list that could

help people specialize in handbook content. 70 people were identified in the initial list and after holding an expert meeting with the expert team, 45 people were identified and finalized in two stages as experts in the field of expertise and the basics of knowledge management. Criteria were identification, experience and skills, work experience, degree, field of work.

After coding the second stage and combining the categories with the components extracted from the background, the final categories and components are presented in Table (1).

Table (1): Final components of knowledge handbook development requirements in a project-based organization

Row	Variable	Component	Source
x1		Mentoring	Background
x2		Hold small workshops to develop skills	Background / Interview
x3	**Staff learning**	Tendency to share and learn from each other	Background
x4		Tendency to listen and accept ideas	Background
x5		Holding internal symposiums	interview
x6		Employee motivation to participate	Background / Interview
x7		Value participation	Background / Interview
x8	**Staff culture**	Provide the necessary support for employees who are looking to improve their knowledge	Background / Interview
x9		Systematic updating based on organizational focus	Background

Row	Variable	Component	Source
x10		Develop a culture of change	interview
x11		Clarify staff on the nature of the learning record	interview
x12		Development of sharing culture	interview
x13		Developing a culture of liquidity	interview
x14	**Technology**	Matching the achieved goals for the organization with the learned technology	Background
x15		Knowledge Dashboard	Background
x16		Proper infrastructure	interview
x17		Integrated information system	interview
x18		System security lesson learned	interview
x19		Guide for processes to access sustainable approaches	Background / Interview
x20		Take advantage of the best successful examples	Background
x21		Involve stakeholders	Background
x22		Written statement to prescribe the steps of creating documents	Background / Interview
x23		Identify the needs of the lesson learned	Background / Interview
x24		A mechanism to monitor adherence to the	Background

Row	Variable	Component	Source
		prescribed process	
x25		Allocate enough time to perform the prescribed steps	Background
x26		Materials or training classes on the prescribed process	Background
x27	**System process**	Utilization of external capacity	interview
x28		Accurate modeling of knowledge transfer process	interview
x29		Document quality monitoring mechanism	Background
x30		Document update mechanism	Background
x31		Ability to track documents	Background
x32		A mechanism for obtaining user feedback on the usefulness of the created documents	Background
x33		Checking the validity of documents	Background
x34		Check the background of the documentation	Background
x35		Prioritize resources in documents	interview
x36		A set of actions related to the usefulness of documents	Background
x37		Follow up on document errors and report problems to provide solutions	Background
x38		Record document documentation data	Background
x39		Record document documentation error statistics	Background
x40		Analysis of document error data and main	Background

Row	Variable	Component	Source
		causes	
x41		Create profiles to use documents	Background
x42		Explain the role of learners	interview
x43		A mechanism for improving feedback on performance or documentation standards	Background
x44		The process of reusing acquired knowledge	interview
x45		Technology integration mechanism for process documentation	Background
x46		Mechanism of combining feedback on the usefulness of documents	Background
x47		Written statement or policy about the importance of the documents	Background / Interview
x48		A written statement or policy indicating what documents should be created for each stage of development	Background
x49	Leadership of the organization	Written statement or policy describing the content of the documents to be created for each stage of development	Background
x50		Agile regulations in the field of knowledge registration	interview
x51		Develop effective strategies	interview
x52		A mechanism to verify that the required documentation has been completed	Background
x53		Control compliance with policy or document standards	Background

4. Analysis of results

Kolmogorov–Smirnov test was used to check the normality of the data. The results showed that due to the smaller significance level of 0.05, the distribution in all items is abnormal. To investigate the research model, the structural equation approach with PLS software has been used.

1.4 Confirmatory factor analysis

In this section, the factor loads of the extracted items are examined. Factor loads are calculated by calculating the correlation value of the characteristics of a structure with that structure. If this value is equal to or greater than 0.4, it confirms that the variance between the structure and its characteristics is greater than the variance of the measurement error of that structure. That measurement model is acceptable. Also, the proposed model, which shows the significance level of the paths, is the most basic criterion for measuring the relationship between structures in the model, which reports a significant number t. If the value of this criterion is more than 1.96, it is clear that the relationship between structures is significant.

The results of confirmatory factor analysis of research variables showed that item No. 46 (mechanism for combining feedback on the usefulness of documents) has no significant factor load and is removed from the model. Figure (١) shows the modified research model with factor loading.
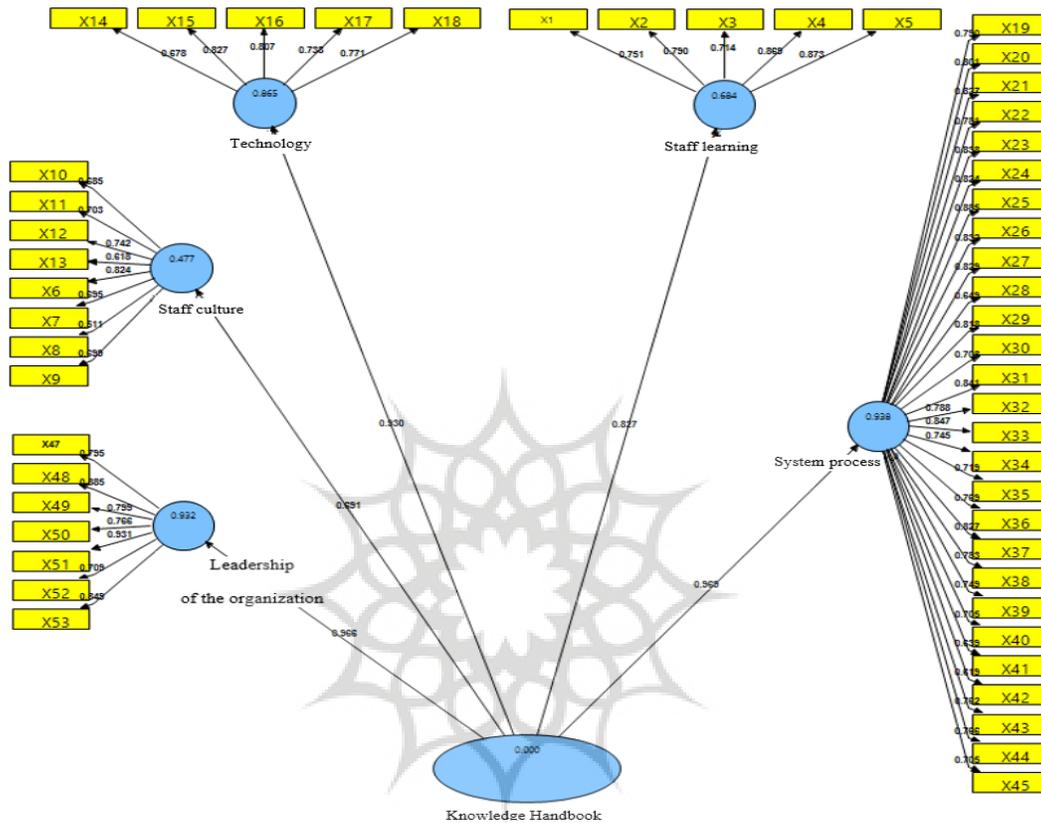
Figure (1): Modified research model with factor loading

The results of confirmatory factor analysis of the research variables showed that all the observed variables, due to the larger factor load of 0.4 and the significance level of t of 1.96, significantly explain and measure the hidden variables.

2.4 Fitting the measurement model

Cronbach's alpha and combined reliability

After measuring the factor loads, Cronbach's alpha coefficients and the combined reliability of the structures are investigated, which is presented in Table (2).

Table (2): Cronbach's alpha and combined reliability

Variable	Combined reliability coefficient > 0.7	Cronbach's alpha coefficients > 0.7
Leadership of the organization	0.9355	0.9185
System process	0.9758	0.974
Staff culture	0.8774	0.842
Technology	0.8761	0.824
Staff learning	0.8995	0.8601

The final research model consists of 5 main components namely organizational leadership, employee culture, technology, employee learning and system process and is presented in Figure (2).

- Employee motivation to participate
- Value participation
- Provide the necessary support for employees who are looking to improve their knowledge
- Systematic updating based on organizational focus
- Develop a culture of change
- Clarify staff on the nature of the learning

- Mentoring
- Hold small workshops to develop skills
- Tendency to share and learn from each other
- Tendency to listen and accept ideas
- Holding internal symposiums

- Written statement or policy about the importance of the documents
- A written statement or policy indicating what documents should be created for each stage of development
- Written statement or policy describing the content of the documents to be created for each stage of development
- Agile regulations in the field of
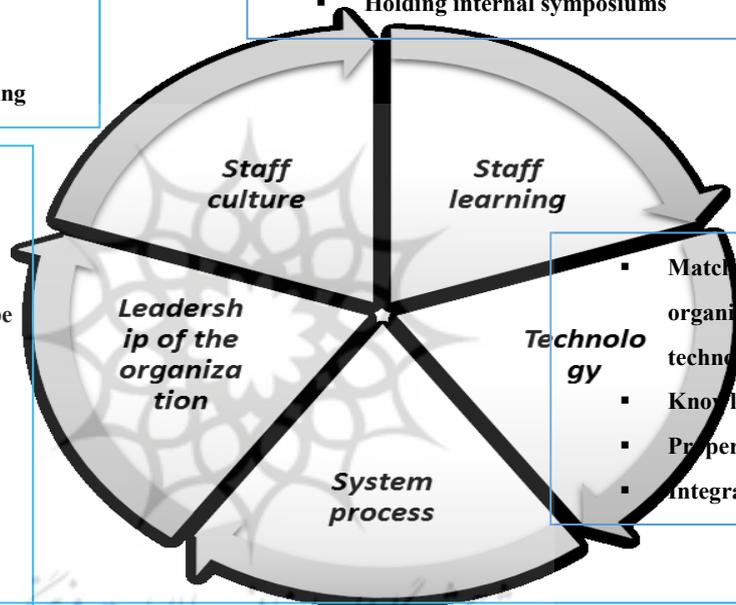
- Matching the achieved goals for the organization with the learned technology
- Knowledge Dashboard
- Proper infrastructure
- Integrated information system

Staff culture · Staff learning · Technology · System process · Leadership of the organization

- Guide for processes to access sustainable approaches
- Take advantage of the best successful examples
- Involve stakeholders
- Written statement to prescribe the steps of creating documents
- Identify the needs of the lesson learned
- A mechanism to monitor adherence to the prescribed process
- Allocate enough time to perform the prescribed steps
- Materials or training classes on the prescribed process
- Utilization of external capacity
- Accurate modeling of knowledge transfer process
- Document quality monitoring mechanism
- Document update mechanism
- Ability to track documents
- A mechanism for obtaining user feedback on the usefulness of the created documents
- Checking the validity of documents
- Check the background of the documentation
- Prioritize resources in documents
- A set of actions related to the usefulness of documents

Figure (2): Model of knowledge handbook development requirements in the organization

3.4 Step-by-step model for recording human capital experiences of experts in research-based educational organizations based on knowledge handbook

First, the questionnaire questions were examined using Kolmogorov-Smirnov (SK) test, and then according to the test results, parametric questions through the test (STUDENTS'ST) and non-parametric questions through the binomial test. Was analyzed. The results of Kolmogorov-Smirnov test showed that except for 7 questions whose code includes (B4-B5-E1-G3-H1-J1-J2) the rest are non-parametric questions.

A) Binomial hypothesis test for nonparametric questions

In this test, the success rate is considered to be 0.9. The reason for comparing the ratio with 06 is that the ratio of option 3 (the average value in the Likert spectrum to option 5 is equal to 0.9. Are, will be more (Mo'meni and Qayyumi, 1389). Assumption H0: The assumed factor has no effect on the design of the knowledge acquisition pattern. (0.6> P H0 :) Hypothesis H1: The hypothesized factor influences the design of the knowledge acquisition pattern. (0.6 <H1: P) Therefore, a summary of the results of non-parametric analysis of the questionnaire by SPSS 20 software can be seen in Table (3).

Table 3. Binomial test for nonparametric questions

According to the table above, the significance level (sig) of all questions is less than 00. Hypothesis H0 of the model will be rejected and Hypothesis H1 will be accepted. Therefore, it can be claimed that the process considered in the model is acceptable. In the next step, we will examine the success ratio with the observed ratio, for this purpose, we compare the observed ratio for the first group with 0.26, if this ratio is from 0. 6 less means that the experts in total had more than average agreement with the question, but if this ratio was more than 0.6, it means that the experts generally had less than average agreement with the question. Therefore, considering that the observed ratio for the first group, except in question D5, is less than 0.6, so the level of agreement of the experts with these questions is very moderate and has a great impact on the model.

B) T test for parametric questions

Due to the fact that the parametric questions have a normal distribution, the T test was used for analysis, the results of which are shown in Table (4).

Question	Group	Grouping	Number of data per group	Observation ratio	Test ratio	Significant level
			Table 4. T test results for parametric questions			
A1	**Group 1**	**<= 3**	·	·,·	0.6	.000ª·
	Group 2	**> 3**	۳۰	۱,۰		
	Total		۳۰	۱,۰		
A2	**Group 1**	**<= 3**	5	·,۲	0.6	.000ª·
	Group 2	**> 3**	25	·,۸		
	Total		۳۰	۱,۰		
B1	**Group 1**	**<= 3**	0	·,·	0.6	.000ª·
	Group 2	**> 3**	30	۱,۰		
	Total		۳۰	۱,۰		
C1	**Group 1**	**<= 3**	5	·,۲	0.6	.000ª·
	Group 2	**> 3**	25	·,۸		
	Total		30	۱,۰		
D1	**Group 1**	**<= 3**	5	·,۲	0.6	.000ª·
	Group 2	**> 3**	25	·,۸		
	Total		30	۱,۰		
D5	**Group 1**	**<= 3**	27	·,۹	0.6	.000ª·
	Group 2	**> 3**	3	۱,۰		
	Total		30	۱,۰		
E2	**Group 1**	**<= 3**	4	·,۱	0.6	.000ª·
	Group 2	**> 3**	26	·,۹		
	Total		30	۱,۰		
F1	**Group 1**	**<= 3**	2	·,۱	0.6	.000ª·
	Group 2	**> 3**	28	·,۹		
	Total		30	۱,۰		
G1	**Group 1**	**<= 3**	3	·,۱	0.6	.000ª·
	Group 2	**> 3**	27	·,۹		
	Total		30	۱,۰		
H2	**Group 1**	**<= 3**	4	·,۱	0.6	.000ª·
	Group 2	**> 3**	26	·,۹		
	Total		30	۱,۰		
I1	**Group 1**	**<= 3**	12	·,ه	0.6	.037ª·
	Group 2	**> 3**	18	·,۷		
	Total		30	۱,۰		
J3	**Group 1**	**<= 3**	0	·,·	0.6	.000ª·
	Group 2	**> 3**	30	۱,۰		
	Total		30	۱,۰		
K1	**Group 1**	**<= 3**	11	·,٤	0.6	.000ª·
	Group 2	**> 3**	19	·,٦		
	Total		30	۱,۰		
M1	**Group 1**	**<= 3**	5	·,۲	0.6	.000ª·
	Group 2	**> 3**	25	·,۸		
	Total		30	۱,۰		

Question	Degrees of freedom	Significance level	Average difference	95% confidence level	
				Down limit	Up limit
B4	29	0.000	4.06667	3.6877	4.4456
B5	29	0.000	2.23333	1.7874	2.6793
E1	29	0.000	4.13333	3.7569	4.5097
G3	29	0.000	2.26667	1.8180	2.7153
H1	29	0.000	3.53333	3.3439	3.7228
J1	29	0.000	4.00000	3.6748	4.3252
J2	29	0.000	4.20000	3.9332	4.4668

According to the results of the table above, since the significance level (sig) of all questions is less than 0.05, so we examine the column of 90% confidence, now if the lower limit of this column exceeds the average of expert opinions (number 3 in the range of degrees Likert) The question will be approved otherwise the question will not be accepted. From the table above, it can be seen that the lower limit of questions B5 and H3 is less than the average value of the Likert spectrum (3-20), so these questions are not approved. In other cases, due to the lower limit of the questions than the average value of the Likert spectrum, we can say 95% assurance of the total agreement of the experts is above average. After

summarizing and applying the experts' suggestions, the final step-by-step model for recording the human capital experiences of the faculty member's experts was provided based on the knowledge handbook.
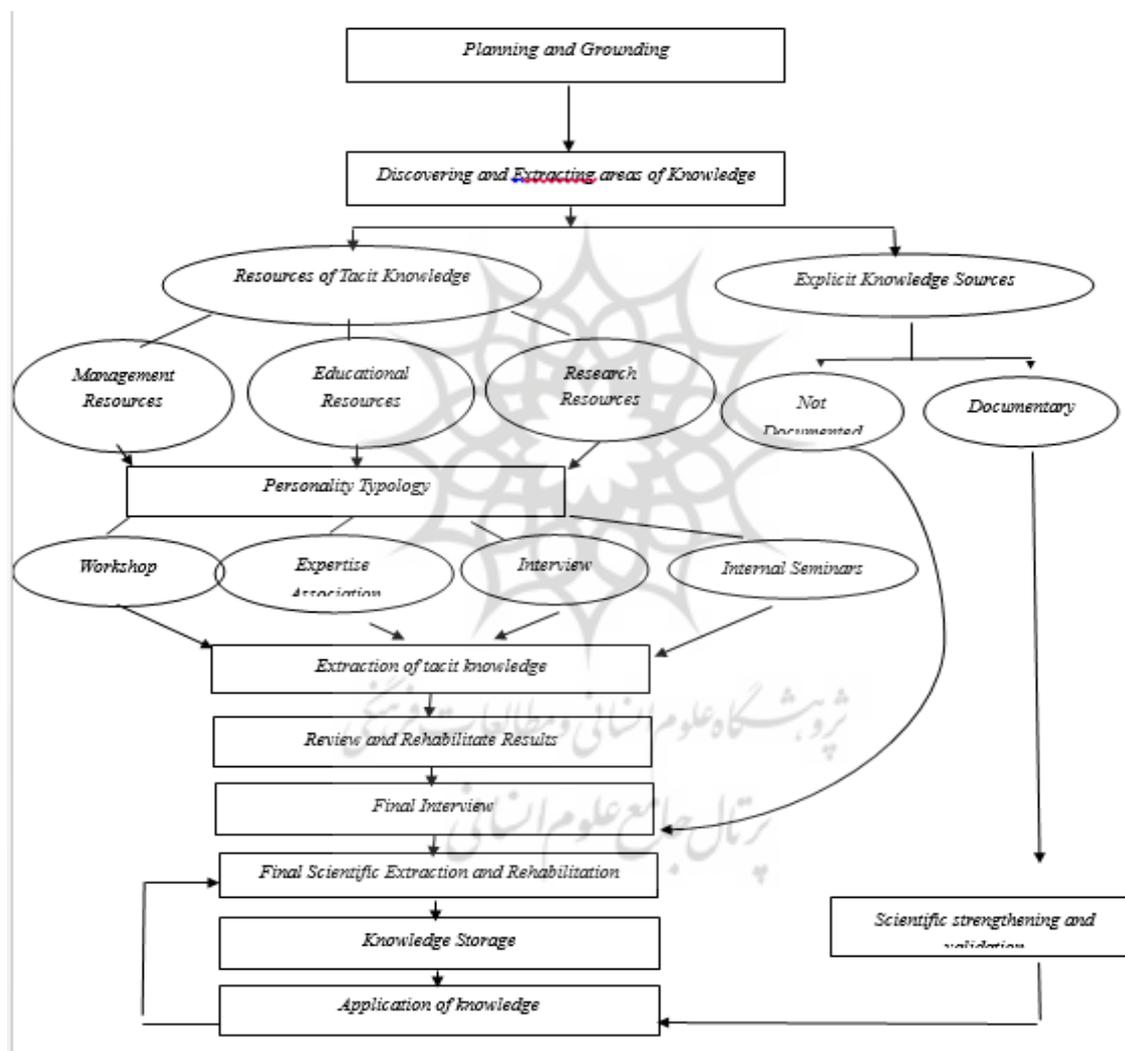

Figure 3. The final step-by-step model for recording the human capital experiences of experts in project-based educational organizations based on knowledge handbook

In order to present the model of knowledge acquisition, by reviewing the literature and research environment, the models and frameworks presented in the field of research have been studied, analyzed, compared, interpreted and used. Then, by designing the first questionnaire and distributing it among the experts, the opinion of the experts was evaluated and the recommendations agreed upon by the experts were approved. In the next step, the second questionnaire was designed according to the pattern of knowledge acquisition, which was in 10 steps, and was put to the opinion of experts. The usefulness of the questionnaire was high. Then, using the results of Kolmogorov-Smirnov test, parametric and non-parametric questions were determined, and non-parametric questions were analyzed by inferential and parametric tests with Student's t test and the rest were approved except for 3 questions out of 45 questions. Finally, by applying the changes agreed upon by experts, the final model of knowledge acquisition from the experiences of experts of research-based educational organizations that deal with the operational and executive process was presented at the final level.

5. Conclusion

Developing a knowledge handbook with emphasis on lessons learned requires descriptions of perceptions, inferences, analysis of actions and activities performed in the pre-decision, decision and post-decision periods and also explaining the knowledge of decision making in four groups of influential factors: internal organizational factors, external organizational factors, decision makers And the factors affecting it are the general characteristics of decision makers based on the chronological order and logic of cause and effect. Understanding and explaining the values, beliefs and perspectives, the key factors of any decision, is a fundamental and decisive necessity in documenting the experiences of managers.

Develop a knowledge handbook that includes expert selection approaches (recording expert experiences; participating in seminars; press conferences; inviting experts; creating a database), forum, communication; Sharing knowledge; question and answer; Thought sessions; Skill development; Learning; Cognition of perspectives), case-based reasoning, (acquisition of perspectives; case study; similarity analysis), storytelling (observations; information; perspectives; personal experiences; knowledge transfer; events and topics and suggestion system (review of experiences to improve staff attitudes;

Expansion of activities, motivation, transfer of employees' knowledge, which are presented as five desirable methods for documenting the strategic experiences of managers. A variety of experiences with the use of tools, considering the rules and regulations governing the industrial organization, as general policies in the localization of documentation methods in the development of knowledge handbook should be considered.

In compiling the organization's knowledge handbook, the first phase will be to identify areas of knowledge and experience, then identify knowledge and classify it, as well as identify the characteristics of people with knowledge and interview them in areas of experience is part of the preliminary stage or acquisition of this model. In general, at this stage, researchers make the necessary preparations to identify areas of knowledge and people related to these areas. In the second phase, which is called the documentation stage, the researcher collects tacit knowledge and experiences of experts by considering various methods of compiling experiences, documentation patterns, patterns of knowledge acquisition and selecting the best method appropriate to the research area and its managers. Then the preparation process of the researched experts includes motivation, empowerment, familiarity with the methods of compiling his

experiences, considering the information components. This stage is the operational stage of developing experiences and as a stage of collecting valuable information and data and must be done with high accuracy and sensitivity. Any mistake in recording information and gathering knowledge and experience of expert's causes unrealistic results in the next stage, which is the output stage; therefore, the sessions of acquiring, receiving and recording information continue frequently and taking into account the feedback after the preliminary compilation. After compiling the experiences and knowledge of managers, it is necessary to study the collected information based on evaluation models, ideas and knowledge claims, and to comment on their conceptual relationships with the field under study.

6. *Management implications*

In order to apply the proposed model; Challenges of managing the lessons learned in research-based educational organizations, especially projects in cooperation with industry, were identified and appropriate solutions were provided. In the following, the challenges and solutions will be reviewed according to the interviews and researches done to improve the current process. This is one of the most useful parts of this research because these results were

extracted from interviews with experts who themselves have high work experience and significant job positions.

Table 5. Summary of organizational challenges extracted from experts of research-based educational organizations

The origin of the challenge	Challenge code	Challenge Description
human	1	Job security and the fear of losing a good position as a result of sharing experiences
human	2	High workload and lack of time to devote to activities related to learning management
human	3	Oral transmission of experiences and lessons learned orally and weakness in writing them
human	4	Existence of a culture of blame and a culture of blame and low tolerance in accepting past mistakes
human	5	Lack of the necessary cultural context to share what has been learned
human	6	Individuals' resistance to changing current trends Restrictions on access to experiences (recorded information, individuals, ...)
Organizational	7	Massive archiving of information in raw form and lack of a specific place to record lessons learned
Organizational	8	Not prioritizing such activities and considering it as a side effect for the organization
Organizational	9	People do not share in the profits and losses from the lessons learned due to the governmental nature of the organization
Organizational	10	Lack of obligation in describing the duties of individuals to record the lessons learned and not defining the organizational position for it
Organizational	11	Not following the existing activities and sections in

		order to register and publish the lessons learned
Organizational	12	Tasteful approach to this process due to the lack of clear instructions
Organizational	13	Not holding meetings dedicated to recording and transferring experiences and lessons learned
Organizational	14	Lack of a comprehensive system in the university for recording and publishing lessons learned
Organizational	15	Lack of senior management support for activities related to the lessons learned
Organizational	16	Insufficient motivational approaches to share experiences
Organizational	17	Lack of specific plans to use the experiences of retirees and experienced people in the organization
Organizational	18	Insufficient maturity of the organization to participate in activities related to the lessons learned
Organizational	19	Lack of training related to the management of the lessons learned and the low quality of the courses held
Organizational	20	Lack of training related to the management of the lessons learned and the low quality of the courses held
Technologically	21	Lack of integration of existing systems and management processes of lessons learned
Technologically	22	Mismatch between the needs of individuals and existing systems and processes
Technologically	23	Reluctance to use existing systems due to lack of familiarity and experience with them

In this section, based on the content analysis of the interviews conducted, the proposed solutions are mentioned. We have divided the solutions into two categories; Short-term solutions and long-term solutions. Short-term solutions in this study are solutions that can be implemented in a short time: their effect can be temporary or permanent. The importance of these strategies is that they can be

used to implement more basic solutions; In other words, they act as painkillers until the main treatment is effective. Long-term solutions, as their name suggests, require more time and groundwork for implementation and effectiveness. On the other hand, some of the strategies mentioned in the interviews are not a solution alone, but contribute to the effectiveness of other strategies.

Table 11. Description of the solution to the challenges

Solution code	Type of solution	Area	Description of the solution
1	short term	human	Consider a specific person to record the lessons learned
2	short term	Organizational	Design a form or specify a specific format for recording lessons learned
3	short term	Organizational	Requiring people to record what they have learned by including it in their job descriptions
4	short term	Organizational	Holding sessions dedicated to sharing lessons learned
5	short term	human	Creating a culture in order to record and share experiences and lessons learned
6	short term	Organizational	Employing a consultant in the field of recording and publishing lessons learned
7	long time	human	Reaping knowledge
8	long time	Organizational	Holding purposeful and quality training courses in relation to management

9	long time	Organizational and technological	Lessons learned
10	long time	Organizational	Implement a comprehensive system in the university for effective management of lessons learned
11	long time	human	Creating a separate unit in the organization as the custodian of knowledge management in the organization
12	long time	Organizational	Implementing the teacher-student model (coaching)
13	long time	Organizational	Form a committee of lessons learned
14	long time	Organizational	Preparing a knowledge map of people
15	long time	human	Prepare a clear instruction on how to deal with the lessons learned from the projects
16	Complement	Human and organizational	Creating a culture in order to record and share experiences and lessons learned
17	Complement	Organizational	Support and follow-up of senior managers from activities related to learning management
18	Complement	Organizational	Ease of access to existing lessons learned
19	Complement	human	Allocate the necessary funds for activities related to this issue

References

Abualoush, S., Masa'deh, R., Bataineh, K., and Alrowwad, A. (2018). "The role of knowledge management process and intellectual capital as intermediary variables between knowledge management infrastructure and organization performance ", Interdisciplinary Journal of Information, Knowledge, and Management, Vol. 13 No. 1, pp. 279-309.

Adjei, K. O. K., and Dei, D. G. J. (2015). "Assessing the implementation of knowledge management systems in banks, a case of Ghana", Journal of Information and Knowledge Management, Vol. 5 No. 1, pp. 133-139.

Akhavan, P., and Dehghani, M. (2015). "The Role of Knowledge Management on Improvement of Marketing Activities Case Study of Active Company in Medical Equipment", Vol. 11 No. 41, p. 27.

Anbari, F. T., Carayannis, E. G., and Voetsch, R. J. (2008). "Post-project reviews as a key project management competence", Technovation, Vol. 28 No. 10, pp.633-643.

Ardoin, N. M., Bowers, A. W., and Gaillard, E. (2020). "Environmental education outcomes for conservation: A systematic review", Biological Conservation, Vol. 241, p.108224.

Astafieva, M. M., Zhyltsov, O. B., Proshkin, V. V., and Lytvyn, O. S. (2020). "E-learning as a means of forming students' mathematical competence in a research-oriented educational process", Vol. 2643, pp. 674-689.

Bairi, J., Murali Manohar, B. and Kundu, G.K. (2013), "Knowledge acquisition by outsourced service providers from aging workforce of oil and gas industry: A study", VINE, Vol. 43 No. 1, pp. 39-56.

Bashir, M. and Farooq, R. (2018), "The synergetic effect of knowledge management and business model innovation on firm competence: A systematic review", International Journal of Innovation Science, Vol. 11 No. 3, pp. 362-387.

Bratianu, C. (Ed.). (2015), "Organizational Knowledge Dynamics: Managing Knowledge Creation, Acquisition, Sharing, and Transformation: Managing Knowledge Creation, Acquisition", Sharing, and Transformation. IGI Global.

Carrillo, P., Ruikar, K., and Fuller, P. (2013), "When will we learn? Improving lessons learned practice in construction", International journal of project management, Vol. 31 No. 4, pp. 567-578.

Chatterjee, S., Chaudhuri, R., Thrassou, A., and Vrontis, D. (2021), "Antecedents and consequences of knowledge hiding: The moderating role of knowledge hiders and knowledge seekers in organizations", Journal of Business Research, Vol. 128, pp. 303-313.

Davenport, E., & Cronin, B. (2000), "Knowledge management: semantic drift or conceptual shift? Journal of Education for Library and Information Science", Vol. 41, No. 4, pp. 294-306.

Dehghani, M. and Akhavan, P. (2017), "An experimental investigation of knowledge acquisition techniques", Journal of Management Development", Vol. 36 No. 4, pp. 493-514.

Dei, D. G. J., & van der Walt, T. B. (2020a), " Knowledge management practices in universities: The role of communities of practice", Social Sciences & Humanities Open, Vol. 2, p. 100025.

DEI, D.-G. J. & VAN DER WALT, T. B. (2020b), " Strategies for Managing Knowledge in Organisations: A Conceptual Study", Strategies, Vol. 3, p. 8-2020.

Dragicevic, N., Ullrich, A., Tsui, E., & Gronau, N. (2019), " A conceptual model of knowledge dynamics in the industry 4.0 smart grid scenario", Knowledge Management Research & Practice, Vol. 18, pp 199-213.

Duffield, S., & Whitty, S. J. (2015), " Developing systemic lessons learned knowledge model for organizational learning through projects", International journal of project management, Vol.33, pp. 311-324.

Eken, G., Bilgin, G., Dikmen, I., & Birgonul, M. T. (2020). " A lessons-learned tool for organizational learning in construction", Automation in Construction, Vol.110, pp.102977.

Evans, J. M., Brown, A., & Baker, G. R. (2017). " Organizational knowledge and capabilities in healthcare: Deconstructing and integrating diverse perspectives", SAGE open medicine, Vol. 5, p 2050312117712655.

Evers, G., & Chappin, M. M. (2020). " Knowledge sharing in smart grid pilot projects", Energy Policy, Vol. 143, p111577.

Goryainova, L., Maksimova, T., Zhdanova, O., & Ermilova, M. (2020). " Possible ways to attract private investment in a knowledge-based economy", E3S Web of Conferences, EDP Sciences, Vol. 159, p. 06013.

Hebibi, L., Raimi, N., & Milićićević, R. (2019). "Knowledge management and the importance of knowledge management for the organization's performance", Ekonomika, Vol. 65, No. 1, pp. 117-126.

Hildrum, J. M. (2009) . " Sharing tacit knowledge online: A case study of e-Learning in Cisco's network of system integrator partner firms", Industry and Innovation, Vol. 16, No. 2, pp. 197-218.

Jensen, P. R., Cruz, J., Eger, E. K., Hanchey, J. N., Gist-Mackey, A. N., Ruiz-Mesa, K., & Villamil, A. (2020). "Pushing beyond positionalities and through "failures" in qualitative organizational communication: Experiences and lessons on identities in ethnographic praxis", Management Communication Quarterly, Vol.34, No. 1, pp. 121-151.

Djiffouet, A. L. K. (2019) . " An Investigation into the Acquisition of Tacit Knowledge in e-Learning Environments: An Experimental Study", the University of Wales Trinity Saint David, p. 27777173.

Lin, Y. H., & Chen, Y. S. (2017). " Determinants of green competitive advantage: the roles of green knowledge sharing, green dynamic capabilities, and green service innovation", Quality & Quantity, Vol. 51, No. 4, pp. 1663-1685.

Lopes, C. M., Scavarda, A., Hofmeister, L. F., Thomé, A. M. T., & Vaccaro, G. L. R. (2017) . "An analysis of the interplay between organizational sustainability, knowledge management, and open innovation", Journal of Cleaner Production, Vol.142, pp. 476-488.

McClory, S., Read, M., & Labib, A. (2017). " Conceptualising the lessons-learned process in project management: Towards a triple-loop learning framework", International Journal of Project Management, Vol. 35, No. 7, pp. 1322-1335.

Nakashima, D., & Krupnik, I. (Eds.). (2018). " Indigenous knowledge for climate change assessment and adaptation", Cambridge University Press, Vol. 2.

Nisar, T. M., Prabhakar, G., & Strakova, L. (2019). " Social media information benefits, knowledge management, and smart organizations", Journal of Business Research, Vol.94, pp. 264-272.

Nonaka, I., & Takeuchi, H. (2007). "The knowledge-creating company", Harvard business review, Vol.85, No.7, pp 162.

O'Dell, C., & Hubert, C. (2011). " The new edge in knowledge: How knowledge management is changing the way we do business", John Wiley & Sons.

Rathi, D., Given, L.M. and Forcier, E. (2016). "Knowledge needs in the non-profit sector: an evidence-based model of organizational practices", Journal of Knowledge Management, Vol. 20 No. 1, pp. 23-48.

Ramohlale, M. P. (2014) . " Knowledge management practices at the Department of Defence in South Africa", Citeseer.

RANUCCI, R. A. & SOUDER, D. 2015. Facilitating tacit knowledge transfer: routine compatibility, trustworthiness, and integration in M & As. Journal of Knowledge Management, Vol. 22 No. 5, pp. 570-589.

Rönkä, J. (2020). " Development of project logistics and distribution operations of outflowing goods in engineering and construction projects", Vol. 47, pp. 777-780.

Sharkey, J. (2018). " The promising potential role of intercultural citizenship in preparing mainstream teachers for immigrant populations", Language Teaching Research, Vol. 22 No. 5, pp. 570-589.

Wang, J., Lin, E., Spalding, E., Klecka, C. L., & Odell, S. J. (2011). " Quality teaching and teacher education: A kaleidoscope of notions", SAGE Publications Sage CA: Los Angeles, CA, Vol. 62 No. 4, pp. 1591-1601.

Wątróbski, J. (2019). "Towards Knowledge Handling in Sustainable Management Domain", Procedia Computer Science, Vol. 159 No. 1, pp. 1591-1601.

Wiig, K. M. (1997). " Knowledge management: Where did it come from and where will it go? ", Expert systems with applications, Vol. 13 No. 1, pp. 1-14.

Zahedi, M., Akhavan, P., & Naghdi Khanachah, S. (2020). "Identifying the Key Barriers to Knowledge Management and Lessons Learned in the Project-Based Military Organizations", MILITARY MANAGEMENT QUARTERLY, Vol. 19 No. 76, pp. 29-68.

Zahedi, M.R. and Naghdi Khanachah, S. (2021). "The effect of knowledge management processes on organizational innovation through intellectual capital development in Iranian industrial organizations", Journal of Science and Technology Policy Management, Vol. 12 No. 1, pp. 86-105.

Zazkis, R., & Leikin, R. (2010). " Advanced mathematical knowledge in teaching practice: Perceptions of secondary mathematics teachers", Mathematical thinking and learning, Vol. 12 No. 4, pp. 263-281.

Zeraati, M., Abolghasemi, M., Khorasani, A., & Kheirandish, M. (2020). " Knowledge development of knowledge workers based on knowledge management approach", Innovation Management in Defense Organizations, Vol. 3 No. 1, pp. 147-172.

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