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THE STUDY OF KNOWLEDGE MANAGEMENT STATUS THROUGH THE BUILDING STONES OF KNOWLEDGE MANAGEMENT AND DIMENSION RANKING THROUGH TOPSIS (CASE STUDY: IRANIAN MAPNA Power Plants Construction & Development Co)

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ABSTRACT
Nowadays, knowledge is key point in organizational competition. Modern organizations have adopted knowledge-based approach in management; it means that they are designed in a manner that would identify knowledge, preserve it and make benefit of it in due time. Considering the crucial role that knowledge and intangible asset play in organization, Mapna group as a construction and development institute of thermal power plants has brought knowledge management system into a sharper focus. Doing so, determining the status quo of knowledge management in Mapna Group seems very vital. Analysis of knowledge management makes it possible to identify the gaps and reach performance-enhancing factors in implementing projects. The present study, which was conducted in a survey framework, employed the Building Stones of Knowledge Management as a model to measure knowledge management performance. Also, TOPSIS was used to rank the factors related to the knowledge management in Mapna Group. Some suggestions were made to improve the status quo of the knowledge management in organization.

KEYWORDS: Building Stones of Knowledge Management, Information Technology, Knowledge, Knowledge Management, Tacit Knowledge, TOPSIS.

INTRODUCTION

Knowledge management has revolutionized the management in the recent years. Knowledge management is a concerted effort to capture critical knowledge, share information within an organization, and capitalizes on the collective organizational memory to improve decision making, enhance productivity, and promote innovation. It involves capturing the knowledge, the wisdom, the added value experiences of individuals within an organization, making it easy to find again, and in so doing preserving it as an organizational asset (Glaser, 2003). Drucker considers the knowledge management as key factor in organizational success in 21th century. Although many organizations have invested in various area of knowledge development, most of them faced with failure due to the fact that managers consider knowledge management as waste of time and money. That's why managers are suggested to improve the setting for exchanging knowledge among staff and enhance interpersonal interactions in organizations (Balogum, 2004). Kang *et al*. (2007) discuss that an organization needs to provide employees with the training opportunity; thus, the use of training and development programs should help to develop interactions between employees that result in closer interpersonal ties (social capital) that positively affects knowledge flows within organizations (ibid).

Review of literature

Some authors use the concept of "intellectual capital" as an umbrella term. Intellectual capital in Skandia, a major Swedish insurance company in 1994, was defined as 'the possession of knowledge, applied experience, organizational technology, customer relationships, and professional skills that provided Skandia with a competitive edge in the market showing that intellectual capital could be as important as financial capital (Radding, 2004). In fact, Skandia proved this fact that knowledge would be valuable asset that should be managed, developed and used effectively (ibid). Regarding knowledge as the vital factor in competitive workplace of organizations is not something new as Marshal (1999), a century year ago, said that "Knowledge is our most powerful engine of production". It was after The Second World War that scholars understood the importance of knowledge in economics more profoundly. Since knowledge management has been examined through various approaches, it is not possible to represent a unanimously agreed definition of this concept.

Davenport (1998) believes that knowledge management is a sort of knowledge that resides in the minds of people in an organization but has not been put in structured, document based form. This type of knowledge which is often called 'tacit' knowledge would benefit people who are engaged in organizational decision-making. In other words, he believes that knowledge management is an effort to explore latent assets in the minds of people and converting them into organizational assets so that a wide range of people involved in organizational decision making can access to it. KM is an attempt to turn employee's knowledge (human capital) into a shared, firm wide asset (structural intellectual capital) (Gandhi, 2004). Carlos (2012) concluded that organization with descending knowledge flow should increase cooperation with other companies in order to exchange knowledge about human resource. According to Schein (2001), knowledge management is a process which allows organizations to use new knowledge in the format of creation, validate, dissemination and application and improve a scope of organizational traits by enabling the companies to more smart performance. Knowledge resource is seen as an iceberg that its visible part is explicit knowledge. It can be easily accessed, identifies and shared. The latent part is tacit knowledge. It reminds the famous statement by Michael Polanyi (1996) who said: "we know more than what we can express."

There are two kinds of knowledge: explicit knowledge and tacit knowledge. Explicit knowledge can be expressed in words and numbers and shared in the form of data, scientific formula, specifications, manuals, and the like. This kind of knowledge can be readily transmitted between individuals formally and systematically. Whereas tacit knowledge is highly personal and hard to formalize, making it difficult to communicate or share with others. Subjective insights, intuitions, and hunches fall into this category of knowledge. Tacit knowledge is deeply rooted in an individual's actions and experience as well as in the ideals, values, or emotions he or she embraces (Nonaka and Konno, 1998).

Almost all activities people engage in require some combination of explicit and tacit knowledge. For effective KM, it is essential to capture both tacit and explicit knowledge. The real challenge of KM lies in being able to identify and capture tacit knowledge so that it can be retrieved when needed. However, while explicit knowledge is easy to record and transfer, tacit knowledge is difficult to identify, capture, and transmit. Therefore, most organizations concentrate on managing the 20 percent of the explicit knowledge available, leaving it to coincidence that tacit knowledge is used. Although converting tacit knowledge to explicit knowledge is difficult, it is not impossible (Gandhi, 2004).

As said by Sivan (2000), measuring the benefits of capital related to knowledge has transformed into one of the most difficult and challenging topics of businesses today based on knowledge. Quantification of knowledge is impossible and measurement of the direct results of KM is not so easy. The benefits of using knowledge management from technical to strategic levels impact on culture and productivity of total organization. Some benefits include:

- Improving competitive response: enabling organizations to respond market changes and to accelerate the needed time to deliver the products to market,
- Mitigating the costs and avoiding wasting subjective capitals: possessing implicit knowledge allows the organization to use it to keep future applications and to eliminate the costs of retraining employees and practitioners,
- Satisfying the needs to act globally: geographically dispersed operations demand special cultural and knowledge management challenges. Those organizations that have effective culture in knowledge management can terminate "they and us", convert everything which exists into "we" and maximize efficient usage of dispersed resources,
- Job effectiveness: using knowledge management infrastructures would eliminate traditional limitations, increase knowledge sharing among employees and improves effectiveness,
- Organizational effectiveness: tools, pattern and the best applications of knowledge management along with knowledge sharing culture can shape a cooperative environment and increase organizational effectiveness,
- Strategic orientation: using knowledge culture increases creativity and innovation and, as a result, impact on strategic orientation,

MATERIALS AND METHODS

The present study employed Probst *et al.* model (2002), called "The Building Stones of Knowledge Management" (Figure 1). As the designers claim, "it has proved its usefulness in many kinds of organizations". Probst *et al.* (2000) discuss that the building blocks of knowledge management represent activities that are directly knowledge-related. This

model involves eight components that form two cycles, one inner cycle and other outer cycle. The inner cycle consists of the building blocks of identification, acquisition, development, distribution, preservation, and use of knowledge. An outer cycle consists of all these activities plus goal-setting and measurement. This feedback cycle clarifies the importance of measuring the measurable variables in order to focus on goal-oriented interventions.

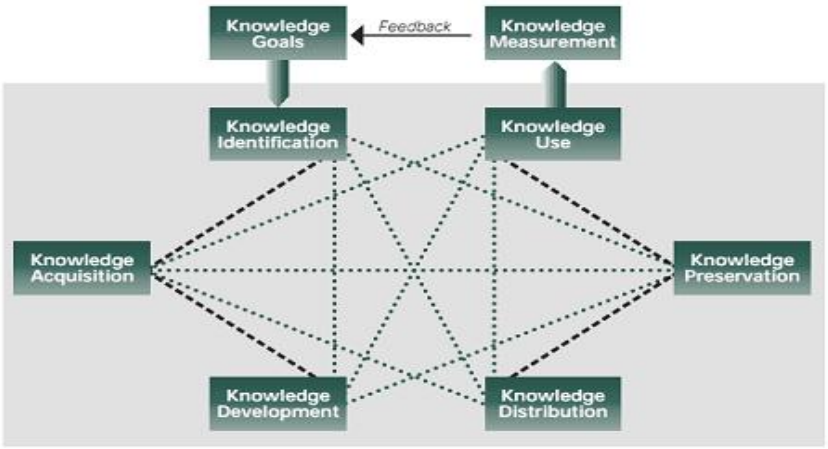

Figure1. The Building Stones of Knowledge Management (Probst *et al*., 2000)

Probst *et al*. (2000) define the buildings blocks as following:

1. Knowledge Goals: knowledge goals point the way for knowledge management activities. They determine which capabilities should be built on which level. It is divided into two sub-categories of 'strategic knowledge goals' and 'operational knowledge goals'.
    - Strategic knowledge goals define organizational core capabilities and describe the future knowledge needs of the company.
    - Operational knowledge goals make sure that normative and strategic knowledge goals will be translated into action.
2. Knowledge Identification: before investing heavily in the development of new capabilities, companies should know what knowledge and expertise exist both inside and outside their own walls. In fact, identification is the process where external knowledge for analyzing and describing the company's knowledge environment is identified.
3. Knowledge Acquisition: The explosive growth and simultaneous fragmentation of knowledge have made it all but impossible for companies to build up all the know-how they need for market success by themselves. Instead, they have to buy critical capabilities, often from many knowledge markets, using focused acquisition strategies. So, acquisition refers to what forms of expertise should the company acquire from outside through relationship with customers, suppliers, competitors and partners in co-operative ventures.
4. Knowledge Development: knowledge development consists of all the management activities intended to produce new internal or external knowledge on both the individual and the collective level. In other words, development is a building block which complements Knowledge Acquisition. Its focus is on generating new skills, new products, better ideas and more efficient processes. Knowledge Development includes all management efforts consciously aimed at producing capabilities.
5. Knowledge Distribution: In making knowledge available and usable across the whole organization, the critical questions are: Who should know what, to what level of detail, and how can the organization support these processes of knowledge distribution? Thus, distribution means is the process of sharing and spreading knowledge which is already present within the organization.
6. Knowledge Use: knowledge use—meaning the productive deployment of organizational knowledge in the production process—in fact is the purpose of knowledge management. It, in deed, consists of carrying out activities to make sure that the knowledge present in the organization is applied productively for the benefit its.

7. Knowledge Preservation: after knowledge has been acquired or developed, it must be carefully preserved. Preservation, in other words, is the process where takes place the selective retention of information, documents and experienced required by management.
8. Knowledge Measurement: The evaluation and measurement of organizational knowledge presents the biggest challenge in the field of knowledge management. Regarding this fact, preservation deals with the process where takes place the selective retention of information, documents and experienced required by management.

Table 1 shows the tools of the building blocks of knowledge management.

Table1. Tools of the building blocks of knowledge management (Probst *et al.*, 2000)

Step	Tool
Knowledge Goals	Strategic knowledge, normative knowledge goal, knowledge-based goals
Knowledge Identification	Knowledge maps, knowledge transparency, knowledge transfer
Knowledge Acquisition	Visitors, knowledge held by other firms, experts, knowledge product
Knowledge Development	Collective knowledge, scenario, orientation to the center
Knowledge Distribution	Problem-solving techniques, space management
Knowledge Use	Deployment of organizational knowledge, in-practice training
Knowledge Preservation	Electronic storage, learning from events
Knowledge Measurement	Intangible asset monitor, multidimensional measurement knowledge system

Many aspects of knowledge management were identified on the basis of literature. Considering the fact that results of the present study could be used in Mapna Group, it can be said that this research is an applied in objective, and survey in data gathering through questionnaire. In addition, it is a case study since it has examined Mapna group as a construction and development institute of thermal power plants. The reliability of research questionnaire, which was developed through the model of study, was reported 0.86; also, its validity was confirmed through content analysis.

Research objectives and questions

The present study aims to examine the application of knowledge management components in Mapna Group as as a construction and development institute of thermal power plants. Doing so, it can identify gaps and enhance the status quo more efficiently. The present study was aimed at answering the following questions:

1. At which level is the existing status of knowledge management indexes in Mapna Group? Also, to what extent is the gap between each of indexes and standard level?
2. At which level is the existing status of knowledge management dimensions in Mapna Group located? Also, to what exten is the gap between each of dimensions and standard level?
3. What are the ranks of knowledge management dimensions in Mapna Group?
4. What strategies can be employed to enhance each of knowledge management dimensions in Mapna agroup?

Research population

5. Mapna Group is an Iranian enterprise including 28 subgroups which operates in the area of construction and development of thermal power plants under EPC scheme, independent power plants (IPP), oil and gas as well as rail traction projects. Since its incorporation in 1993, Mapna Group has contributed to the engineering, manufacture of equipment and construction of power plants within the framework of commissioned, under construction and prospect projects scheduled to generate a major proportion of electricity and installed power plants capacity in Iran. Mapna Group, in addition, has been leading Iranian industrial group which has secured significant and remarkable achievements in design and engineering of National Dispatching Center.
6. Research population included all Chief Executive Officers (CEO) and experts in Mapna Group; applicants had BSC or MSC degree in relevant majors and possessed more than 3 years of experience. Diagram and 2 show the population status with regard to education and job experience.

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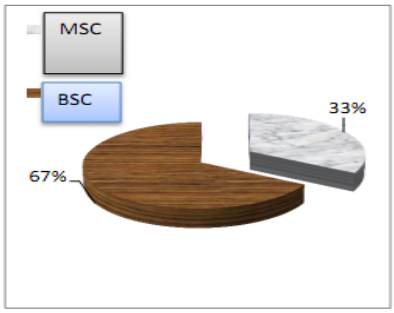

Diagram 1 education level of population

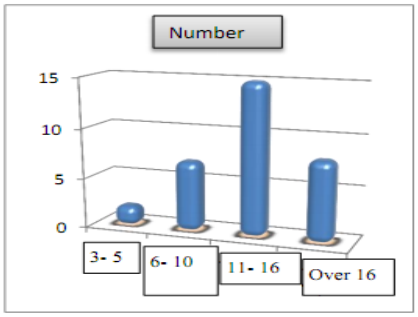

Diagram 2 job experience of population

Figure2.

RESULTS

Question1: at which level is the status quo of knowledge management indexes in Mapna Group? Also, to what extent is the gap between these indexes and standard level?

Table2. Status quo of knowledge management for each of indexes (%)

Dimension	Index	Mean (%)	Gap (%)
Knowledge Goals	To what extent are organizational perspectives and missions defined?	47	53
	To what extent are knowledge management principles given priority to?	48	52
	To what extent are organizational weaknesses understood?	53	47
Knowledge Identification	To what extent are databases and documents identified within organization?	59	41
	To what extent are users and employees' knowledge and skills identified within organization?	44	56
	To what extent are databases and documents identified outside organization?	42	58
	To what extent are users and employees' identified outside organization?	39	61
Knowledge Acquisition	To what extent are internal and external consultants and experts used in organization?	53	47
	To what extent are joint projects with other institutes implemented in organization/	37	63
	To what extent does the organization participate in national conferences?	60	40
	To what extent does the organization participate in international conferences?	38	62
	To what extent does the organization participate in workshops?	58	42
	To what extent is it possible to access first-hand sources (journals, projects, thesis, inventions, etc.) in the organization?	41	59
	To what extent is it possible to access secondary sources (books, encyclopedias, review articles, etc.) in the organization?	48	52
	To what extent is it possible for the organization to access internal websites and databases?	63	37
	To what extent is it possible to access external websites and databases in the organization?	52	48
	To what extent does the organization access to basic data through internet and intranet?	65	35
	To what extent does the organization pay attention to using electronic communication (email, etc.)?	77	23
Dimension	Index	Mean (%)	Gap (%)
Knowledge Development	To what extent does the organization update its knowledge with global changes?	55	45
	To what extent does the obtained knowledge contribute to the organizational procedures and objectives?	50	50
	To what extent does the organization act logically in recruit knowledgeable applicants?	45	55
Knowledge Distribution	To what extent are the faculty members active in holding conferences for sharing knowledge?	39	41
	To what extent are forums important in organization?	33	67
	To what extent is effective job rotation observable in organization?	34	66
	To what extent are the tasks performed through team work in organization?	55	45
Knowledge Use	To what extent does the organization use academic experts?	43	57
	To what extent is it crucial for the organization to examine the existing and new documents and reports?	52	48
	To what extent does the organization encourage risk-taking in creative projects?	37	64
Knowledge Preservation	To what extent is the organization active in preserving job procedures?	54	46
	To what extent does the organization try to create knowledge centers (such as library, web-based institutions, etc.)?	49	51
	To what extent is the organization active in keeping knowledge centers up-to-date?	43	57
	To what extent is it possible for the employees in organization to access job experiences of their colleagues?	34	66
Knowledge Measurement	To what extent is the guideline and suggestion system used in organization?	30	70
	To what extent is the knowledge quality preferred to knowledge quantity?	40	60
	To what extent is feedback provided for knowledge performance?	33	67

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Question2: at which level is the status quo of knowledge management dimensions in Mapna Group located? Also, to what exten is the gap between each of these dimensions and standard level?

Table3. Status quo of knowledge management dimensions

Dimension	Performance (%)	Gap (%)
Knowledge Goals	48.49	51.11
Knowledge Identification	45.83	54.17
Knowledge Acquisition	53.94	46.06
Knowledge Development	50.33	49.67
Knowledge Distribution	40.17	59.83
Knowledge Use	44	56
Knowledge Preservation	45.13	54.88
Knowledge Measurement	34.22	65.78

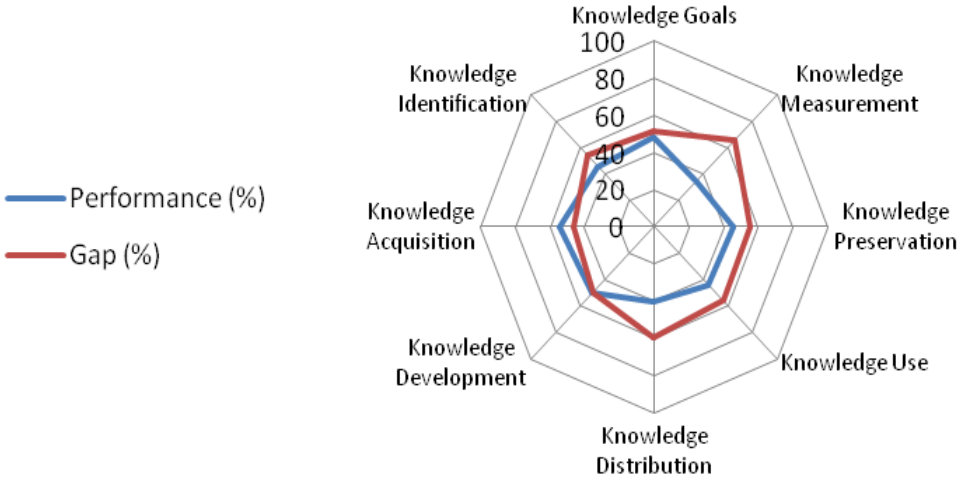

Figure3.
Diagram 3. Comparison of status quo of knowledge management dimensions with warning level (total mean)

Question3. What are the ranks of knowledge management dimensions in Mapna Group?

To rank the dimensions of knowledge management, TOPSIS was employed. Also, managers and experts were interviewed to obtain the pairwise comparison matrices in TOPSIS questionnaire. The data were analyzed, the results of which are shown in table4.

Table4. TOPSIS results

No.	Dimension	S’	S*	C*
1	Knowledge Goals	0.07	0.04	0.62
2	Knowledge Identification	0.08	0.04	0.70
3	Knowledge Acquisition	0.08	0.05	0.61
4	Knowledge Development	0.07	0.06	0.55
5	Knowledge Distribution	0.08	0.05	0.61
6	Knowledge Use	0.06	0.05	0.58
7	Knowledge Preservation	0.02	0.10	0.18
8	Knowledge Measurement	0.04	0.09	0.31

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Table 5. Improvement in every aspect of knowledge management

Dimension	Index	Strategy
Knowledge Goals	Organizational knowledge management 47% Identification of weaknesses 48% Organization perspectives 53%	Major organizational strategies related to knowledge management should be brought into sharper focus; also, strategic thinking based on knowledge management is to be taught regularly.
Knowledge Identification	External staff's knowledge 38.6% External data bank and documentation 41.6% internal staff's knowledge 44% Internal data bank and documentation 59%	Knowledge documentation and storage systems should be activated; also, the data are to be classified in order to staff access to them more systematically.
Knowledge Acquisition	Conducting projects with research institutes 36.6 % Getting access to firs-hand sources 41% Holding international conferences 38.8 % Getting access to secondary sources 48.3% Getting access to external data bases 52.3 % Using internal and external experts' ideas 53% Holding specialized workshops 58% Holding internal conferences 60.3% Getting access to internal data bases 62% Getting useful access to internet 65.3% Using email 77.3%	Research and Development (R & D) section is suggested to determine some projects to establish the knowledge setting in organization. Also, the department is suggested to subscribe in authentic databases of international journals to provide the staff with the first-hand sources. It is not economic to hold international conferences, so national conferences (gap=39.67%) seem better to be held through unions and interpersonal cooperation.
Knowledge Development	Recruiting knowledgeable applicants 45.3% The impact of knowledge on process 50.3% Paying attention to environmental changes 55.3%	The organization is suggested to enhance its relationship with institutes and universities; also, intellectual capital is to be regarded in recruiting employees.
Knowledge Distribution	Paying attention to establishing web forums 33% Job rotation 34.4% Holding session with faculty members 38.6% Performing based on team-work activities 54.6%	Human resource department is strongly suggested to plan job rotation in a manner that converting tacit knowledge into explicit knowledge and implementing internship courses are facilitated.
Knowledge Use	Risk-taking in creative projects 36.6% Employing academic experts' ideas 43.3% Examining documentations and reports 52%	This index is widely used in knowledge-based organizations. So, it doesn't seem very popular for those organizations that use knowledge as an instrument.
Knowledge Preservation	Getting access to staff's records 34.3% Updating data bases 42.8% Establishing knowledge bank 49% Activating storage 54.3%	Human resource management is suggested to prepare a booklet in which staff's job experiences are recorded, so others can access to them easily. Doing so, staff's information is updated gradually.
Knowledge Measurement	Using system of guidelines and suggestions 30% Providing feedback for knowledge performance 33% Prioritizing quality over quantity 39.6%	The organization is to device a system for receiving staff's guidelines and suggestions to provide staff with an opportunity to express their ideas anonymously.

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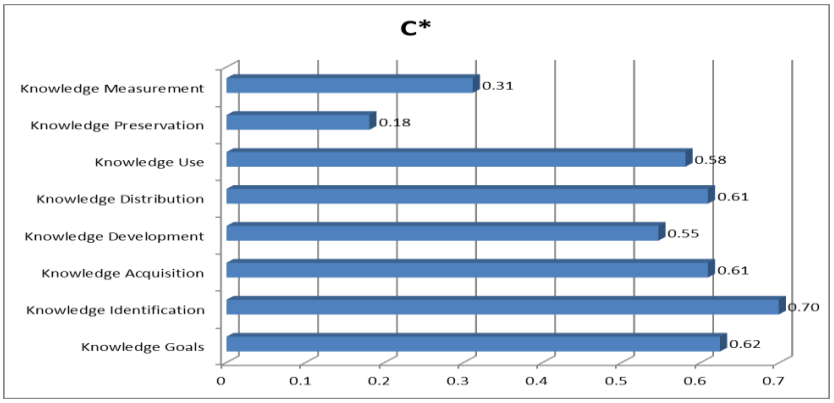

Figure 4. Ranking of knowledge management dimensions in TOPSIS

Question4. What strategies can be employed to enhance each of knowledge management dimensions in Mapna agroup?

RESULTS AND DISCUSSION

Energy is very crucial to industry and considered as an inalienable part of life nowadays. Similarly, power is regarded as an infrastructure for development. Mapna Groups as a knowledge-based organization needs to adopt a high level of knowledge management due to the large-scale investment and high technology it benefits from. According to the results of table 3, it can be inferred that:

- In knowledge objective dimension, the highest score is related to perspectives and future demands of organization and the lowest score is related to the organizational knowledge management,
- In knowledge identification dimension, the highest score is related to data bank and the documentation inside organization and the lowest score is related to knowledge and expertise of users and colleagues outside of organization,
- In knowledge acquisition dimension, the highest score is related to effective access to information via internet and intranet whereas the lowest score is related to conducting projects with research institutes,
- In knowledge development dimension, the highest score is related to updating knowledge and the least score is related to recruiting knowledgeable applicants,
- In knowledge distribution dimension, the highest score is related to team work index and the least score is related to establishing internet forums,
- In knowledge use dimension, the highest score is related to examining documentations and reports and the least score is related to risk-taking in creative projects,
- In knowledge preservation dimension, the highest a score is related to keeping procedures and storage and the least score is related to getting access to staff's records,
- In knowledge evaluation dimension, the highest score is related to prioritizing quality over quantity and the lowest score is related to using a system for guidelines and suggestions.

In short, the dimension of strategic capabilities (71.89%) was reported as the strongest dimension whereas the dimension of supplementary capabilities (67.32%) was reported as the weakest dimension.

According to the results of table 4, it can be inferred that:

- The dimension of knowledge acquisition (53.94%) was reported as the strongest dimension whereas the dimension of knowledge measurement (34.22) was reported as the weakest dimension.
- The dimension of knowledge acquisition (46.06%) had the biggest gap with regard to the standard level whereas the dimension of knowledge measurement (65.78) had the smallest gap in comparison to the standard level based on experts' ideas.

According to the results of diagram 4, it can be inferred that:

- Knowledge identification was reported as the highest rank and knowledge preservation was reported as the lowest rank among dimensions of knowledge management.

Finally, based on the results of table4, it can be inferred that:

- Knowledge identification (48.9) was the strongest and knowledge distribution (34.22) was the weakest dimension among all dimensions of knowledge management,
- The dimension of knowledge acquisition (46%) had the biggest gap with regard to the standard level whereas the dimension of knowledge measurement (65.8%) had the smallest gap in comparison to the standard level based on experts' ideas.

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