Knowledge Management Critical Success Factors in Construction Projects

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Abstract

Knowledge management (KM) is defined as the act of establishing, sharing, and flowing of knowledge within an organization. Knowledge is an important driving force for business success and competiveness, especially in the construction industry, which is a project-based oriented that involves multidiscipline stakeholders. Knowledge management critical success factors (KMCSFs) are considered crucial for the construction industry. Previous works suggested a positive relation between addressing the critical success factors and the successful implementation of knowledge management. The objective of this paper is to identify and assess those factors. Data were collected by a structured questionnaire distributed randomly to 300 construction project professionals in the Palestinian construction industry concerning their knowledge management experiences. 277 questionnaires were received giving a response rate of 92%. Data were analyzed using Relative Importance Index (RII) and Exploratory Factor Analysis (EFA). It has been found that teamwork and face- to- face communication are considered the most significant critical success factors in managing knowledge. Moreover, three groups of critical success factors for managing knowledge have been categorized by EFA. They are related to culture, knowledge sharing process, and organizational structure. The findings of this study are significant in the understanding of knowledge management critical success factors in construction project. This knowledge may contribute to better decision-making and improvement of the construction projects performance.

Keywords: Knowledge management, critical success factors, construction, performance

1.0   Introduction

In today's dynamic and complex environment, knowledge becomes a critical asset of an organization [1]. Consequently, effective knowledge implementation is becoming more significant for providing a sustainable competitive advantage [2, 3, 4]. Within the construction industry, where products and services are the end results of the several project initiatives of the organizations, the need for creating innovative and unique knowledge that leads to organizational sustainability in the marketplace is acknowledged [5]. This requires effective utilization and management of project knowledge, whereas knowledge management implementation is also being crucial.

In construction practices, sharing experiences among the project participants is of use to avoid mistakes that have been happened on previous projects. It can also be considered as one of the effective ways of improving construction management [1, 5, 6]. Previous research found that integrating knowledge management with project management is important to enhance project success in organizationsis [7]. Based on this, establishing the critical success factors to the construction knowledge management is of great important and significant for those who will use knowledge management in their company. These factors are called CSFs of KM, which can be defined as those activities and behaviors, necessary to ensure a successful implementation [8].

There is sporadic evidence that failing to identify the critical success factors for knowledge implementation is one of the main reasons for businesses failing to implement KM successfully. This study attempts to explore these critical success factors in the construction industry in Palestine in accord with the participants' experience and concepts. The participators of this survey are construction project professionals and experts who are the main part of knowledge management practice in construction.

1.1   Definition of Knowledge Management

Knowledge management (KM) is defined as the creation, sharing and flow of knowledge within organizations [5]. It includes systematic management and processes of creating, gathering, organizing, utilizing, and exploiting information [9]; managing by creating, structuring, dissemination and applying the knowledge [10]; capability to create new knowledge disseminates it throughout the organization [11]; The creation of an environment encourages knowledge to be created, shared, enhanced, organized and utilized [12]; leveraging intellectual assets to enhance performance [13]; An integrated, systematic approach to identify, manage, and share department's information assets [14]; application of knowledge to maximize knowledge-related effectiveness and returns [15]. Peter Drucker was the first who introduced knowledge idea [16].There were various opinions of what is meant by knowledge. Some defined it as an absolute truth that exists separately from the knower [17], while others upheld that is socially constructed [18, 19]. Knowledge is reckoned as: facts and data that are organized to describe a particular situation [20]; multidimensional concept for gaining access to information[21]; information, ideas, expertise [22]; information that drive people's actions [23]; something deeper than data or information [4]; power for acting and making decisions [19, 23]; information that merged with creativity, intuition [24], interpretation, context and experience that is gained [25]; insight, ideas, experience, skill, information or data, may be associated with knowledge [26].

Sarvary [27] suggested that knowledge management involves the process whereby organizations innovate, use, spread, and accumulate organizational knowledge. Nicolas [28] showed that it is a logical process for creating and using knowledge to attain organizational objectives. Lloria [29] stated that it included a sequence of policies and guidelines that enable the creation, and institutionalization of knowledge in order to attain the firm's objectives. Gao et al. [26] confirmed KM as managing the activities of knowledge through motivating, leading, and supporting knowledge, providing a suitable working environment.

Knowledge is considered as a significant organizational resource [30]. Knowledge is the information that guides task execution, problem solving, and decision-making [18]. It justifies personal beliefs to take effective action [11], it also regarded as an important production factor that create values and sustainable competitive advantage [3, 24, 31, 32]. Researchers pointed out that knowledge is a conceptualized subject to an individual's subjective interpretation [19, 33, 34]. While knowledge is not a physically identifiable entity [12], it is considered as a service by many researchers [35]. It is also considered as something that can be reused and transferred [4].

Knowledge has three stages of accessibility: explicit, tacit, and implicit forms [35, 36, 37, 38]. Tacit knowledge defined as intangible information [11], which needed for problem solving and decision-making [39]. On the other hand, it's harder to express, communicate [26].Tacit knowledge helped in making explicit practicable [40]. Explicit knowledge allows encoding, and clear illustration, it is the formalized knowledge sent into a systematic and formal language [30, 41] and delivered in a format, such as data, databases, electronic files and paper documents [42, 43]. Explicit knowledge is easy to get and can be deployed quickly to the dissemination of knowledge [44].The construction industry values the assets of experiential knowledge in which knowledge can be lost when employees resign or retire from an organization [17]. Implicit knowledge is knowledge that can be expressed in verbal, symbolic, and written form [45]. Its existence is implied by or inferred from observable behavior or performance [36]. This kind of knowledge can often be teased out of a competent performer by a task analyst, knowledge engineer or other person skilled in identifying the kind of knowledge that can be articulated [38].

Knowledge in organizations can be both formal and informal in nature [46]. Hutchinson and Quintas [47] agreed that formal knowledge concerns policies, structures, and practices that are named and governed by the concepts of KM. In contrast, the informal management of knowledge refers to practices that are concerned with knowledge processes, but are not so rigid. According to Azudin et al., [46], formal exchange mechanisms, such as procedure, and formal language will ensure that people will exchange and combine their explicit knowledge, while, informal knowledge interchanges between and among staff is effective in building up knowledge base and facilitating faster learning. Zin and Egbu [48] stated that formal knowledge including activities designed by a company with the aim of learning from each other and encourage (knowledge sharing) KS in organizations, from basic instructions, to more complex interventions, regarding informal refers to informal networks and communication.

1.2   Knowledge management critical success factors (KMCSFs)

The success of KM implementation is determined by a group of CSFs that have been studied by several authors. Alazmi and Zairi [49] defined Knowledge management critical success factors (KMCSFs) as a restricted number of areas in which satisfactory results are guaranteed for a successful competitive performance. Wong [8] and Tan [8] regard CSFs related to KM as those activities and behaviors that are nurtured and created to achieve better implementation.

Table 1 shows the main research contributions made in the field of KMCSFs.

Author/s and year	KMCSF
Davenport and Prusak [4]	Nine success factors including: multiple channels for knowledge transfer, some level of knowledge structure, nontrivial motivational aid, clarity of language and vision, a modicum of process orientation, a link to economics or industry value, senior management support, technical and organizational infrastructure, and a knowledge oriented culture.
Tan [50]	Six success factors include: People, leadership, information systems, processes, organizational structure and reward system.
O'Dell and Grayson [51]	Five enablers to create an environment for best practices. Those are: technology, culture, reward, senior leadership, and measurement
Chourides et al. [52]	Five knowledge management success factors including: marketing, quality, IT, human resource management, and strategy
Nelson and Middleton [53]	Ten organizational factors that enable KM activities. Those are: information architecture, information behavior, organizational culture, information management processes, IT practices, KM processes, people management, information policy and strategy, information politics, and organizational structures
Karabag [54]	Thirteen SCFs, divided as CSFs in human sector include: KM acceptance, establish management support, communication, motivation aids, employee's engagement; CSFs in organizational sector include: KM well planned strategy, time pressure, understand and define KM process, measurement and content quality, KM responsibility and feedback from user for improving the KM quality; CSFs in technological sector include: KM system quality and timely detection of shortcomings
Wong [8]	Eleven KMCSFs that include: HRM, training and education, resources, motivational aids, processes and activities, organizational infrastructure, measurement, strategy and purpose, IT, management leadership and support, and culture.

Chong and Choi [55]	Eleven critical knowledge management enablers that include: Employee training, employee involvement, teamwork, employee empowerment, top management leadership and commitment, organizational constraints, IS infrastructure, performance measurement, egalitarian culture, benchmarking, and knowledge structure.
Akhavan et al. [14]	Sixteen KM CSFs, those include: CEO's commitment and support, organizational culture, pilot projects, knowledge identification, knowledge storage, knowledge review, knowledge capturing, business process engineering, organizational structure, trust, KM strategy, organizational transparency, KS, expert networking, knowledge architecture, and training.
Conley and Zheng [56]	Nine CSFs consists of: the leadership and top management support, KM strategy, technology infrastructure, organizational culture, incentives, education and training, KM processes, KM practices, and the use of KM team
Steyn and Kahn [57]	Six factors that include: training, collaborative organizational structures, leadership, information and communication technologies, organizational transparency and dimensions of KM
Salleh [58]	Seven main success factors: organizational planning efforts, project manager's goal commitment, project team's motivation and goal orientation, clarity of the project's scope and work definition, project manager's capabilities and experience, safety precautions and applied procedures, use of control systems and safety
Kanagasabapathy et al. [59]	Eleven CSFs including: Trusting and open organizational culture, management, leadership and commitment, employee involvement, employee training, trustworthy teamwork, employee empowerment, information systems infrastructure, performance measurement, Benchmarking, and knowledge structure.
Rašul et al. [60]	three categories of CSFs: Information technology, organization and knowledge.
Lee and Choi [61]	Collaboration, trust, learning, centralization, formalization, T-shaped skills, and information technology support.
AL-Hakim and Hassan [2]	HMR, information technology, leadership, organizational learning, organizational strategy, organizational structure, and organizational culture.
Bishop et al. [62]	KM acceptance, establish management support, motivation aids, KM well planned strategy, understand KM process, and KM responsibility.
Cristina [63]	Eleven critical enablers such as Employee training, employee involvement, teamwork, employee empowerment, top management leadership and commitment, organizational constraints, information system infrastructure, performance measurement, egalitarian culture, benchmarking, and knowledge structure.

2.0   Methodology

This study was carried out in the Gaza Strip, which consists of five governorates: northern governorate, Gaza governorate, middle governorate, Khan Younis governorate, and Rafah governorate. The population of this study was contracting companies who are registered in

the Palestinian Contractors Union (PCU) in the Gaza Strip, which are 238 contracting companies. Those contractors are classified under five main grades. The sample of this study was the construction professional workings with the contracting companies including the five grades of registration. The following statistical equation was used to determine the sample size [64].

$$SS = \frac{Z^2 \times P \times (1-P)}{C^2}$$

Where:
SS: The sample size
Z: Z value (e.g. 1.96 for 95% confidence interval)
P: Percentage picking a choice, expressed as decimal, (0.50 used for sample size needed)
C: Maximum error of estimation (0.08)

$$SS = \frac{1.96^2 \times 0.5 \times (1-0.5)}{(0.08)^2} = 150$$

According to the equation, the minimum sample size is at least 150 based on 8% margin of errors. 300questionnaires were distributed randomly (more than three copies for each contracting company) to construction professionals with different professions and disciplines. 277 questionnaires were received back yielding 92% response rate.

2.1 Pilot study

A pilot study was conducted by sending the questionnaire and a cover letter via email to fifteen participants from different companies and academic professionals. The professionals were selected with more than 10 years' experience in construction work. The respondents were asked to complete the questionnaire and to review the design and structure of the survey. This was followed with personal interviews with those participants. The aim was to test the suitability and comprehensibility of the questionnaire. During the interviews, feedback and comments related to the design of questionnaires and suggestions for refining the survey instruments were collected. As a result, few changes were made to the questionnaire. Mainly, the pilot study showed that some attributes were repeated, irrelevant, weak, or vague and should be omitted. Other attributes were modified to suit the Gaza Strip construction professionals work nature and some attributes were added by the respondents in the pilot study. In addition, grammatical and spilling mistakes were corrected.

2.2 Questionnaire sampling and distributing methods

The questionnaire was initially designed based on an extensive literature review of previous studies, which designed to investigate KM implementation and CSFs within construction organization. Most of those previous studies used the delivery and collection questionnaires method [65] in distributing the questionnaires, for example: [2, 3, 4, 17, 25, 33, 35, 42, 48, 49, 50, 53, 54, 56, 60, 66, 67]. Consequently, a self-administered questionnaire was used for data collection. However, as recommended by Saunders et al. [65] the survey was including an information cover letter, which gives brief information about the objective of the study, background about the researcher, the ethical approval that obtained from the research committee of the researcher's university and the when the questionnaire is likely to be collected.

3.0 Data analysis method

To enhance the external validity, perceived reliability, and optimize a balance between the depth and breadth of the research, a quantitative method, was adopted for this research. A quantitative research method was the major type of data collection and analysis methods adopted in behavior and management research studies [68, 69]. SPSS 20 (Statistical Package for the Social

Sciences) was used to analyze the collected data. In this research, ordinal scales were used. Ordinal scale is a ranking or a rating data that normally uses integers in ascending or descending order. The numbers assigned to the important (1, 2, 3, 4, 5) do not indicate that the interval between scales are equal, nor do they indicate absolute quantities. They are merely numerical labels [70]. Researchers usually use Likert scales [71] as means to discover strength of feeling or attitude towards a given statement or series of statements. Likert scales can be a three, five, or seven-point range that asks respondents to indicate rank order of agreement or disagreement by circling the appropriate number [72, 73]. Five-point Likert scale) was used in this questionnaire, where the implication is that the higher the category chosen, the greater the strength of agreement. The respondents were asked to rate their agreement or disagreement about the identified KSCSFs by circling the appropriate box.

3.1 The relative importance index

Descriptive statistics namely relative importance index method (RII) was used to determine the ranks of all KSCSFs and to highlight the relative importance of attributes as perceived by the respondents. The relative importance index was computed as Enshassi et al. [74, 75]:

$$RII = \frac{\sum W}{A \times N}$$

Where:
W is the weighting given to each factor by the respondents (ranging from 1 to 5)
A = the highest weight (i.e. 5 in this case)
N = the total number of respondents

The RII value had a range from 0 to 1 (0 not inclusive), the higher the value of RII, the more impact of the attribute. However, RII does not reflect the relationship between the various attributes [76].

3.2 Factor analysis

Factor analysis is a powerful statistical technique that aims at providing greater insight. It is considered a data reduction technique, which is used to reduce a set of variables to a smaller number of variables or factors [77, 68]. To achieve this aim, SPSS 20 software was used, where EFA was employed to examine the pattern of inter-correlations between the variables and whether there are subsets of variables that correlate highly with each other. It is used to reduce a large number of related variables to a more manageable number, prior to using them in other analyses such as correlation or multiple regressions [77, 76, 78]. Exploratory factor analysis was adopted in this study to explore the inter-relationships among a set of variables.

In order to evaluate the adequacy of the survey data to employ factor analysis, two main assumptions should be tested, those are; Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity [76, 78]. The value of (KMO) represents the ratio of squared correlation between variables to the squared partial correlation between variables. It varies from 0 to 1. A value close to 1 indicates that pattern of correlation was relatively compact and hence factor analysis should give distinct and reliable results. A minimum value of 0.5 has been suggested [78]. Values that are higher than 0.5, were recommended by Field [76]. The Bartlett's Test of Sphericity should be significant ($p < 0.5$) for factor analysis to be suitable [76, 78], which was met for this data set.

T test was used to determine if the mean of an item was significantly different from a hypothesized value 3 (Middle value of Likert scale). If the P-value (Sig.) is smaller than or equal to the level of significance, $\alpha=0.05$ then the mean of an item was significantly different from a

hypothesized value 3. The sign of the Test value indicates whether the mean is significantly greater or smaller than hypothesized value 3. On the other hand, if the P-value (Sig.) is greater than the level of significance, α=0.05, then the mean an item is insignificantly different from a hypothesized value 3 [76, 78].

3.3 Questionnaire validity

Statistical validity of the questionnaire refers to the degree to which an instrument measures what it is supposed to be measuring [79]. Validity has a number of different aspects and assessment approaches. To insure the validity of the questionnaire, two statistical tests should be applied. The first test is Criterion-related validity test (Spearman test) which measured the correlation coefficient between each item in one field and the whole field. The second test was structure validity test (Spearman test) that used to test the validity of the questionnaire structure by testing the validity of each field and the validity of the whole questionnaire. It measures the correlation coefficient between one filed and all the fields of the questionnaire that have the same level [79].

3.4 Criterion related validity

Internal consistency of the questionnaire was measured by a scouting sample, which consisted of 30 questionnaires through measuring the correlation coefficients between each item in one field and the whole filed. The p-values (Sig.) are less than 0.05, so the correlation coefficients of this field were significant at α = 0.05. Therefore, it can be said that the items of each field were consistent and valid to measure what it was set for [70].

3.5 Structure validity of the questionnaire

Structure validity was the second statistical test that used to test the validity of the questionnaire structure by testing the validity of each field and the validity of the whole questionnaire. It measures the correlation coefficient between one filed and all the fields of the questionnaire that have the same level of likert scale. The p-values (Sig.) were less than 0.05, so the correlation coefficients of all the fields were significant at α = 0.05. Therefore, it can be said that the fields were valid to measure what it was set for to achieve the main aim of the study.

3.6 Reliability analysis

Cronbach's Coefficient Alpha was used to measure the reliability of the questionnaire between each field and the mean of the whole fields of the questionnaire [68]. The normal range of Cronbach's coefficient alpha value between 0.0 and + 1.0 [68], and the higher values reflects a higher degree of internal consistency and vice versa. The value of Cronbach's coefficient alpha is inflated by a large number of variables, so there is no set interpretation as to what is an acceptable limit.

4.0 Results and discussion

A list of the 16 attributes related to knowledge management was selected from literature and confirmed by the pilot study. These attributes were subjected to the views of respondents via the questionnaire survey. The following sections present the analysis results. It starts by presenting the descriptive results of mean value, RII, SD, test value, P-value, and ranks of each item (i.e. CSF) affecting the knowledge management implementation. It followed by explaining the results of the EFA.

The critical success factors will be discussed based on the first top five attributes. The results revealed that that the sign of the test value is positive for all attributes with the exception of

the last one 'the prevailing notion ----'as it has a negative nature; if this belief is predominant in the company atmosphere, it will form obstacles in knowledge sharing perception. In addition, the rest of the attributes have a mean greater than the hypothesized value. Therefore, it can be concluded that the respondents agreed to the mentioned set of attributes of knowledge management critical success factors.

4.1   Descriptive results of the means, SD, RII, and ranks

Table 2 shows the results of the initial descriptive analysis. It gives the results of mean value, RII, SD, test value, P-value, and ranks of each item (i.e. CSF) affecting the knowledge management implementation.

Table 2: RII ranks and Test value for knowledge management critical success factors

No.	Knowledge management critical success factors	Mean	RII (%)	SD	Test value	P-value (Sig.)	Rank
KM5	In my organization teamwork, discussion and collaboration enhance communication among colleagues.	4.17	83.36	0.87	14.12	0.000*	1
KM4	In my organization, there is high level of face-to-face interaction among colleagues in the workplace.	4.06	81.16	0.96	12.86	0.000*	2
KM12	I always share knowledge with my colleagues.	4.03	80.58	0.90	13.37	0.000*	3
KM10	Certain tasks require getting information from different departments in order to be accomplished.	3.95	78.99	0.92	12.71	0.000*	4
KM1	My organization's values and purposes emphasize on managing knowledge.	3.89	77.75	1.06	11.71	0.465	5
KM14	My organization is efficient at leveraging knowledge to improve performance.	3.84	76.87	0.94	11.73	0.000*	6
KM8	My manager helps employees in managing and sharing knowledge.	3.83	76.61	1.01	11.25	0.001*	7
KM2	My organization is encouraging and supportive organizational culture.	3.80	76.09	1.05	10.52	0.000*	8
KM13	My organization is good in generating new knowledge	3.79	75.85	0.98	10.65	0.000*	9
KM6	Negative behavior towards knowledge management and sharing is always discouraged.	3.65	72.92	1.13	8.29	0.000*	10
KM9	The information system is available to me upon need.	3.62	72.41	1.03	9.39	0.050*	11
KM7	My organization's leadership supports the activities relating to knowledge management.	3.61	72.29	1.04	9.48	0.000*	12
KM3	I will give out knowledge if I know that I will get new knowledge in return.	3.55	70.95	1.27	6.84	0.000*	13
KM11	Workers actively participate in the process of decision-making.	3.49	69.82	1.19	6.75	0.000*	14
KM15	My organization is good in transferring existing knowledge to other organizations.	3.42	68.50	1.11	6.50	0.000*	15
KM16	The prevailing notion that knowledge management is the task of a few designated ones and there is no need for knowledge sharing.	3.09	57.74	1.21	-1.18	0.118	16

KM: knowledge management
*The mean is significantly different from 3
SD: Standard Deviation
RII: Relative importance index

The results indicated that *"In my organization, teamwork discussion and collaboration enhance communication among colleagues"* attribute was ranked first with a mean value = 4.17 and RII = 83.36%. This attribute is asserted as previous research that suitable teamwork's environment and managing collaboration is crucial for an effective knowledge management. For example, Rašul et al. [60], Davenport & Prusak [4], McDermott, and O'Dell [39] concluded that teamwork occupies the first rank highlighting the importance of building teamwork as influencing attribute in the success of organizational knowledge management.

This was followed by "*In my organization, there is high level of face to face interaction among colleagues in the workplace*" attribute with a mean value = 4.06 and RII = 81.16% as the second ranked attribute. The respondents' perceptions showed that there is a need for a flexible approach in administering the project to achieve the pre-determined objectives. Effective participation in a team environment requires a direct communication between employees, thus improving relationships. This is consistent with Wang and Noe [67] who assisted that knowledge sharing can occur via written documents or face-to-face communications through networking with other experts.

The results showed that "*I always share knowledge with my colleagues."* attribute with a mean value = 4.03 and RII = 80.58 % was ranked third. It is indicated that employees must be aware about their strategies and attitudes on how to respond to their fellows' inquiries, and be aware of the permanent willingness to share knowledge. The knowledgeable workers are likely to be influenced by the expectations of their peers in deciding to engage in knowledge sharing. The obtained result is consistent with Abdul-Jalala et al. [81]; Abilia et al. [82]; Akhavan et al. [14]; Alazmi and Zairim [49]; Ardichvili et al. [83]; Bishop et al. [62]; Egbu [33]; Hau et al. [84]; Rasli et al. [85]; Sa´enz et al. [86]; Zin and Egbu [48] who focused on this attribute as a mean of maximizing information usage by sharing knowledge with the whole team.

"*Certain tasks require getting information from different departments in order to be accomplished"* attribute was ranked fourth with a mean value = 3.95 and RII = 78.99%. Top manager should make a delegation and impose authority to attain the knowledge management objective not only in a closed isolated system, but also between the entire organizational departments. This can be achieved by minimizing or avoiding any pessimistic concept, in particular managerial obstacles. Therefore, organization should create the atmosphere of collaboration predominant on department managers. This is in agreement with Nor et al. [42], Renzl [87], Hong et al. [9], and Chee [88]. As they asserted higher level of communication and coordination between departments within organization, departments will be sped up. "*My organization's values and purposes emphasize on managing and knowledge sharing."* with a mean value = 3.89 and RII = 77.75% as the fifth ranked attribute. This result illustrates noticeably the influence of setting common goal and values of the organization in knowledge management process. Since the project manager should have a thorough understanding of the knowledge management during the construction project lifecycle. In this essence, a non-hierarchical, self-organizing organizational structure is the most effective for knowledge sharing. A similar result was found by Al-Alawi et al. [89], and Davenport & Prusak [4].

4.2   Factor analysis

The data gathered was subjected to EFA to examine the inter-relationships among the sixteen statements in attempt to identify interrelationships among items and group items that are part of unified concepts. First data suitability was assessed using the recommended measures of sampling adequacy as discussed previously. Table 3 shows the Kaiser-Meyer-Oklin (KMO) and Bartlett's test of sphericity. For these data, KMO = 0.906, which is more than the recommended threshold of 0.50. On the other hand, Bartlett's test was highly significant (P-value < 0.001). Therefore, exploratory factor analysis was appropriate. Cronbach's Alpha was equal to 0.880 suggested that the reliability of the research instrument used was accepted.

Table 3: KMO and Bartlett's test of knowledge management critical success factor

Kaiser-Meyer-Olkin Measure of sampling adequacy.		0.906
Bartlett's Test of sphericity	Approx. Chi-Square	1,774.150
	Df	120
	P-value	< 0.001
Cronbach's Alpha		0.880

Figure 1 shows the scree plot of performance, which resulted in three factors; culture, knowledge sharing process, and organizational structure, because the regression line was severed up to attribute 3 and became almost straight line after that. Factor 1: culture explained 24.573% of total variance. Factor 2: knowledge sharing process explained 21.633% of total variance, and factor 3: organizational structure explained 11.153% of total variance.
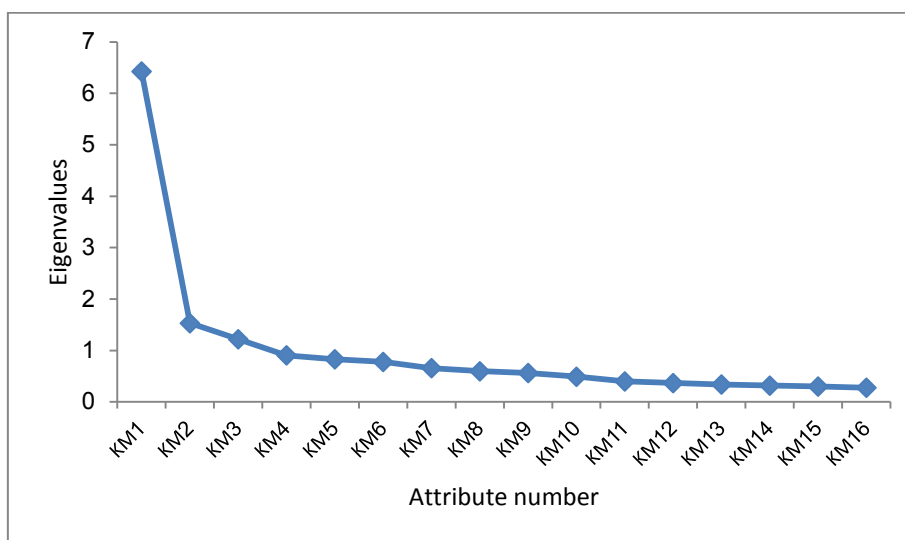

Figure 1: Scree plot for knowledge management critical success factors

Table 4: Results of factor analysis for knowledge management critical success factors

No.	Knowledge management critical success factors	Factor loading	Variance explained
	Factor 1: Culture		24.573%
KM5	Teamwork discussion and collaboration enhance communication among colleagues.	0.752	
KM10	Certain tasks require getting information from different departments in order to be accomplished.	0.732	
KM4	There is high level of face-to-face interaction among colleagues in the workplace.	0.663	
KM3	I will give out knowledge if I know that I will get new knowledge in return.	0.585	
KM8	My manager helps employees in managing and sharing knowledge.	0.584	
KM9	The information system is available to me upon need.	0.568	
KM1	My organization's values and purposes emphasize on managing and knowledge sharing.	0.557	
KM7	My organization's leadership supports the activities relating to knowledge management and sharing.	0.553	

KM6	Negative behavior towards knowledge management is always discouraged.	0.512	
	Factor 2: Knowledge sharing process		21.633%
KM13	My organization is good in generating new knowledge.	0.801	
KM14	My organization is efficient at leveraging knowledge to improve performance.	0.795	
KM12	I always share knowledge with my colleagues.	0.673	
KM2	My organization is encouraging and supportive organizational culture.	0.622	
KM15	My organization is good in transferring existing knowledge to other organizations.	0.572	
	Factor 3: Organizational structure		11.153%
KM16	The prevailing notion that knowledge management is the task of a few designated ones and there is no need for knowledge sharing.	-0.678	
KM11	Workers actively participate in the process of decision-making.	0.545	

Factor 1: Culture

The first factor (culture) explained 24.573% of the total variance, which was represented by nine attributes. This factor included the attributes related to organizational and personality culture between employees within organization. The attributes had adequate factor loadings ($\geq$ 0.512). Table 4, shows that the highest factor loading attribute for culture factor is "In my organization, teamwork discussion and collaboration enhance communication among colleagues". This emphasized the importance of teamwork as a core critical success factor for knowledge management. The obtained results are in the same line with Kanagasabapathy et al. [59], Chong and Choi [55], Conley and Zheng [56], and Lee and Choi [61].

The second highest factor-loading attribute was "In my organization, certain tasks require getting information from different departments in order to be accomplished". This result reflected the agreement of respondents regarding the importance of ensuring effective communication between different departments. This attribute indicated that interactions and cooperative relationships between departments should be more sedulous and conscientious given the competitive nature of the construction industry. In addition, knowledge-sharing activities between departments are certainly guided or interfered by managers. This is agreed with Lin [66] results revealed that organization should establish a mechanism for interactions and management style so that works can be pursue actively. The results also showed that the first two high loading attributes are homogenous and interrelated concepts. Organization goals should include creating a comprehensively atmosphere, and a knowledge-friendly culture.

Factor 2: Knowledge sharing process

The second factor "knowledge sharing process" accounted for 21.633% of the total variance and comprised five attributes. The attributes had appropriate factor loadings ($\geq$ 0.572). For this factor, the highest factor-loading attribute was "My organization is good in generating new knowledge". This indicated that organization should look from employees' sight in addressing their needs and problems by making the radical transformation process for new knowledge to be advantageous to raise the level of the knowledge workers perceptions. As long as the transformation be seen as a 'benefit change for the staff'. Organization process motivates and supports capturing, creating, sharing, and reusing of knowledge on individual and organizational levels. This comes to agreement with Rasli et al. [85] and Poonkundran [90] who assisted on the importance of organization in accepting new knowledge.

The second highest attribute was "My organization is efficient at leveraging knowledge to improve performance". It is indicated that formal and informal communication networks are

needed to ensure an efficient information circulation. Therefore, increasing the degree of communication amongst the project participants, leading to higher the participant satisfaction and hence organizational success. Ruggles [91] had this attribute as first ranked in its group. Rasli et al. [85] outcomes emphasized the fact that organizations must give people the space to transfer and deliver their knowledge. These findings are similar to Abilia et al. [82] results, which showed that the two factors, culture and knowledge-sharing process, had the highest loading. This result is contrary with Hung and Chuang [91] who concluded that organizational mission and value was the most critical success factors and knowledge sharing was the least critical one.

Factor 3: Organizational structure

The third factor "organizational structure" explained 11.153% of the total variance and comprised only two attribute indicating the respondents' degree of organizational structure. The attributes had relatively adequate factor loadings (≥ 0.545). As indicated in Table 3, the highest factor loading attribute was "In my organization, the prevailing notion that knowledge management is the task of a few designated ones and there is no need for knowledge sharing". It is concluded that prevailing belief that legitimacy of the employees' involvement in the knowledge management reflects the social relations, moral behaviors, relationships nature between employees as well as top management. Knowledge should not be monopolized on certain people; it is preferred to be available for everyone to get the advantages and experiences of the qualified fellows.

The second attribute of this factor was "In my organization, workers actively participate in the process of decision making". The obtained result clarified that top managers often involve human resources particularly experienced ones to share their values and technical culture in decision-making. The importance of worker participation in decision-making is tightened to practical experience gained across their day-to-day involvement in the execution stage of the project. Consequently, they become more responsible. The role of project manager is to effectively manage the relationship between top management and workers as well as acquired knowledge distribution. Thus, the organization should hire the manager with a high management competence and skills. This is agreed with Akhavan et al. [14] who concluded that the workers have a right to play a part in the decision-making.

Community consultation concept can be implemented by activating the internet communication between municipalities and citizens since it's the easiest and most comfortable way for citizens to communicate the local council. Feedback consulted from the public on the quality of services and fairness in distribution has a great impact on community consultation and satisfaction, and there is a real need for conducting town hall meetings that calling citizens and municipality council for attendance.

5.0   Conclusion and recommendations

This study is a part of a research that aims at developing a framework for effective knowledge management implementation in the Palestinian construction industry. The main objective of this study is to investigate knowledge management critical success factors in construction projects in the Palestinian construction industry. The Results obtained indicated that culture, knowledge sharing, organization structure are the main critical success factors for knowledge management. Findings revealed that teamwork, face to face interaction, generate new knowledge environment, resourceful process for sharing, workers participation are the highest factor loading attributes for culture, organizational structure and knowledge sharing factors. The study demonstrated that the factors derived from knowledge management factors could influence knowledge sharing behaviors.

Construction companies advised to create an environment that is conducive to knowledge sharing, develop cultural norms that build trust, collective cooperation, and positive social interactions among workers. Construction companies recommended encouraging knowledge sharing behaviors by promoting teamwork, pro-social and organizational behavior, and face-to-

face interaction. The findings of this study are significant in the understanding of knowledge management critical success factors in construction project. This knowledge may contribute to better decision-making and improvement of the construction projects performance.

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