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CHALLENGES TO THE ADOPTION OF KNOWLEDGE MANAGEMENT IN CIVIL ENGINEERING CONSTRUCTION FIRMS IN GHANA

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Abstract: Knowledge Management is very vital to Civil Engineering (CE) construction firms in creating, identifying, sharing of knowledge on best practices, learning lessons and experiences within the organization. Therefore, as CE construction projects have specific goals and unique deliverables that are not the same, there may be difficulties in recording and capturing project knowledge efficiently. This study sought to explore the critical challenges and key strategies associated with the adoption of knowledge management (KM) in civil engineering construction firms. A questionnaire was designed based on an extensive literature search, and sent to 13 CE construction firms comprising 70 professionals. Based on the data collected, a relative importance score matrix was developed. The findings from this study revealed that key among the challenges associated with the adoption of knowledge management is lack of available KM systems, lack of leadership support and lack of awareness of KM practices. Furthermore, innovation, awareness creation and use of knowledge storage were among the key strategies which the respondents felt should be put in place to improve on the adoption of KM. The findings from this study should enable top management in the construction sector to adopt proactive approaches to improve knowledge sharing in order to improve on performance.

Keywords: challenges, techniques, measures, knowledge management, civil engineering firms, Ghana

INTRODUCTION

The construction industries of developing countries face numerous problems that result in poor performances in the jurisdictions of cost, quality and productivity [1, 2, 3]. Performance in the construction industry is a major concern among client groups and other stakeholders in Ghana [1]. The construction industry in Ghana is a key sector that employs large number of employees in various professionals. Civil Engineering construction plays a key part in the development of the construction industry in Ghana. Civil engineering construction projects accumulate intellectual knowledge which can later be used by firms to add value, innovation, competitiveness among others to improve on future project performances [4]. In civil engineering construction firms, different experts and professionals are brought together to achieve the dreams of clients, and to find solutions to problems that arise on construction sites [5]. In most cases these problems and solutions are rarely documented, and the lessons learned are confined to the minds of those who experienced them [5]. As a result of this, it is very important that knowledge is captured, stored and shared with other employees on the construction sites to ensure that projects are delivered effectively [5].

Knowledge Management is very vital to Civil Engineering (CE) construction firms in creating, identifying, sharing of knowledge on best practices, learning lessons and experiences within the organization. Therefore, as CE construction projects have specific goals and unique deliverables that are not the same, there may be difficulties in recording and capturing project knowledge efficiently [5]. Knowledge can be re-used, and shared among engineers and experts that are involved in the construction works to better the construction process and reduce the time and cost of solving problems. If skill and knowledge are shared, then synonymous problems in construction projects will not be repeatedly solved [6]. Ahadzie [7] stated that in many instances in Ghana, contractors were





blamed for poor performance and were heavily criticized for having limited knowledge in the application of requisite management techniques. However, the construction industry has a poor record in the management of its knowledge and results in huge wastage of resources and detrimental effect to quality.

The structure and working practices in the construction industry makes it difficult to share knowledge [8]. Various initiatives aimed at improving the construction process have necessitated the need for change and continuous improvement in the construction industry. These initiatives are primarily targeted at reducing fragmentation, and have included:

- a. the development of alternative procurement strategies to clarify and improve the communication structure among different participants in the construction process [9];
- b. the use of computer technology to integrate the construction process through electronic sharing of data/information in both directions at the design-construction interface [10, 11, 12];
- c. the adoption of a wide range of concepts, tools and techniques (example total quality management and partnering) to enhance collaboration and improved components, materials and construction methods, including standardization and pre-assembly [13].

According to [14], Knowledge Management System Development (KMSD) can be adopted to improve the construction industry, but the industry fails to reflect the nature and locus of knowledge in the management of knowledge. For developed countries such as Hong Kong, UK and the USA, construction researchers and practitioners have significantly studied and applied the concept of knowledge management. Nevertheless, this is not the situation in a developing country like Ghana. Despite the wide range of literature on knowledge management, very little is known about similar studies conducted on the area in Ghana. Empirical studies have rarely been conducted on the subject in Ghana, especially its adoption and implementation in the Ghanaian Construction Industry. For this reason, the researchers were of the view that professionals working in the construction industry in Ghana may have heard of knowledge management, however, very little is known about its practice. There could be several issues hindering the implementation of the knowledge management principles. This study sought to identify the critical challenges which civil engineering professionals face in the implementation of knowledge management principles, and determined some key strategies which the professionals thought could assist in its adoption.

LITERATURE REVIEW

Conceptual perceptive of KM

Knowledge can be considered in a variety of ways. The explicit dimension of knowledge is articulated, codified and communicated in symbolic form and natural language. Knowledge management can be considered as the effective learning process associated with exploitation and sharing of human knowledge that use appropriate technology and cultural environments to enhance an organization's intellectual capital and performance [15]. However, [16] explained knowledge management as a set of distinct and well-defined approaches and processes that aims at maximizing an enterprises' knowledge related effectiveness and returns from its knowledge assets and be able to renew them constantly. Knowledge management can be used to describe the panoply of procedures and techniques used to acquire the most from a firm's knowledge assets and require the development of dynamic capabilities and the ability to sense and seize opportunities quickly and proficiently [17]. Beijerse [18] also defined knowledge management as the management of information within an organization by steering the strategy, structure, culture and systems and the capacities and attitudes of people with regard to their knowledge. Knowledge management is considered as the achievement of an organization's goals by making the factor knowledge productive [18]. Knowledge can be classified into two distinct dimensions in an organization. Polanyi [19] indicated that knowledge could be considered as tacit or explicit. Tacit dimension of knowledge is rooted in action, experience and involvement in a specific context and it comprises of both cognitive and technical elements [20]. The cognitive element refers to an individual's mental models consisting of mental maps, beliefs, paradigms and viewpoints. However, the technical component consists of concrete know-how, crafts and skills that apply to a specific context.

Knowledge management is regarded as an emerging set of organizational design and operational principles, processes, organizational structure, applications and technologies that helps knowledge workers dramatically leverage their creativity and ability to deliver business values [21]. McInerney [22] also identified knowledge management as an effort to increase useful knowledge within an organization through encouraging communication, offering opportunities to learn and promoting the





sharing of appropriate knowledge artifacts. Knowledge management provides the tools and services for end-users to capture, share, reuse, update and create new experiences, problem solutions and best practices to aid employees in processes such as decision making and innovation without having to spend extra time, effort and resources on reinventing solutions that have already been invented elsewhere in organizations [23]. In summary, knowledge management can be concluded as developing a set of distinct and well-defined processes and techniques that includes procedures based on technologies and practices that motivate effective creation, capturing, organization, distribution, use and sharing of knowledge that enable individuals of the organization to be more effective and productive in their work in order to generate value for the projects and the entire organization.

KM techniques and strategies

The aim of knowledge management is to seek best practices in all business activities to provide better service to its clients. Knowledge management also improves project or business performance and indirectly increases profitability. According to [24], about ninety per cent (90%) of the knowledge captured in two main areas of expertise of a firm will be lost if the people involved leave the organization. It is therefore prudent to develop knowledge management techniques to address both tacit and explicit knowledge.

Two strategic philosophies are associated with knowledge management, codified and personalized strategies [25]. Zack [26] noted that codified knowledge is associated with explicit knowledge which can be more precisely expressed and formulated even when removed from its context. Codified approach describes how the system can help to capture the experience and knowledge of experts within civil engineering construction firms before team members leave [25]. A codified technique revolves around explicit knowledge captured and leveraged using information technology tools comprising software such as expert systems, artificial intelligence and data mining tools. However, the personalized approaches express that the knowledge, experience and skills can be captured via interviewing, protocol analysis, questionnaire surveys and observation and simulation.

Suman and Psunder[27] noted that, the personalized approach is adopted in civil engineering construction firms to facilitate the communications between the various personnel in the organization, so as to easily transfer and share knowledge and information within the arena of projects. Personalized strategy virtually revolves around tacit knowledge using non-information technology tools or human interactive systems such as peer tutoring, regular meetings and training, a supervision/mentoring system, a reward system and lessons that are learned [25]. In a codified strategy, information technology can be used to make intelligent decisions, whereas in a personalization strategy, information technology provides communication support. To encourage the use of knowledge management, civil engineering construction firms should be given clearer concept of knowledge management and more guidelines for its implementation. The exact knowledge management approach relies heavily on the type and size of an organization. Hansen et al.[28] suggest that a firm should choose to adopt one of the strategies with the other acting as a support mechanism, otherwise the focus of the approach would be lost. Hansen et al.[28] proceeded further to suggest an 80% -20% approach that indicates that one strategy or the other will be dominant. However, a mixed approach is not advocated as the focus of the knowledge strategy would be reduced.

Challenges associated with the adoption of KM practices

Several challenges hinder the implementation of knowledge management practices within organizations. Culture has been a recurrent theme in the knowledge management literature as it can enable or inhibit an organization's knowledge management strategy. Coopers and Lybrand [29] explained that culture concerns the values, beliefs, history and traditions, which reflects the deeper foundations of an organization. It has also been identified as one of the most crucial factors that contribute to the success of a knowledge management design and perhaps the most difficult constraint that knowledge managers must deal with [30]. Culture has been identified as the most significant challenge in the implementation of knowledge management practices in construction organizations, especially civil engineering construction firms. This is consistent with the findings from a survey of 431 US and European organizations which identified culture as the biggest impediment to knowledge transfer [31]. The culture of formal and informal sharing of knowledge is important. However, [32] highlighted that culture cannot be changed directly but only through indirect means such as incentives, role models and the likes.

The lack of standard work processes has also been identified as a key challenge. The significant merger and acquisition activities over the past decade have transformed many construction organizations, and





the implication is that organizations have inherited new processes. Many construction organizations now suffer from having too many different processes for performing similar activities. The lack of standard processes and systematic procedures, combined with the lack of awareness of the importance and future benefits of knowledge management causes the need for a more coherent and structured approach for managing and utilizing the different types of knowledge within organizations [33].

Gann [34] argued that construction organizations may have strong capabilities in project management but are often much weaker in organizing their internal business processes. However, preliminary evidence from on-going case studies with selected organizations reveals that there is a new recognition in some organizations for a rationalization or synchronization of some processes to improve the possibility of re-using knowledge of best practice and sharing experience. Time constraint is also considered as a challenge in construction organizations given that projects are characterized by fixed time scales, associated with clients' need to deliver at particular times. Many construction organizations consider their organizational structure too lean -to exploit knowledge management to the fullest, as people want to share knowledge but the pressure to deliver under tight project schedule does not often permit the recording of experience and sharing of knowledge before, during and after projects.

Furthermore, poor organization of internal business processes means that project-based construction organizations often struggle to learn from one project to another [34]. This means that the scope for reduction in project duration and the subsequent time available to document lessons learnt from previous projects are often very limited. Sharing knowledge demands additional effort and may be minimized by work practices and the introduction of better knowledge sharing tools. Construction projects are always working to tight deadlines. Anything that detracts from the main business is seen as of diminished importance. Another challenge to the implementation of knowledge management is employee resistance, which is closely associated with cultural factors. Cultural factors tend to be either negative or positive in orientation with respect to employees. Positive orientation refers to situations where individuals have a positive attitude to the creation and sharing of knowledge. Negative orientation reflects the reverse situation where there are knowledge inhibitors as people who feel insecure about their job situation, do not trust their employers and are therefore less likely to share knowledge [34]. Other challenges identified include knowledge acquisition, knowledge modelling, knowledge retrieval, knowledge re-use, knowledge publishing and maintenance [35]. Despite these challenges, [8] stated that knowledge management is a concept which is relatively new to the construction industry and has the fundamental need to manage its knowledge in a formal and structured way from project to project, given that participants must work with various interested stakeholders.

Measures to improve KM practices

Knowledge management practices enable organizations to succeed into the future and also maximize productivity. Measures such as knowledge storage could be adopted to improve knowledge management practices within an organization. Knowledge storage includes a series of items which try to cover the way the firm implements mechanisms and tools for gathering knowledge and promotes their best use in the organization. Based on existing literature [36, 37, 38, 39], knowledge storage can be adopted to improve knowledge management practices in an organisation.

Knowledge management modelling could also be used to improve knowledge management practices in an organisation. Models are used to help people to understand the complexity of real systems by representing the main features and dividing the large systems into its parts, which will simplify understanding and managing [40]. Models help to provide a more structured approach to understand, implement, apply and evaluate knowledge management systems within a firm. Many researchers however, have developed knowledge management models to help organizations in implementing and applying knowledge management practices successfully. However, in modern contemporary organizations, knowledge is no more adequately possessed at individual levels. New technologies and an abundance of competition require that knowledge be shared and utilized at an organizational level if a company hopes to survive. Hendricks and Vrien [41] suggested that the knowledge assets possessed by a company create the possibility for sustainable competitive advantage. This being the case, a learning organization actively adapts individual knowledge into information that can be readily used to the benefit of the organization as a whole. Aside from extracting and clarifying knowledge from the individual, learning organizations organize and provide structure to knowledge so that it can be





used consistently to update existing practices. Furthermore, a strategic imperative for establishing a successful KM program is the need to implement new practices on a regular basis. Collins [42] indicated that the greatest threat to achieving greatness is an organisation that is content with being very good at what it does. However, a key element to successfully introducing these new practices is the development of a change management program that provides a framework for the implementation process. A central thread in change management is the need to have multiple individuals collaborating and sharing knowledge to successfully introduce the practice.

Innovation can also be employed to improve knowledge management. The ability to innovate is a fundamental requirement for long-term performance improvement. This need for innovation has been overlooked and undervalued within the construction industry. Toole [43] highlighted that there are significant economic, organizational and industry structural barriers within construction organizations of all sizes towards innovation improvement. Notwithstanding, innovation occurs when individuals exchange knowledge and believe that a greater opportunity exists to improve performance than what is currently being achieved [44].

RESEARCH METHODS

This study sought to determine the critical challenges and key strategies associated with the adoption of knowledge management in CE construction firms in Ghana. A quantitative approach employing a structured questionnaire survey was engaged to analyze the identified variables. A quantitative approach is able to generalize and replicate outcomes [45]. Thus, it was engaged in this research because it permits for the likelihood of inferring findings that are representative of the entire population and offers the researcher more control over the research process [46].

The sample frame comprised 13 civil engineering construction firms in the Accra and Kumasi metropolis. From statistical comparisons, Accra and Kumasi is known to be the hub of most civil engineering construction firms in Ghana. To settle on the appropriate sample size, a snowball sampling approach was adopted. Snowball sampling is valuable in research since it is directed at individuals that are difficult to identify [47]. Accordingly, this research employed the snowball sampling to reach hard-to-get respondents. Seventy (70) survey questionnaires were administered by hand to project managers, quantity surveyors, engineers, and managing directors within the 13 firms. The respondents were asked to indicate their level of agreement to the importance of the identified challenges and measures associated with adoption of KM using a five-point Likert scale of 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree and 5=Strongly agree.

Based on the objectives, the variables identified from literature were used to prepare the content of the questionnaire. As a means to ensure a good response rate and to guarantee ethical considerations are attained, introductory letters were sent to the firms to indicate their willingness to partake in the survey. Interestingly, all the 13 CE construction firms responded positively. Sixty-seven (67) responses were received after two months and 7 of those were discarded due to missing data, resulting in 60 usable responses and an overall response rate of 85.7%.

Data was analyzed using the Relative Importance Index (RII) for the ranking of the challenges and measures identified. The five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree) was adopted and transformed to relative importance indices (RII) for each of the challenges and measures. The higher the value of RII, the more important the challenge or measure and vice versa [48]. The RII was used to rank (R) the different challenges and measures. These rankings made it possible to cross-compare the relative importance of the challenges and measures as perceived by the four groups of respondents. Each individual strategy's RII perceived by all respondents should be used to assess the general and overall rankings in order to give an overall picture of the challenges and measures to improve knowledge management. RII is deemed necessary for the study because it takes into account the size of the population and the relative disadvantage experienced by the different management professionals.

RESULTS AND DISCUSSION

Respondents' demographics

Respondents who participated in this survey represent diverse sets of personalities cutting across top construction professionals in the 13 construction firms. Quantity surveyors dominated the study with 33.3% of the total respondents. 26.7% were engineers, while 21.7% were managing directors. Concerning their work experiences, 83% of the respondents indicated they have accumulated more than 5 years of experience in the construction industry. Meanwhile, 14% of the respondents have 3 to 5 years of experience and 3% indicated 2 to 3 years of experience. Examining respondents' highest





level of education, 42% of the respondents indicated they have attained a Bachelor of Science Degrees (BSc). Thirty-three percent (33%) were Higher National Diploma (HND) holders, while the remaining 25% were Master of Science Degree holders. The respondents belonged to construction firms with distinct legal status. The legal framework determines the control of the business, acquisition of capital, extent of risks, the distribution of profits and losses, legal formalities, taxation payment and where legal liabilities rest. More than three quarter (83.3%) of the respondents belong to public limited companies with just 10% belonging to private limited companies. Only 6.7% belonged to sole proprietorship. An intriguing examination was that of the modes of learning adopted by the respondents in their respective firms. Slightly more than half (53%) of the respondents suggested they learn on projects via observation and simulation. While 38.3% learn via survey queries. However, only 8.3% of the respondents indicated they learn lessons through interviewing. Regarding knowledge transfer modes, exactly 50% of the respondents suggested tutoring/mentoring as their mode of knowledge transfer. Thirty-five (35%) indicated meetings, 12% indicated expert system while 3% indicated the adoption of a database mode of knowledge transfer.

Challenges associated with adoption of KM

The opinions of respondents were sought on the challenges associated with the adoption of knowledge management. Table 1 shows the ranking of the challenges in descending order using the method of relative importance index. Table 1 further show that the index rankings ranged between 61.0% to 79.0%.It can be inferred from Table 1 above that respondents' identification of the challenges associated with the adoption of knowledge management was grounded in to lack of available KM systems, lack of leadership support, lack of awareness of KM practices, lack of understanding KM, and employee resistance. However, respondents ranked lack of organizational culture and lack of training and support as quite low (14th and 15th respectively).

Firms which are able to implement adequate knowledge management are better positioned within the global competitive market [30]. Notwithstanding, there should be knowledge management systems so as to ensure its implementation. It is however not surprising those respondents in the study named lack of available KM systems as the most significant challenge associated with the adoption of knowledge management. This challenge was the highest ranked (0.79, 1st) in Table 1. This finding confirms that of [30] who stated that firms need knowledge management systems to implement profitable knowledge management.

Davenport et al.[30] explained that management support is vital in the implementation of knowledge management initiatives and should be represented in both word and action. Lack of leadership support acquired an RII of 0.72 and was ranked 2nd from Table 1. The study revealed that lack of management support is a very critical challenge that should be considered in order to implement knowledge management within an organization.

Lack of awareness of KM practices (0.72, 3rd as in Table 1) was ranked as the third most relevant challenge facing the adoption of knowledge management in CE organizations. Simply put, this

infers that firms need to be adequately aware of knowledge management practices so as to implement them. This buttresses [33] assertion that the lack of awareness of the importance and future benefits of knowledge management causes the need for a more coherent and structured approach for managing and utilizing the diverse types of knowledge within an organization.

Measures to improve KM practices among CE firms in Ghana

The opinions of respondents were further sought on the measures to improve knowledge management in civil engineering construction firms. Figure 1 shows the rankings of the measures in descending order using their relative importance indices. Figure 1 further shows that the index ratings ranged between 65.0-81.0%.From Figure 1, the respondents identified that measures for improvement were anchored on innovation, awareness creation, use of knowledge storage, use of KM models and adequate financial resources. However, respondents ranked establishing a learning organization and clear KM strategic goals quite low (9th and 10th respectively).

Table 1. Challenges associated with adoption of KM

Challenges	RII	Rank
Lack of available KM systems	0.79	1
Lack of leadership support	0.72	2
Lack of awareness of KM practices	0.72	3
Lack of understanding KM	0.71	4
Employee resistance	0.71	5
Poor organization of internal business	0.70	6
Lack of adequate technology	0.70	7
Lack of structured procedures	0.69	8
Time constraint	0.69	9
Lack of standard work processes	0.68	10
Diverse individual cultures	0.67	11
Lack of project documentation	0.66	12
Nature of projects	0.65	13
Lack of organizational culture	0.62	14
Lack of training and support	0.61	15



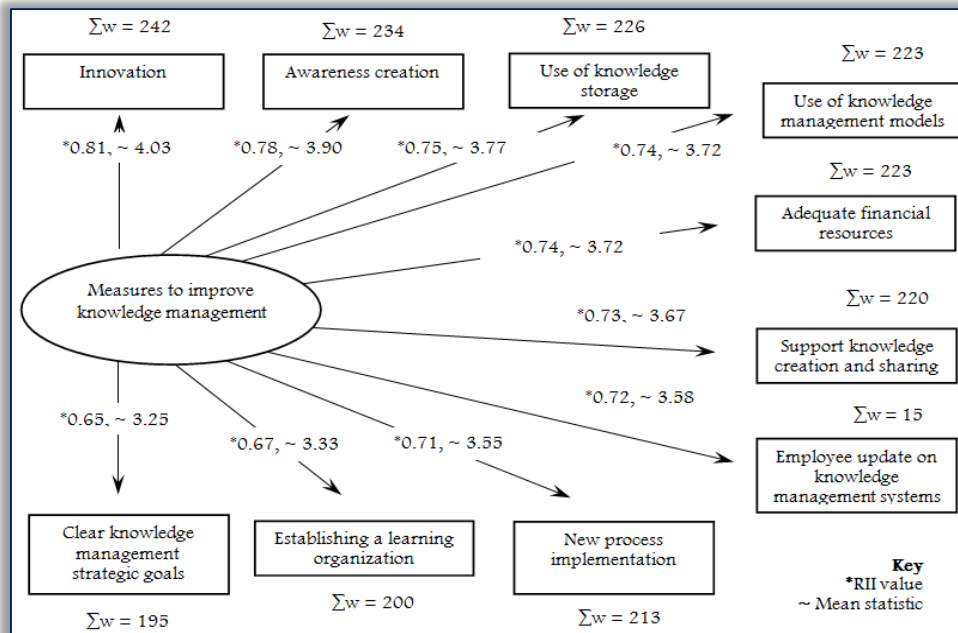


Figure 1. Relative importance score matrix for measures needed to improve knowledge management in Ghana. Innovation is essential to the firms so as to help them remain competitive. Innovative firms are able to develop certain features which give them a competitive edge over their competitors within the job market. It was not surprising when respondents in this study identified innovation as the most relevant measure to improve knowledge management in organizations. This measure was top-ranked (0.81, 1st) in Figure 1. According to Katzenback and Smith [44], innovation occurs when individuals exchange knowledge and believe that a greater opportunity exists to improve performance than what is currently being achieved.

Respondents indicated that awareness creation is very relevant to the management of knowledge within an organisation. If individuals are fully aware of the benefits derived from knowledge management practices, there is the likelihood for them to fully participate in the knowledge management processes (Abdullah et al., 2002). Awareness creation (RII=0.78, ranked 2nd) was revealed in the study as a significant measure for improving knowledge management in organizations. Use of knowledge storage was emphasized as a key measure. The finding revealed that firms need to adopt the use of knowledge storage so as to improve knowledge management. According to Alavi and Leidner[36], knowledge storage includes a series of items used for gathering knowledge and can be adopted to improve knowledge management practices in an organisation.

CONCLUSION

Knowledge Management is very vital in the growth of every organisation and helps to increase useful knowledge within the organisation. However, research has shown that knowledge management in organizations face numerous challenges which adversely affect its incorporation. Notwithstanding these challenges, various strategic measures could be adopted to improve its incorporation within organizations. This study sought to determine the critical challenges and key strategies associated with the adoption of knowledge management in CE construction firms in Ghana. Key among the critical challenges associated with the adoption of knowledge management among the firms were lack of available KM systems, lack of leadership support, lack of awareness of KM practices, lack of understanding KM, and employee resistance.

The professionals were of the view that innovation, awareness creation, use of knowledge storage, use of KM models and adequate financial resources are some of the measures that can be put in place to control the challenges encountered. Recommendations encouraged from this study are that management should ensure adequate platform for exchange of knowledge and also strive to introduce innovation in the management of knowledge within the organisation. In addition, management should also employ the use of knowledge management models and develop adequate knowledge storage systems. Finally, there should be an awareness creation and advocacy on the benefits of knowledge management to firms so as to remain competitive in the global market.

This study is very significant because most of the literature on knowledge management is based on literature in developed countries. There is an adequate pool of knowledge on the concept from





America and other European countries. However, there seem to be little work done on the concept in most developing countries. In Ghana for instance, there is scarcity of research in the area of knowledge management, more specifically in construction organizations. Identifying the challenges to the adoption of knowledge management, and determining strategies to improve on the adoption of the concept will enable top management in the construction sector to adopt proactive approaches to improve knowledge sharing in order to improve on performance.

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