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Knowledge Creation Capabilities for Human Capacity Development in SMES Construction Company in Sabah

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ABSTRACT

In SME construction company, knowledge creation is important for organizational competitiveness and survival. Ability to create new knowledge is one of the vital assets for an organization to keep being competitive. In previous research, studies have been widely conducted in knowledge management and focus on large organizations in high technology sectors. This paper seeks to explore the current implementation of knowledge creation capabilities in SMEs construction company in Sabah. The attributes and barriers of knowledge creation in SMEs organization that can affect the organizational performance were investigated. This study also proposed the mitigation measures to the barriers of knowledge creation in the SMEs organization. Critical literature review and quantitative method were used to achieve the objectives of this study. An online questionnaire will be distributed to identify the attributes and barriers of knowledge creation and its mitigation measures in SME construction companies in Sabah. The data obtained from the questionnaire were analysed using Statistic Package for the Social Sciences (SPSS) by descriptive analysis. The attributes of knowledge creation in SMEs organization have been identified: learning/education, IT adjustment, and collaboration, while the critical barriers: poor training, practice, poor T-shaped skills, and ineffective knowledge & information communication. The most critical mitigation measures that should be taken to remove the barriers: develop an effective knowledge management system, provide education, training, and development practice, and build ethical organization culture. The paper also provide recommendation for future research.

Keywords: Human Capacity Development; Knowledge Creation; Capacity Development Attributes

INTRODUCTION

The importance of knowledge management on organisational outcomes such as organizational learning, innovation, and product quality, besides creative, financial, economic, and organisational performance has been addressed by many studies. Knowledge Creation Process is a dynamic, multidimensional, and complex process. The knowledge creation process can also be defined as the ability of an organization to develop and circulate knowledge in their services. Effective, consistent creation and application of knowledge in an organization can determine the success of the organization (Abubakar et al. 2019). In today's unpredictable and highly competitive environments, knowledge management has gotten a lot of attention as a vital strategy for organizational success and survival (Hwang 2003). Innovation is the process of creating new knowledge and ideas to facilitate new business outcomes, such as enhancing internal business processes and structures and creating market-driven products and services. Therefore, a company's ability to constantly develop new knowledge could be seen as a determining factor in its competitiveness. Many small companies have a flat structure and a free-floating, organic management style that promotes entrepreneurship and innovation. They are usually informal, devoid of bureaucracy, and governed by few regulations (Durst et al. 2013).

PROBLEM STATEMENT

In post-industrial society, knowledge has become a crucial source of value generation and competitive advantage. Organizations must continuously develop knowledge that is both similar and different from that of opponents to survive in an ever-changing business environment and to develop sustainable Human Capacity Development. Knowledge creation is crucial to innovation because it allows an organization to facilitate a dynamic environment (Durst et al. 2013). The construction industry has always been a fast-paced, transaction-oriented sector. For decades, the inflexible structure of 'third-party' contracts restricted the construction industry's ability to respond creatively to the requirements of its clients (Burnes & Coram, 1999). Construction industry nowadays is becoming more competitive, moving away from the traditional design–bid–build process and toward a new organizational innovation capability and performance-based approach, in which jobs are awarded based on skill. As a result, finding strategies to strengthen these traits in a systematic and ongoing manner to assure future competitiveness is a challenge for construction organizations. Construction organizations have been managing knowledge informally for years, but the challenges facing today's sector imply that most organizations now require a more organised, coherent approach to knowledge management (Mcadam et al. 2010).

Research and studies have been widely conducted in knowledge management and focus on large organizations in high technology sectors with structured research and development (R&D) plans, frameworks and/or strategies. High technology sectors are those with high intensity in R&D and with complex technology, while medium and low technology sectors are those more mature industries with less or no investment in R&D and not research-intensive (Kamal et al. 2021). Knowledge creation is crucial in determining SMEs human capabilities and innovation adaptation as the Malaysian construction industry consists of 90% SMEs. The objectives of this study are to identify the attributes of knowledge creation in SME construction companies in Sabah, determine the barriers of knowledge creation that cause the ineffective of HCD for SME construction companies in Sabah and to propose the mitigation measures to the barriers of knowledge creation in SME construction companies in Sabah.

LITERATURE REVIEW

Knowledge creation capabilities are the elements in technical innovation which reflects the strength of a regional knowledge inputs and outputs of the ratio between the results. Sustainable development of innovation cannot be guaranteed if new knowledge is not created. Innovate knowledge and make use of existing knowledge to produce new knowledge are crucial to maintain a competitive edge (Chen & Wang 2012). Understanding and evaluating company's knowledge management practices is the first step in improving an organizational capability (Kale & Karaman 2012). This proves that knowledge creation is crucial in an organizational to develop a sustainable capacity development.

ATTRIBUTES OF KNOWLEDGE CREATION IN CONSTRUCTION COMPANY

T-SHAPED SKILLS

According to Abubakar et al. (2019), T-shaped skills in knowledge creation process are important to the organizational performance. T-shaped professionals are considered as the "Industry 4.0 style workforce". Employees with T-shaped skills are competent for innovation and creative performance as they are leveraged on their problem solving and decision-making capabilities (Hecklau et al. 2020; Pfeiffer 2015). Hence, T-shaped skills have a notable impact on knowledge creation processes and organizational performance.

COLLABORATIVE

The positivist research stream has focused on defining the governance mechanisms that collaboration has on team performance from a theoretical perspective. This study contends that collaboration is beneficial in reducing knowledge concealing behaviour. which are recognised to be a barrier to innovation (Labafi 2017). External collaboration provides are the basis for knowledge creation and innovation. Customers, suppliers, friendly firms, and other external stakeholders are all highlighted by the interviewees in a survey for knowledge creation for SMEs in German. Along with customers and suppliers, respondents mentioned collaborative partners as sources of joint knowledge creation. The findings point to much more collaboration between subcontractors and contractors at their interfaces. (Durst et al. 2013). Because knowledge concealing behaviours are most common among coworkers,

the quality of their relationship is crucial. In general, information dissemination among colleagues through collaboration increases knowledge creation processes, which is likely to boost competitive advantage and assist organisations in outperforming competitors. With this perspective, we may conclude that collaboration has a substantial influence on knowledge generation processes and organizational performance (Abubakar et al. 2019).

IT SUPPORT

Knowledge acquisition, diffusion, and storage are all aided by IT. However, knowledge exegesis is dependent on humans or professionals. "IT can only aid implicitly in delivering information to support the processes and situations that allow knowledge generation and knowledge management," Kautz & Thaysen (2001) added. Furthermore, knowledge creation processes may improve job productivity by allowing useful information to be reused (X. Wang et al. 2015). In an information-intensive sector, IT assistance may improve work and company efficiency, which improves overall performance, according to Gregory et al (2019). With the advent of the internet and the fast growth of other information technologies, the value of knowledge-based assets has skyrocketed. Companies are developing knowledge management information systems to manage their own learning and in-house business know-how (Anumba & Pulsifer 2012; Ramjeawon & Rowley 2020). As a result of this perspective, it can be concluded that IT support has a substantial influence on knowledge generation processes and organizational success (Abubakar et al. 2019).

LEARNING

Participation and apprenticeship are crucial for updating and reactivating knowledge, so as new and market knowledge (Marsh & Stock, 2006). Prior technology and market knowledge is required to enhance company performance (Chih et al. 2016; Hernández-Espallardo et al., 2010). According to Durst et al. (2013), training and higher education are significant tools for acquiring knowledge. Therefore, learning has an impact on how much knowledge can be used to exploit opportunities, as well as how knowledge can be applied to new products, services, and business processes. Learning has an influence on knowledge creation processes and organizational performance, according to this viewpoint (Abubakar et al. 2019)

TECHNOLOGICAL, SOCIO-ORGANIZATIONAL, INDIVIDUAL ATTRIBUTES

According to Pinho et al. (2012), the attributes of knowledge creation can be categorised by technological, socio-organisational, and individual. Individual, socio-organizational, and technological barriers and attributes are taken into account since they are the three aspects that have the most impact on the flow and processes of knowledge management (Armistead, 1999; Birkinshaw and Sheehan, 2002; Bontis et al. 2002; Regoet al. 2009; Ruggles 1998).

Technological attributes are:

1. IT systems that supporting information/knowledge storage (Alavi & Leidner 2001; Chang & Li 2007);
2. IT adjustment (Rosen et al. 2007); and
3. systems supporting decision making (e.g., communication software facilitating anonymous brainstorming and nominal group decision making) (Armbrecht et al. 2001; Tian et al. 2006a).

Socio-organizational attributes of knowledge creation are:

1. organizational social capital (Adenfelt & Lagerstrom 2006; Chang & Li 2007; Martini & Pellegrini 2005);
2. leadership (Nonaka et al. 2000);
3. performance-oriented culture (Edmondson 1996, 1999; Lee & Choi 2003).
4. Individual facilitators are:
5. individual social/relational capital (Cabrera & Cabrera, 2002; Wang et al. 2006);
6. T-shaped skills (Lee & Choi, 2003); and
7. honesty/integrity (Wang et al. 2006).

BARRIERS OF KNOWLEDGE CREATION IN CONSTRUCTION COMPANY

SHORT-TERM TRAINING

The emphasis switched to intangible aspects in the 1970s, with a priority on education, health, and population. Later on, formal education are replaced by short-term training (Merino et al. 2012). In another study, survey was conducted to identify factors contribute to the ineffectiveness of human capacity development for Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA). One respondent highlighted that "a one-day or two- day workshops, that is an awareness, it is not a training". Another respondent stated that "The fact, in most of the

workshops you attend, you just go, sit, listen and then you get up and go. That has no impact". One respondent remarked that knowledge and knowhow transfer is a long-term process that leads to individuals being able to run institutions and processes independently. Another participant added that "for a project to be sustainable and to have any impact, I think it is minimum of three years" (Hagelsteen et al. 2021). Individual and organisational learning may both be conceptualised. Because of the complexity of the process, various researchers with different theoretical perspectives have viewed learning at the individual level in different ways (Hwang 2003).

NEGATIVE ORGANIZATIONAL CULTURE

The most extensively explored enabling or barrier knowledge management adoption in colleges has been culture (Desireé et al. 2011; Devi Ramachandran et al. 2013). Knowledge creation, knowledge sharing, and knowledge transfer have all been found to be influenced by culture. However, in the application of knowledge management, culture is complicated and difficult to control. According to some experts, university culture is individualistic and, to some degree, self-serving, and academics prefer to work independently (Goh & Sandhu, 2013). Other academics, on the other side, have shown that a robust knowledge sharing culture may improve Knowledge Management processes such as knowledge production (Gera 2012; Tian et al. 2009).

INEFFECTIVE KNOWLEDGE AND INFORMATION COMMUNICATION

According to Palm & Backman (2020), Ineffective knowledge and information communication is an important barrier to improving energy efficiency in small and medium-sized enterprises (SMEs). In the study, communication refers to the dissemination of information/knowledge concerning energy efficiency. The energy efficiency management in the industry has considered that governments should only engage in the markets when market failures happen. Two market failure are in the forefront, information asymmetries and information imperfection. Lack of information and cost of information show that costs are affiliated to seek and acquire information on energy efficiency solutions. This can also be one of the factors to the barrier of knowledge creation in SMEs because communication is an important tool for knowledge creation.

INEFFECTIVE KNOWLEDGE MANAGEMENT SYSTEM

With the fast expansion in the construction sector, the industry confronts numerous issues of how to use a successful knowledge management system that gives the necessary outcomes and advantages. A successful knowledge management deployment involves a fundamental shift in organisational culture and commitment at all the organisational levels (Gupta et al. 2000). Numerous challenges to knowledge management implementation in the construction industry have been identified. These include the complexity of the industry, the diversity of work players, adversarial relationships that are encouraged by the strategy of contracting and the project nature, which is under time constraints, and the non-repetitive nature of the work. These obstacles all contribute to significant "knowledge waste" and difficulties in accessing important information. Construction firms, particularly small and medium-sized enterprises (SMEs), which contribute for 99 percent of construction firms in the UK, have been found to be unaware of numerous important issues related to knowledge capture and the advantages it provides to construction firms, according to some empirical studies. Knowledge management implementation has proven problematic for many construction organizations, not only due to the sophisticated nature of knowledge management operations, but also due to the fact that many knowledge management projects have been implemented in an unplanned and informal manner, as has frequently been the case. A study conducted on leading construction organizations revealed that these organizations lack coordination and strategy when it comes to knowledge management implementation, and that a high percentage of them have not appointed a knowledge manager or a team to implement their knowledge management strategy. This is in line with the fact that small and medium-sized enterprises (SMEs) are less successful than their larger counterparts when it comes to knowledge management implementation, according to the study (Robinson et al. 2005). According to the results of a survey conducted by Carrillo et al. (2004), which investigated the main barriers to implementing KM strategies such as work processes, employees' time, organizational culture, expenses, employees' resistance, and poor IT infrastructure, the most significant challenges to knowledge management implementation is the insufficiency of standard work processes. Moreover, the systematic procedure for collecting and reusing lessons learnt and best practice are lacking. Perform similar activities also required different procedure.

GENERAL EDUCATION ISSUES IN CIVIL ENGINEERING INEFFECTIVE KNOWLEDGE MANAGEMENT SYSTEM

The goal of a fundamental engineering curriculum is to provide the framework for further study that will prepare students to enter and succeed in the engineering field. One argument in favour of a master's degree is that more time may be invested in the basic programme to ensure that students have a good general education. A variation of this approach may be found in both law and medicine, to a certain extent. From the commencement of engineering as a formal profession, engineers have stressed the need of lifelong learning. When it comes to Accreditation Board for Engineering and Technology's (ABET) existing criteria, two of the most hotly debated aspects are outcomes evaluation and the particular goals that must be met. One of the aspects is the ability to sustain in life-long learning. One of the main objectives of any civil engineering program's general education element should be to establish in its graduates an understanding of the value of general knowledge in engineering practice and how that knowledge may be strengthened after graduated. The sustainability issue mentioned by Rhodes (2006) is the opportunity for engineering students to engage in lifelong learning. Engineering's technical content continues to expand, and it would be simple to squeeze everything except the technical into a four-year engineering curriculum. This is another compelling justification for a more extensive formal education. Some argue that although a technical degree will equip graduates well for their initial job, it will not prepare them for a career that will need them to work in a variety of environments. As a result, a properly designed longer formal education might be advantageous. This argument is strengthened by viewing the university as a learning community and understanding the importance of peer learning (Kelly 2008). Since university is seen as an institution of learning community, it is important to build up a competent individual through General Education of Civil Engineering in order to promotes knowledge creation. Moreover, Abubakar et al. (2019) also stated that learning is one of the knowledge management enabler components for knowledge creation.

TECHNOLOGICAL, SOCIO-ORGANIZATIONAL, AND INDIVIDUAL BARRIERS

Technological barriers to knowledge creation include:

1. IT system that are not adjusted to the users' needs (Armbrecht et al. 2001),
2. inefficient infrastructure/equipment (Wang et al. 2006).
3. Socio-organizational barriers identified in the literature appear as relevant obstacles to knowledge creation:
4. Poor external coordination and communication (poor external capital) (e.g. ineffective coordination and collaboration between public and private institutions; Yokakul & Zawdie, 2010)
5. Poor leadership (Chang & Li 2007; Mason & Pauleen 2003; Riege 2005; Rosen et al. 2007; Sapienza, 2005);
6. Poor rewarding system (Riege 2005; Sun & Scott 2005; Jain et al. 2006; Majdzadeh et al. 2008; Singh & Kant 2008); and
7. Poor training practices (Riege 2005
8. Individual barriers are:
9. poor T-shaped skills and the inability to think "out of the box" (Majdzadeh et al. 2008; Sun & Scott 2005); and
10. unethical behaviors (Wang et al. 2006).

MITIGATION MEASURES TO THE BARRIERS OF KNOWLEDGE CREATION IN CONSTRUCTION COMPANY

SUSTAINABILITY AS A THEME FOR GENERAL EDUCATION OF CIVIL ENGINEERING

The American Society of Civil Engineers (ASCE) amended its code of ethics in 1996 to include explicit declarations on sustainable development, and approved Policy 418 on the subject around the same time. ASCE (2004) defined Sustainable Development as "the challenge of meeting human needs for natural resources, industrial products, energy, food, transportation, shelter, and effective waste management while conserving and protecting environmental quality and the natural resource base essential for future development". After more than 10 years, there is a growing agreement on the definition of sustainable development and engineering sustainability, however a small minority of people still believe that sustainable development is anti-engineering. American Society for Testing and Materials (ASTM) International has published a new standard reference for building sustainability. This standard lays forth ideas that may be used not just to buildings but also to infrastructure systems, according to the standard. Both sustainability and sustainable development are defined in the standard. Sustainability is becoming more widely recognised as a notion that must incorporate all social activities, including engineering. The ambiguity of the

notion of sustainable development and the word sustainability, both of which are used by experts in areas ranging from sociology to civil engineering and both of which might be tied to the concept of the common good, is a flaw, but also a strength. The common good, as a concept, has some of the same flaws and benefits as sustainable development. Much of what engineering students are learning regarding sustainability must come from their general education courses (Kelly 2008).

BUILD ETHICAL ORGANISATION CULTURE

The ethical failures in all of the aforementioned situations were caused by a lack of a culture that encouraged ethical behaviour among individuals. "The frequently used and relatively stable beliefs, attitudes, and values that exist inside an organisation" is how organisation culture is described (Pascale, 1985). Corporates are now better realising the necessity of an ethical culture as a result of the massive public outcry against corporate unethical behaviour (Cellini 2007). Sarwono & Armstrong (2001) suggested that specific ethics training is crucial in order to develop ethical culture. According to Verschoor (2006), developing an ethical business culture is crucial for staff recruitment, retention, and increased productivity.

DEVELOPED AN EFFECTIVE KNOWLEDGE MANAGEMENT SYSTEM

In today's economic environment, organisations in the architecture, engineering, and construction industry must be always on the lookout for new solutions in order to stay competitive and be more flexible and innovative (Vaz-Serra & Edwards, 2020). Knowledge and experience in a company is considered a strategic asset that able to deliver competitive advantages (Ahmad et al. 2008; Grant 1996; Spender 1996). Many construction companies have made significant investments in knowledge management applications during the past decade in response to the increasing pressure on them to enhance their business operations (Egan 1998; Kamara et al. 2002; Murray 2008). An IT-based construction knowledge management system named *ConstruKnowledge* was created after a study of current knowledge management systems and an interview survey of 22 managers in the Portuguese Architecture, Engineering, and Construction sector (contractors, design consultants, and project management consultants). An evaluation of two Portuguese construction projects by 12 management of the corporation responsible for those projects confirmed the validity and reliability of the developed knowledge management system. According to the findings of two pilot tests conducted in two Portuguese construction projects, the usage of *ConstruKnowledge* may increase levels of confidence in decision-making and knowledge retention, as well as the ability to offer value to the organisation (Vaz-Serra & Edwards 2020). This proves that an effective knowledge management system plays important role in the construction industry.

PROVIDE EDUCATION, TRAINING, AND DEVELOPMENT PRACTICES

A successful economy has a workforce capable of operating industries at a level where it holds a competitive advantage over the economies of other countries. Nations may try incentivising training through tax breaks, providing facilities to train workers, or a variety of other means designed to create a more skilled workforce. While it's unlikely that an economy will hold a competitive advantage in all industries, it can focus on several industries in which skilled professionals are more readily trained (Majdzadeh et al. 2008; Wang et al. 2006).

APPROPRIATE REWARDING SYSTEM

Knowledge management has a well-established beneficial impact on the competitiveness and profitability of organisations. Encouragement of knowledge sharing is challenging. Therefore, the issues of how to encourage workers to share their expertise with colleagues and how to reward them for doing so actively are extensively discussed in literature from various perspectives. Some writers provided explanations of why people share and don't share their knowledge with others (Lin, 2007). Other studies have outlined the critical variables that affect knowledge sharing behaviour (Tohidinia & Mosakhani 2010). Numerous studies have acknowledged the potential of rewards system to boost organisationally important and knowledge-sharing-related activities. Such programmes' significance is also emphasised (Šajeva 2014).

RESEARCH METHODOLOGY

The process for this study is outlined in Figure 1. There are several steps that need to be done to achieve the objectives of this study including the identification of issue of the study, literature reviews based on past research/ studies data collection questionnaires and data analysis to formulate a strong conclusion of the study.

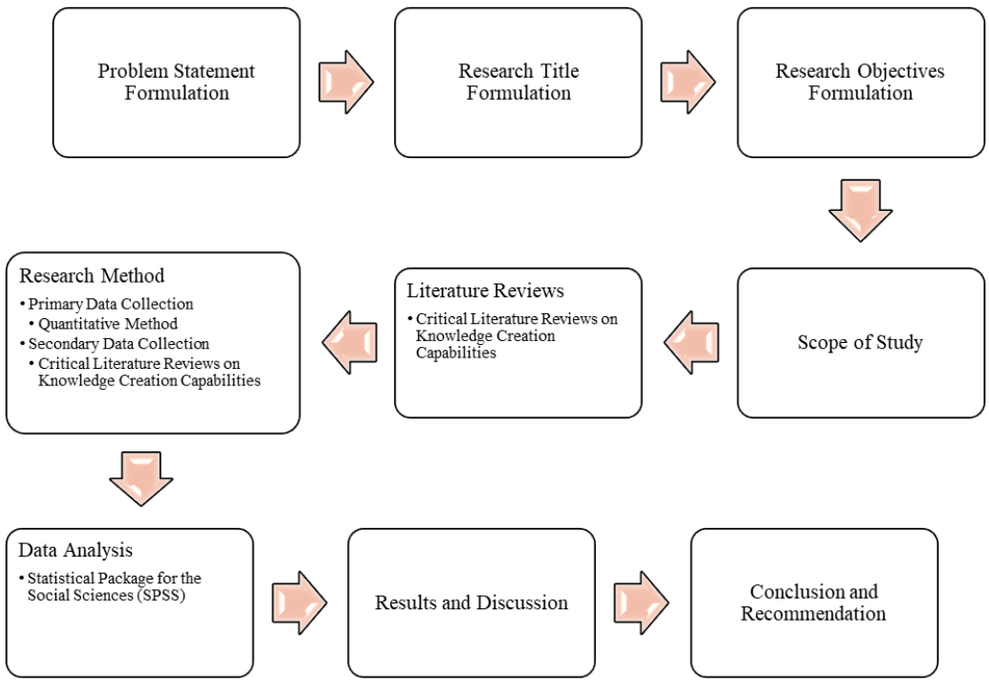

FIGURE 1. Research flowchart

The very first step in this study is identifying problems related to knowledge creation in SMEs. Based on the problem statement, the research title for this study is formulated. The third step is the formulation of the research objectives. Identifying problems related to the research topic is essential for establishing the research title and determining the research objectives. The fourth step involves defining the scope of the study, which delineates the extent of the research area to be explored and sets the boundaries of the investigation. Following this, the fifth step entails conducting a comprehensive literature review. This critical review of existing knowledge creation capabilities and related topics provides an overview of previous studies in the field. The sixth step is to determine the research methodology, which, in this study, comprises both preliminary and secondary data collection. Subsequently, the data analysis method is selected, with the Statistical Package for the Social Sciences (SPSS) being utilised for data analysis. Once the data has been analysed, the results and discussion phase follows. The final step of the study involves constructing the conclusion and providing recommendations based on the findings.

RESULT AND DISCUSSION

Following the completion of the pilot study analysis, primary data collection commenced. For the primary study, a sample size of 213 participants was gathered for data analysis. The determination of this sample size was based on a combination of statistical power analysis and practical considerations. Specifically, the sample size was calculated to ensure sufficient statistical power to detect meaningful effects, taking into account the expected effect size and desired confidence level. Additionally, practical factors such as resource availability and logistical constraints were considered. Demographic data from the primary study were analysed using frequency statistics to provide an overview of the sample characteristics. The items in Section B, Section C, and Section D were analysed using a series of statistical tests. Reliability tests were conducted to assess the consistency of the measures, normality tests were performed to evaluate the distribution of the data, and descriptive statistics were computed to summarise the central tendencies and variability of the responses. All analyses were conducted using the Statistical Package for the Social Sciences (SPSS) software.

TABLE 1. Gender of respondent

Gender	Frequency	Percent
Male	110	51.6
Female	103	48.4
Total	213	100

TABLE 2. Age of respondent

Age	Frequency	Percent
20-30	117	54.9
31-40	84	39.4
41-50	7	3.3
51 and above	5	2.3
Total	213	100

TABLE 3. Position of respondent

Position	Frequency	Percent
Engineer	131	61.5
Architect	9	4.2
Quantity Surveyor	31	14.6
Contractor	10	4.7
Consultant	7	3.3
Project Manager	5	2.3
Assistant Manager	3	1.4
Quality Assurance Specialist	1	0.5
Quality Control Technical Coordinator	1	0.5
Planning & Scheduling Executive	1	0.5
Student	14	6.6
Total	213	100

TABLE 4. Experience of respondent

Experience	Frequency	Percent
1-5 years	111	52.1
6-10 years	91	42.7
11-15 years	5	2.3
More than 15 years	6	2.8
Total	213	100

TABLE 5. Qualification of respondent

Qualification	Frequency	Percent
Diploma	58	27.2
Bachelor's Degree	148	69.5
Master	7	3.3
Total	213	100

The primary study involved 213 respondents, comprising 110 males and 103 females, all of whom are employees in SME organisations in Sabah, as detailed in Table 2. The gender distribution showed a slightly higher percentage of male respondents at 51.6%, compared to 48.4% female respondents. The age distribution revealed that the majority of respondents were aged 20-30 years, accounting for 54.9% (117 respondents). Those aged 31-40 years constituted 39.4% (84 respondents), while only 3.3% (7 respondents) were aged 41-50 years, and 2.3% (5 respondents) were aged 51 and above. This indicates that most respondents were young employees. The respondents held various job positions, including Engineer (131 respondents), Architect (9 respondents), Quantity Surveyor (31 respondents), Consultant (7 respondents), Contractor (10 respondents), Project Manager (5 respondents), Assistant Engineer (3 respondents), Quality Assurance Specialist (1 respondent), Quality Control Technical Coordinator (1 respondent), Planning & Scheduling Executive (1 respondent), and Student (14 respondents). Engineers constituted the majority with 61.5% (131 out of 213 respondents). Additionally, 6.6% of the respondents were students who had interned with SME construction companies. In terms of work experience, 52.1% of respondents had 1-5 years of experience in the construction industry, the highest percentage among the groups. Respondents with 6-10 years of experience accounted for 42.7% (91 respondents). Those with 11-15 years and more than 15 years of experience comprised 2.3% (5 respondents) and 2.8% (6 respondents), respectively. Regarding academic qualifications, the respondents held diplomas, bachelor's degrees, and master's degrees. Specifically, 27.2% (58 respondents) had a diploma, 69.5% (148 respondents) had a bachelor's degree, and 3.3% (7 respondents) held a master's degree.

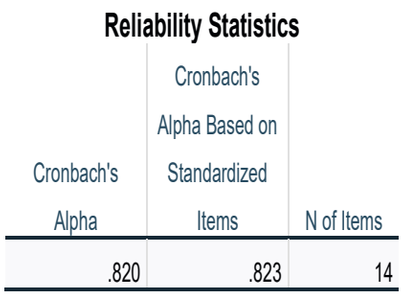

FIGURE 7. Reliability test result for Section B

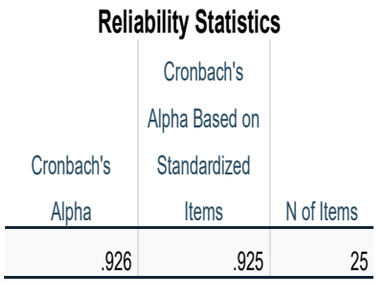

FIGURE 8. Reliability test result for Section C

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.740	.738	5

FIGURE 9. Reliability test result for Section D

The Cronbach's Alpha value for all items in Section B is 0.820, indicating good internal consistency. When standardised items were considered, the Cronbach's Alpha value for Section B increased slightly to 0.823, further confirming the good internal consistency. In Section C, the Cronbach's Alpha for all items and the value based on standardised items were 0.926 and 0.925, respectively, both of which denote excellent internal consistency. For Section D, the Cronbach's Alpha for all items was 0.740, while the value for standardised items was 0.738. Both values indicate acceptable internal consistency, as they exceed the threshold of 0.7.

NORMALITY TEST

The normality test for the primary study data in Sections B, C, and D revealed p-values less than 0.05 for all items, indicating significant deviations from a normal distribution. Both the pilot study and primary study data showed p-values below 0.05, confirming that the data significantly deviate from normality. Normally distributed data are required for the application of several statistical tools, such as individuals control charts, Cp/Cpk analysis, t-tests, and analysis of variance (ANOVA). However, the need for normally distributed data arises only when specific statistical tools necessitate it. In instances where data is not normally distributed, it is crucial to identify the cause of non-normality and take appropriate remedial actions.

Non-normality can result from various factors, such as the presence of extreme values, measurement errors, data-entry errors, or outliers. Cleaning the data by addressing these issues can help achieve normality. It is essential to verify that outliers are indeed special causes before elimination, as a small percentage of extreme values is expected in normally distributed data. Data from multiple processes, operators, or shifts can also lead to non-normality, resulting in bimodal or multimodal distributions. In such cases, stratifying the data by identifying and separating the contributing factors can restore normality. Additionally, round-off errors or poor resolution of measurement devices can distort continuous and normally distributed data, which can be mitigated by using more accurate measurement systems or collecting more data.

When dealing with non-normal data, several alternative statistical techniques and transformations can be employed to handle the deviations from normality. Non-parametric tests, such as the Mann-Whitney U test or the Kruskal-Wallis test, do not assume normality and can be used as alternatives to t-tests and ANOVA, respectively. Transformations, such as the logarithmic, square root, or Box-Cox transformations, can also be applied to stabilise variance and achieve normality. For instance, log transformation is useful for reducing right skewness, while square root transformation can address moderate skewness. The Box-Cox transformation provides a range of power transformations to identify the best fit for normality. Additionally, robust statistical methods, such as bootstrapping, can be utilised to generate accurate confidence intervals and significance tests without relying on normality assumptions. These alternative techniques and transformations ensure the validity and reliability of statistical analyses when the assumption of normality is violated.

DESCRIPTIVE ANALYSIS

ATTRIBUTES OF KNOWLEDGE CREATION IN SMES CONSTRUCTION COMPANY IN SABAH

For the primary study, descriptive analysis was performed on a sample size of 213 respondents, examining Sections B, C, and D. The analysis highlighted the three items with the highest mean values in each section, which will be discussed in detail. The majority of the respondents were engineers, accounting for 61.5% (131 out of 213 respondents). Additionally, 52.1% of the respondents had 1-5 years of experience in the construction industry, and 69.5% held a bachelor's degree. Moreover, 54.9% of the respondents were aged 20-30 years. Thus, the discussion in this section predominantly reflects the perspectives of young engineers with 1-5 years of experience in the construction industry.

TABLE 6. Descriptive analysis of Section B

	Min	Max	Mean	Std. Deviation
T-Shaped Skills	2	5	4.4178	0.693
Collaboration	2	5	4.4272	0.64472
IT Support	2	5	4.3991	0.6767

continue ....

... cont.

Learning/Education	2	5	4.5023	0.68422
IT Adjustment	2	5	4.4742	0.75582
System Supporting Decision Making (Brainstorming)	2	5	4.1643	0.7046
Individual Social Capital	2	5	3.7512	0.77646
Organisational Social Capital	2	5	3.6056	0.6898
Leadership	2	5	3.9531	0.82282
Performance-Oriented Culture	2	5	3.8826	0.92671
Training & Development	2	5	4.1549	0.85199
Honesty/Integrity	2	5	3.7793	0.77894
Knowledge Types	2	5	3.9296	0.841
Knowledge Modes	2	5	3.8404	0.89171

"Learning/education" has the highest mean value which is 4.50 followed by "IT adjustment" with mean value of 4.47 and "collaboration" with the mean value of 4.42.

The practical/pragmatic aspects of engineering are the fundamental core of engineering education. This can be accomplished by infusing engineering education with pragmatism. This liberty may be achieved by altering the teaching strategies. Students should be assisted by engineering education in using their understanding of math, science, and other subjects to emphasise creating, constructing, inspecting, designing, and inventing things. Making changes via designing, creating, and inventing results in liberations for engineers. The essential thing that most engineering programmes lack is this (Mina 2013). Learning/education is vital to equip future professionals in the construction industry with engineering knowledge. Hence this can circulate the knowledge creation in the organisational. Furthermore, sustainable development is becoming an important part of engineering education. This is because professionals of the future need to have a flexible mindset and a wide range of knowledge to solve the complex problems of the 21st century. In order to do this, using the concepts of active learning to the teaching of sustainable building results in better learning outcomes and student growth. The goal is to improve the skill set of undergraduate students so that they are more equipped, aligned, and supported to design, build, and run our infrastructure systems (El-Adaway et al. 2015).

To accomplish efficient knowledge processing and flow, technologists often highlight the characteristics and functions of knowledge management systems, giving the technological domain prominence (Pinho et al. 2012). IT adjustment refers to adjustment between IT systems/processes and the users' needs and activities. For instance, an organisation adopting appropriate IT for the team's needs (Armbrecht et al. 2001; Rosen et al. 2007). IT adjustment is crucial to SME because of technological. According to Pinho et al. (2012), technological facilitators is one of the most significant aspects influencing the knowledge management flow/processes. However, IT system itself may be insufficient to assist knowledge management. IT adjustment to current needs is also crucial for organisational performance.

According to the National Research Council (2015), collaboration is a crucial component of scientific study in order to address the complicated issues and problems facing contemporary society. An individual with greater levels of intellectual or social capital may provide these benefits to all his/her collaborative teams and improve performance across all of his partnerships. Research assessment at the individual level is still a process that is important today (Wang 2016). While scientific collaboration may provide a number of benefits, including functional specialisation, labour division, resource sharing, and productive idea cross-pollination, it can also boost a variety of coordination costs that hinder productivity (Stephens & Cummings 2021). Collaboration can improve communication between people, opening more chances for mutual respect and trust to grow. This can help with some of the coordination problems that might occur in an organisation and enhance the knowledge creation in the organisation.

TABLE 7. Descriptive analysis of Section C

	Min	Max	Mean	Std. Deviation
Short-term training	1	5	4.3005	0.80906
Negative organisational culture	1	5	4.0047	0.78607
Ineffective knowledge & information communication	1	5	4.385	0.76612
Ineffective knowledge management system	1	5	4.2864	0.7756
General education issues in civil engineering	1	5	3.6948	0.87729

continue ....

... cont.

Poor T-Shaped skills & inability to think 'out of box'	1	5	4.4085	0.80524
IT system that are not adjusted to users' needs and activities	1	5	3.9108	0.69127
Deficient technical support	1	5	3.7606	0.68263
Inefficient infrastructure/equipment	1	5	3.9953	0.84952
Poor training practice	1	5	4.5399	0.74261
Poor leadership	1	5	3.8732	0.88376
Poor rewarding system	1	5	3.8638	0.77414
Financial barriers	1	5	3.8122	0.91757
Ineffective coordination & collaboration between public and private institutions	1	5	3.6432	0.80354
Mistrust between organisational members	1	5	3.6432	0.82096
Internal fragmentation (fragmented workplace)	1	5	3.8498	0.94468
Misalign between knowledge management & organisational goals	1	5	3.6714	0.95413
Inappropriate physical space and workspace layout	1	5	3.4930	0.89348
Poor access to research networks	1	5	4.0376	0.98981
Differences between institutional norms governing public & private knowledge	1	5	3.9061	0.942

Table 7 shows the descriptive statistics for analysis of Section C using SPSS. "Poor training practice" has the highest mean value which is 4.54 followed by "Poor T-shaped skills" with mean value of 4.41 while "ineffective knowledge and information communication" has mean value of 4.39.

Poor training practice can obstruct knowledge creation in the organisation. Employees with poor training are prone to have poor job performance and elevated levels of work-related stress. Understanding the consequences of not involving the training into the organisation's strategy is also crucial. Neglecting to conduct training is equivalent to disregarding all areas of a company. An effective knowledge management requires training because it provides you with tacit knowledge. Insufficient of knowledge and training result into poor performance, which yields lesser profitability. This kind of employment often results in errors, poor quality, and time wasted repeating tasks. Additionally, it has a lot of negative effects on stakeholders including clients, vendors, and suppliers.

A T-shaped skilled individual possesses deep knowledge and expertise in specific areas while also demonstrating the ability to collaborate effectively across disciplines. Although knowledge transfer is fundamental at the outset of any career, professional success extends beyond merely acquiring advanced knowledge. One of the major challenges in the construction industry is the limitations that hinder the pace of innovation. Malaysia's construction sector, largely dominated by newly established organisations and SMEs, often lacks the necessary resources, expertise, and experience required for innovation and product development. Consequently, top management faces significant pressure to make timely and effective decisions under these constraints. Beyond the aforementioned criteria, employee competencies, such as skills and experiences, are vital for developing innovative technologies (Hamdi et al. 2016). However, SMEs frequently face financial constraints, leading some to hire employees with minimal qualifications to reduce wage costs rather than investing in highly skilled experts. This practice can result in poor T-shaped skills, thereby obstructing knowledge creation within the organisation. T-shaped skills refer to a combination of deep expertise in a specific area (the vertical bar of the 'T') and a broad ability to collaborate across disciplines (the horizontal bar of the 'T'). This concept emphasises the importance of having specialised knowledge while also being able to work effectively with others in different fields, facilitating knowledge transfer and innovation within an organisation.

Innovation Barriers: In the context of this study, innovation barriers are defined as the various limitations and challenges that impede the development and implementation of new ideas, products, or processes within the construction industry. These barriers can include lack of resources, expertise, experience, and financial constraints, particularly prevalent in SMEs.

IT Adjustment: IT adjustment refers to the process by which an organisation adapts its information technology infrastructure and practices to better align with its strategic goals and operational needs. This includes updating software and hardware, training staff, and integrating new technologies to enhance productivity, efficiency, and innovation. Understanding these key constructs is essential for analysing how T-shaped skills and other factors influence knowledge creation and innovation within Malaysia's construction SMEs.

In the haste to get the information through to workers, communication is sometimes taken for granted at work, and effective communication is frequently given less priority. A team is significantly impacted by management style. Failure to effectively communicate, to support and offer feedback, to clarify particular duties or how an employee's job fits into the business as a whole may ultimately result in irritation, indifference, disengagement, and a clear lack of inter-team communication. This can result to ineffective knowledge creation.

Mitigation measures to the barriers of knowledge creation in SMEs construction company in Sabah

TABLE 8. Descriptive analysis of Section D

	Min	Max	Mean	Std. Deviation
Sustainability as a theme for general education of civil engineering	2	5	4.2066	0.57835
Build ethical organisational culture	2	5	4.3052	0.69079
Develop an effective knowledge management system	2	5	4.5775	0.65146
Provide education, training & development practices	1	5	4.4366	0.65298
Appropriate rewarding system	3	5	4.2629	0.75008

Table 8 shows the descriptive statistics analysis for all items in Section D. "Developed an effective knowledge management system" has the highest mean value which are 4.577 followed by "provide education, training, and development practice" with mean value of 4.436 and "build ethical organisational culture" with mean value of 4.305.

Knowledge has grown in importance for firms in the competitive and dynamic commercial world of today. Effective knowledge management (KM) gives an organisation the ability to design its formal and informal structure, functions, and procedures in order to codify and utilise its intellectual assets. In order to successfully disseminate critical information across projects, teams, and organisations, knowledge management systems (KMSs) must be used in the construction industry. But for knowledge management to be truly effective and impactful, it needs more than just new technologies. It needs people to understand and work with it, as well as the right culture to work in (Fong & Kwok 2009). There are several KM tools that are often used in the construction industry for the capture and sharing of knowledge, which can be broadly divided into KM technologies (IT-tools) and KM practises (non-IT-tools). Groupware, an expert or talent directory, specially created software, forums, post-project reviews (PPRs), and communities of practise (CoPs) are some of the examples. For the purpose of collecting and disseminating information in the construction industry, PPRs and CoPs are the KM tools that are most often employed (Tan et al., 2012). In a study of the effect of knowledge management capacity by Chawla et al. (2021), the findings reinforce the notion that effective knowledge management in an organisation leads to better innovation capabilities and higher organisational performance. In addition, the study shows that the impact of KM capacity on a company's performance goes through a series of relationships (serial mediation) consisting of strategic human resource management, management innovation, and innovation. Knowledge management system must be developed to mitigate the barriers of knowledge creation so that SMEs organisational performance can be enhance.

Every participating organisation must embrace the collaborative nature of integrated project delivery and have appropriate transitions for its contractual, cultural, and technological needs due to the particular features of integrated project delivery. Because of these particular requirements, the project team members must possess the background knowledge required for each integrated project delivery requirement in order to contribute to the success of the project and the team's experience (Ghassemi & Becerik-Gerber 2011). This requires relevant education, training, and/or professional experience. Through various channels, such as higher education, corporate training, and/or project training, the knowledge necessary for enhancing

project performance may be developed. Hence, this can justify the needs of education, training and development practices as a mitigation measure to overcome the barriers of knowledge creation in SME construction company. Recent construction projects have become more complicated and unpredictable, making it crucial that project team members get training in interdisciplinary practise and integrated team environment (Lee et al. 2013).

Ethical culture can be defined as a set of experiences, assumptions, and expectations of managers and employees about how the organisation encourages them to behave ethically or unethically. The culture of a company influences the moral judgment of employees and stakeholders. Companies that work to create a strong ethical culture motivate everyone to speak and act with honesty and integrity. Companies that portray strong ethics attract customers to their products and services. Hence, this explains why build ethical organisation culture was one of the most important mitigation measures for knowledge creation.

CONCLUSION AND RECOMENDATION

The critical attributes of knowledge creation in SME construction company in Sabah has been identified. Based on the analysed data, "learning/education", "IT adjustment", and "collaboration" are the attributes of knowledge creation in SME construction industry. Each attribute has been discussed in the previous chapter.

The second objective of this study has been achieved. The barriers of knowledge creation in SME construction company are "poor training practice", "poor T-shaped skills" and "ineffective knowledge & information communication". However, in the pilot study, the 3 most critical barriers were "poor leadership", "unethical behaviour" and "financial barriers".

Finding the attributes of knowledge creation in SME construction company can help the organisation to improve their knowledge management system. Knowledge management fosters innovation within a business, provides consumers with greater access to best practises, and reduces staff turnover. Knowledge management is becoming more and more significant. A knowledge management system's objective is to provide managers the tools they need to find and arrange the relevant knowledge and experience needed to handle certain organisational activities and projects, resulting in increased productivity and longevity.

The mere act of identifying barriers to learning and knowledge creation in organisations can help remove them or introduce measures to address them, which can be embody in a knowledge management strategy. In contrast, the utter lack of a knowledge management strategy can also be seen as a barrier of knowledge creation. When barriers of knowledge creation are identified, the roots of occurrence can be deeply analysed and a framework can be establish to remove the barriers. The organisation can also raise assessment to counter these barriers. The organisation will be able to continuously enhance knowledge management procedures and develop their maturity to accomplish its goals by using the established framework and a set of typical countermeasures. Hence, the organisation can focus on intensifying the efficiency of knowledge management.

Achieving the objective number 3 of this study can assist organisation to develop proposal of mitigation measures. These identified mitigation measures are crucial for organisational productivity. This will enable the organisation to monitor the efficiency of their current knowledge management system and keep improving the system.

A literature review provides the interpretation of existing literature in light of updated developments in the field to help in establishing the consistency in knowledge and relevancy of existing materials. Apart from elucidating the continuance of knowledge, it also points out areas that require further investigation and thus aid as a starting point of any future research.

Other than that, using a proper advance tool to assess knowledge creation capabilities of human capacity development can also improve a lot to this study such as the Organisational Capacity Assessment (OCA). OCA tool is designed to measure the overall capacity of an organisation. It assesses capability in five key areas: governance, organisational management, program management, human resources management, and financial management. This study only uses survey questionnaire to assess the knowledge creation capabilities.

Based on the analysed primary data, the data has deviated from a normal distribution. This may be caused by an unbalanced job position among respondents. Since different job position has different job scope, the viewpoint on knowledge management/processes might come out differently. Hence in the future, researchers should only assess the knowledge creation of a specified job position/ professional so that the outcome will be more reliable. Moreover, further tests for non-normal distribution data should be done since no further analysis done for the non-normal distribution data in this study.

For the third objective of this study, the mitigation measures proposed were "develop an effective knowledge management system", "provide education, training and development practice", and "build ethical organisation culture". These mitigation measures might be the most important measure to tackle the issues of knowledge creation capabilities in SME construction organisation.

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DECLARATION OF COMPETING INTEREST

None.

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