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Knowledge Management in Engineering Companies in the Nigeria Oil and Gas Industry

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This is to certify that the doctoral dissertation by

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has been found to be complete and satisfactory in all respects,
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Walden University
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Abstract

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MPhil, Walden University, 2019

MSc, University of Glamorgan, 2010

BTech, Ladoke Akintola University of Technology, 2005

Dissertation Submitted in Partial Fulfillment

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Doctor of Philosophy

Management

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Abstract

Engineering companies in the Nigerian Oil and Gas Industry are not able to optimize their knowledge resources through the continual conversion of tacit knowledge to organizational knowledge. This is due to barriers that inhibit the holistic process of tacit knowledge conversion. The purpose of this qualitative case study was to understand the enablers and barriers to tacit knowledge conversion in engineering companies as perceived by engineering practitioners working in the Nigerian oil and gas industry. The central research questions focused on exploring the enablers and barriers to the conversion of tacit knowledge to organizational knowledge in oil and gas engineering companies in Nigeria. An integration of tacit knowledge conversion framework and organizational learning framework provided a two-fold conceptual lens for exploring the enablers and barriers to tacit knowledge. Qualitative data were collected using in-depth semistructured virtual interviews with 22 experienced engineering practitioners by using purposive sampling. Thematic analysis was used to identify patterns and themes in the dataset in relation to the research question. Nonexistent knowledge management systems and inconsistent knowledge management practices were the most significant barriers to tacit knowledge conversion in Nigerian engineering companies. The most significant enablers were good knowledge and employee retention strategies, top management commitment, and creating an enabling environment. This study may contribute to positive social change by sensitizing all stakeholders in Nigerian oil and gas industry on the need for the implementation of knowledge management systems and conversion of tacit knowledge to organizational knowledge.

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Dedication

I dedicate this study to the Lord God Almighty God for His Love, Grace, and Mercies.

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I want to specially thank my wife, Folasade, for her sacrifice, patience, and support throughout my Doctoral journey. I would also like to thank my sons, Ethan and Nathan, they were a source of motivation to me. I would like to thank my parents Mr and Mrs Ojuola for their prayers and words of encouragement. Special thanks to my Mentor, Dr Oladiran Fawibe, for his support and mentorship over the years.

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Chapter 1: Introduction to the Study

Knowledge management within the context of developing countries has continued to gain prominence (Sumbal et al., 2017; Wahda, 2017; Xu et al., 2018; Yao et al., 2020). However, Nigerian companies, like most companies in developing countries, have not been able to take full advantage of the benefits of knowledge management (Durmusoglu et al., 2018; Olatokun & Njideaka, 2020; Oliva & Kotabe, 2019). Taking full advantage of knowledge management entails the optimization of knowledge resources through the effective and continuous conversion of tacit knowledge to organizational knowledge (Dahou et al., 2018; Wahda, 2017; Yao et al., 2020).

Most of the studies on knowledge management in the context of Nigerian companies have focused on knowledge sharing as a catalyst for improving organizational performance and the barriers to knowledge sharing in organizations (Ibidunni, 2020; Iyamah & Ohiorenoya, 2015; Olatokun & Njideaka, 2020; Oluikpe, 2015) According to Ibidunni (2020), knowledge sharing improves organizational performance of Nigerian oil and gas companies through improved financial performance, process efficiency, supplier support, and organizational output. Also, lack of trust and collaboration, tribal differences, organizational culture, work-related pressure, lack of motivation, and lack of training have been identified as knowledge sharing barriers in Nigerian companies (Awodoyin et al., 2016; Olatokun & Njideaka, 2020; Omotayo & Babalola, 2016).

However, the process of effective knowledge management transcends knowledge sharing to include knowledge acquisition, knowledge dissemination, knowledge utilization, and knowledge retention (Costa & Monteiro, 2016; McQueen & Janson,

2016; Spraggon & Bodolica, 2017). It is therefore imperative that beyond identifying and removing barriers to knowledge sharing, Nigerian companies also need to understand and remove barriers to knowledge acquisition, knowledge dissemination, knowledge utilization, and knowledge retention. Taking a holistic approach to the identification and removal of barriers along the entire knowledge management value chain will improve knowledge management practices and facilitate organizational knowledge creation.

My goal for this qualitative case study was to understand the enablers and barriers to tacit knowledge conversion as perceived by engineering practitioners working in the Nigerian oil and gas industry. Understanding the enablers and barriers to the effective conversion of tacit knowledge to organizational knowledge could provide a paradigm shift regarding the implementation of knowledge management practices in Nigerian oil and gas engineering companies. This could enhance the process of acquisition, sharing, transfer, use, and retention of knowledge to foster innovation and competitiveness of engineering companies in the Nigerian oil and gas industry.

In this chapter, I discussed the background of knowledge management within the context of engineering companies in the Nigerian oil and gas industry. This was followed by a description of the general and specific problem that the study addresses, the purpose, and the research question. In the remaining part of this chapter, I described the conceptual frameworks that provided the foundation for the study. I highlighted the nature, scope, delimitations, limitations, and significance of the study.

Background of the Study

Knowledge management as a means of strategic competitive advantage has continued to gain relevance in scholarly works in the fields of strategic management (Cabrilo & Dahms, 2018; Dabic & Kiessling, 2019; Dayan et al., 2017; Laihonen & Mantyla 2018; Najmi et al., 2018), quality management (Criado-García et al., 2020; Duan et al., 2020; Wilson & Campbell, 2016), and engineering management (Dang & Le-Hoai, 2019; Qin et al., 2020; Yadav et al., 2020). This is more relevant in knowledge-intensive organizations that rely mainly on knowledge assets and resources to drive business performance (Medina & Medina, 2017). Knowledge-intensive organizations that will be successful in this era are those that are able to develop effective knowledge management practices that promote continuous improvement and the development of dynamic capabilities (Millar et al., 2016).

Knowledge has become a critical resource for organizations and an important component of business strategy. Organizational learning through the conversion of tacit knowledge to organizational knowledge has become a strategic tool for continually increasing organizational knowledge base in order to remain competitive (Dahou et al., 2018; Dayan et al., 2017; Vajiheh & Zeynab, 2016). Companies that do not continually increase their knowledge base through the effective conversion of tacit knowledge to organizational knowledge are not able to optimize their knowledge potential and will not be able to compete globally (Odor, 2018; Wahda, 2017). Organizational knowledge creation through tacit knowledge conversion

therefore continues to attract the attention of both academic scholars and business leaders globally.

Dahou et al. (2018) carried out a case study to examine the impact of knowledge sharing on organizational learning capabilities and found that tacit knowledge conversion facilitates organizational learning and knowledge creation. Similarly, Wahda (2017) examined the relationship between knowledge management, organizational learning, and organizational performance and established that organizational learning culture is required for effective knowledge management and organizational performance. Oluikpe (2015) explored how socially constructed tacit knowledge can be shared and used across several project teams and found that most Nigerian companies find it difficult to effectively capture tacit knowledge on projects and ultimately convert to organizational knowledge. This is an indication that some Nigerian companies lack the ability to effectively convert tacit knowledge to organizational knowledge.

In developing countries, including Nigeria, researchers have pointed out that collectivism, inappropriate organizational culture and structures, lack of trust and collaboration, centralization of knowledge sources, emphasis on explicit knowledge at the expense of tacit knowledge, lack of leadership support, and adverse economic conditions are barriers to knowledge sharing and organizational learning (e.g., Akgun et al., 20 17; Durmusoglu et al., 2018; Ejeh & Hall, 2018; Lawal et al., 2017; Oluikpe, 2015; Owusu-Manu et al., 2018; Razzaq et al., 2019; Zapata-Cantu, 2020). It is imperative that the barriers highlighted above are replaced with enablers for improved organizational performance. Most of the studies on knowledge management in developing economies

have focused only on barriers at the knowledge sharing stage of the knowledge management value chain (Akgun, et al., 2017; Durmusoglu et al., 2018; Madase & Barasa, 2019; Oliva & Kotabe, 2019; Shahzad et al., 2016). However, the end-to-end process of knowledge management goes beyond knowledge sharing and encapsulates the acquisition, dissemination, use, and retention of tacit knowledge to create organizational knowledge (Hubers et al., 2016; Madase & Barasa, 2019; Shahzad et al., 2016).

The effective conversion of tacit knowledge to organizational knowledge requires a holistic and iterative approach to organizational knowledge creation. This holistic approach encompasses the acquisition, sharing, and transfer of tacit knowledge; integration of knowledge in the explicit form; and retention and utilization by the organization for competitiveness and innovation (McQueen & Janson, 2016; Spraggon & Bodolica, 2017). Therefore, taking a holistic approach to the identification of barriers to knowledge management and organizational learning, and replacing these barriers with enablers, is an imperative for knowledge-intensive organizations.

The gap in the literature highlighted above with regard to organizational knowledge creation, by replacing barriers to the acquisition, sharing, dissemination, use, and retention of tacit knowledge, accentuate the issues affecting the implementation of knowledge management in Nigerian companies. This may explain why some Nigerian companies are not able to fully optimize their knowledge potentials and compete effectively with their global counterparts (Ochieng et al., 2018; Ugochukwu & Onyekwena, 2016). This qualitative case study was critical to understanding the perspective of engineering practitioners in the Nigerian oil and gas industry on the

enablers and barriers to organizational knowledge creation through the effective conversion of tacit knowledge to organizational knowledge. Findings from this study could provide insights to improving knowledge management practices in engineering companies in developing countries, particularly Nigeria.

Problem Statement

Emphasis on the conversion of tacit knowledge to organizational knowledge is not common in Nigeria (Ochieng et al., 2018; Oluikpe, 2015; Omotayo & Babalola, 2016). This is because many Nigerian companies remain nonchalant in their commitments towards implementing holistic knowledge management systems and practices (Ejeh & Hall, 2018; Ibidunni, 2020; Ochieng et al., 2018). However, some Nigerian companies focus only on knowledge sharing (Ibidunni, 2020; Iyamah & Ohiorenoya, 2015; Olatokun & Njideaka, 2020) at the expense of tacit knowledge acquisition, dissemination, use, and retention. The implication is that knowledge-intensive companies in Nigeria, are not able to fully optimize their knowledge resources to facilitate organizational knowledge creation, innovation, and competitiveness. The general management problem was that the engineering companies in Nigeria are not able to fully optimize their knowledge resources to compete at the same level as their counterparts in developed countries (see Ochieng et al., 2018; Ugochukwu & Onyekwena, 2016).

In developing countries, an unwillingness to share knowledge and lack of absorptive capability (Akgun et al., 2017), paternalism and social inequality in the workplace (Arrau, 2016), and cultural misalignment and diversity (Ejeh & Hall, 2018;

Lievre & Tang, 2016; Owusu-Manu et al., 2018; Xu et al., 2018) are barriers to knowledge sharing in knowledge-intensive companies. In Nigeria, lack of motivation and incentive for sharing knowledge (Omotayo & Babalola, 2016) and inappropriate organizational culture and structures (Oluikpe, 2015) have been identified as some of the barriers to knowledge sharing. While most of the studies cited above emphasized the need for organizations to identify barriers to knowledge sharing, the process of effective tacit knowledge conversion goes beyond knowledge sharing. The holistic process of tacit knowledge conversion encompasses knowledge acquisition, sharing, dissemination, use, and retention (Costa & Monteiro, 2016; Masadeh et al., 2019). Therefore, the barriers to tacit knowledge conversion process at the knowledge acquisition, dissemination, use, and retention phases of the knowledge management value chain remain unexplored in the context of Nigerian oil and gas engineering companies.

The specific management problem was that barriers exist, which may inhibit the holistic process of tacit knowledge conversion in Nigerian companies (see Chete et al., 2017; Lawal et al., 2017). An understanding of the barriers to tacit knowledge conversion at every phase of the knowledge management value chain is required to effectively convert tacit knowledge to organizational knowledge (see Costa & Monteiro, 2016; Spraggon & Bodolica, 2017). Identifying enablers and barriers to tacit knowledge conversion at the knowledge acquisition, knowledge sharing, knowledge dissemination, knowledge use, and knowledge retention phases is critical to unlocking knowledge potential of Nigerian oil and gas engineering companies (see Ghasemi & Valmohammadi, 2018; Ibidunni, 2020; McQueen & Janson, 2016). Identifying these

enablers and barriers could facilitate the acquisition, transfer, and retention of knowledge within engineering companies such that knowledge assets and resources are fully optimized.

Purpose of the Study

The purpose of this qualitative case study was to understand the enablers and barriers to tacit knowledge conversion in engineering companies as perceived by engineering practitioners working in the Nigerian oil and gas industry. Effective knowledge management, through the continual conversion of tacit knowledge to organizational knowledge, is imperative for optimization of knowledge potentials in organizations (Kianto et al., 2019; Owusu-Manu et al., 2018). An understanding of the perceived enablers and barriers to tacit knowledge conversion, from the perspective of engineering practitioners, is critical to the implementation of effective knowledge management in engineering companies within the Nigerian oil and gas industry.

Research Questions

I used the following research question to guide this study:

RQ1. What are the enablers and barriers to the conversion of tacit knowledge to organizational knowledge as perceived by engineering practitioners working in oil and gas engineering companies in Nigeria?

This research question is further broken down to two subquestions as follows:

SQ1: What are the enablers of the conversion of tacit knowledge to organizational knowledge as perceived by engineering practitioners working in oil and gas engineering companies in Nigeria?

SQ2: What are the barriers to the conversion of tacit knowledge to organizational knowledge as perceived by engineering practitioners working in oil and gas engineering companies in Nigeria?

Conceptual Framework

Conceptual frameworks are used in qualitative studies that are inductive in nature. A conceptual framework serves as a guide for reflexive thinking in line with the research purpose (Ravitch & Carl, 2016). A conceptual framework is used to express the relationship between a researcher's philosophical perspective and research topic as established in the existing literature (Ravitch & Riggan, 2017). Hence, the choice of conceptual framework is not only consistent with the philosophy, strategy, and approach of the study, but it also aligns with research methodology.

The conceptual framework for this study was derived from the integration of the SECI (socialization, externalization, combination, and internalization) tacit knowledge conversion framework of Nonaka and Takeuchi (1995) and the 4I (intuiting, interpreting, integrating, and institutionalizing) framework of organizational learning by Crossan et al., (1999). The SECI tacit knowledge conversion framework highlights four stages of organizational knowledge creation namely: socialization, externalization, combination, and internalization (Nonaka & Takeuchi, 1995). The SECI framework gives an insight into the process of knowledge creation through the conversion of tacit knowledge into

organizational knowledge. The 4I framework of organizational learning consists of four social processes: intuiting, interpreting, integration, and institutionalization. The processes of 4I framework of organizational learning are similar to that of the SECI tacit knowledge conversion framework.

Both SECI and 4I frameworks highlight the process involved in the conversion of tacit knowledge to organizational knowledge. Inherent in this process are enablers or barriers which can either facilitate or impede organizational knowledge creation. Schilling and Kluge (2009) used the 4I framework of organizational learning to identify barriers to organizational learning by describing impediments to learning at the intuiting, interpreting, integrating, and institutionalizing stages of organizational learning. This integrated framework reinforces the relationship between the socialization, externalization, combination, and internalization processes of tacit knowledge conversion and the intuiting, interpreting, integrating, and institutionalizing processes of organizational learning.

An integration of the two frameworks was used to provide a two-fold approach to identifying enablers and barriers to tacit knowledge conversion at each stage of the organizational knowledge creation process. Also, the SECI and 4I frameworks were used to narrow the focus of the qualitative study and interview questions to tacit knowledge conversion within the context of engineering companies in the Nigerian oil and gas industry. Furthermore, these frameworks were used as the basis for pattern matching and concept-driven thematic analysis, whereby patterns from data collected will be compared

to the patterns in existing literature where the conceptual frameworks have been deployed.

Nature of the Study

The focus of this study was to understand the perspective of engineering practitioners on enablers and barriers to tacit knowledge conversion in engineering companies within the Nigerian oil and gas industry. Tacit knowledge conversion is a very important phenomenon in knowledge management and organizational learning (Cegarra-Navarro & Martelo-Landroguez, 2020; Herbst, 2017; McQueen & Janson, 2016). This phenomenon describes the process of creating, acquiring, capturing, sharing, using, and retaining tacit knowledge to improve knowledge management and organizational learning practices in organizations (Lievre & Tang, 2016).

The nature of this study is a qualitative approach using the case study research design. Case studies are often used when the purpose of the research is to focus on a unique group of people or to explore a phenomenon within a specific context (Hancock & Algozzine, 2017; Yin, 2018). Qualitative case studies are used for in-depth inquiry into a phenomenon within a specific real-life context (Yin, 2018). Therefore, the qualitative case study design is ideal for this study because it aligns with the research purpose, which was to understand the enablers and barriers to tacit knowledge conversion in engineering companies as perceived by engineering practitioners working in the Nigerian oil and gas industry.

I considered using other qualitative methods, such as action research and ethnography for this study. However, while action research and ethnography could be

used to collect in-depth and rich data about a phenomenon to existing literature within the natural context of occurrence, both methods could be time consuming and complicated (Ravitch & Carl, 2016). Both methods were therefore not suitable for this study due to the constraints and limitations of time and scope.

Twenty-two participants from several engineering companies in the Nigerian oil and gas industry participated in the study. This was the number of participants that was required to reach data saturation. The population considered for this study was engineering practitioners in Nigeria. Using multiple participants from several Nigerian engineering companies enhanced triangulation of data sources. Also, collecting data from multiple participants enabled me to carry out cross-case comparisons of themes and patterns across several Nigerian engineering companies.

Engineering practitioners in Nigeria cut across several industries such as manufacturing, oil and gas, education, aviation, and information and communications technology. According to Adeh (2020), there are about 53,000 registered engineering practitioners in Nigeria. However, there are no published numbers for engineers working in the Nigerian oil and gas industry. Considerations for sampling included relevant project experience, willingness to participate, and the number of years spent in their respective companies. Sampling for the study was purposive and nonprobabilistic using the snowball strategy, with focus on engineering practitioners with at least 8 years' working experience in the Nigerian oil and gas industry. Collection of primary data was done using in-depth interviews with Microsoft Teams software. Microsoft Teams was

also used to automatically record the interview sessions. Transcription of the interview recordings was done by a transcription service provider Rev.com.

The starting point of data analysis in a qualitative case study is to get familiar with the data by searching for concepts, key words, and patterns that may provide insights into the study (Yin, 2018). Data analysis was carried out using the thematic analysis approach (see Braun & Clarke, 2006; Yin, 2018). Thematic analysis facilitates flexibility in analyzing qualitative data, either by analyzing meanings and patterns across the entire dataset or by focusing on a particular component on the data for in-depth analysis (Jugder, 2016). Thematic analysis also facilitates the reporting semantic or latent meanings (Yin, 2018) and examining the underlying assumptions behind the dataset (Nowell et al., 2017). This data analysis strategy was used to facilitate a thorough formative and summative comparison of identified themes and patterns with existing literature on the topic.

Definitions

In providing proper context to the key concepts in a study, it is important to identify and define the key terminologies and concepts to assist in providing proper insight into the topic under consideration (Burkholder & Burbank, 2016). This will clarify any ambiguity or misinterpretation of these key concepts and terminologies within the context of the study. The following definitions have been identified as the key concepts and terminologies that are critical to this study:

Complex Adaptive Systems: Complex Adaptive Systems (CAS) are complex systems consisting of independent agents that interact with one another and self-organize

through continuous learning and adaptation, to improve the chances of success (Lizier, 2017).

Explicit Knowledge: Explicit knowledge is defined as knowledge that can be easily articulated, readily codified, documented, stored, and disseminated (Ovbagbedia & Ochieng, 2016).

ISO 9001: ISO 9001 is the globally recognized international standard that specifies the requirements and best practices for the implementation of quality management systems (International Organization for Standardization, 2015).

Knowledge Management: Knowledge management is the systematic coordination and management of an organization's knowledge resources and assets with a view to creating value for all stakeholders (Dalkir, 2011).

Knowledge Management Practices: Knowledge management (KM) Practices consist of a set of organizational and managerial practices carried out by an organization with the aim of facilitating the effective and efficient management of knowledge resources and assets (Inkinen, 2016).

Knowledge Sharing: Knowledge sharing is defined as the exchange of knowledge among the different people and within an organization or between organizations (Kianto et al., 2019).

Knowledge-Intensive Organizations: Knowledge-intensive organizations can be defined as organizations whose primary value-added activities consist of the creation, acquisition, storage, dissemination, and utilization of knowledge in the delivery of products and services (Millar et al., 2016).

Knowledge Work: Knowledge work is defined as a profession whereby highly skilled autonomous workforce create and apply knowledge to produce both tangible and intangible results (Kianto et al., 2019).

Knowledge Workers: Knowledge workers are people who creatively and innovatively apply knowledge acquired through education and experience in organizations (Gaizauskiene & Tuncikiene, 2016).

Organizational Knowledge: Organizational knowledge is an aggregate of knowledge resources and assets available to an organization that provides value to the business (Levallet & Chan, 2019).

Organizational Learning: Organizational learning can be defined as an informal process focused on mutual learning between individuals and the organization (Medina & Medina, 2017)

Organizational Memory: Organizational memory can be defined as the ability of an organization to capture, store, and retrieve knowledge and information in a timely manner (Cegarra-Navarro & Martelo-Landroguez, 2020).

Tacit Knowledge: Tacit knowledge is defined as the know-how, abilities, expertise, and skills of an individual that is gained through experience, which often resides in the mind of the individual and is difficult to articulate (Ovbagbedia & Ochieng, 2016).

Assumptions

Assumptions are essential parts of research and articulating the underlying assumptions that shape the main considerations in a study is critical to the validity of the

study (Leedy & Ormrod, 2013). Assumptions should reflect any justifiable bias and contextual conditions associated with the research process (Crawford et al., 2016). The population for this study was engineering practitioners in several engineering companies in the Nigerian oil and gas industry. The first assumption was that a qualitative multiple case study will provide a pathway for understanding the enablers and barriers to tacit knowledge conversion as perceived by engineering practitioners in the Nigerian oil and gas industry.

The second assumption I made was that the population considered for this study was an ideal representation of knowledge workers in Nigeria. This assumption is based on the premise that engineering practitioners fits into the description of knowledge workers. Another assumption was that purposive sample of engineering practitioners with at least 8 years of experience was suitable for the ideal participants in these companies for the study. Engineering practitioners with at least 8 years of experience were expected to possess the requite knowledge and experience required to participate in the study. I also assumed that these group of engineering practitioners would have the competence to provide appropriate responses to the interview questions.

The fourth assumption was that the participants would provide honest, objective, true, and accurate responses to the interview questions. I designed the data collection process such that it assured participants of freedom of expression, confidentiality, and anonymity. The fifth assumption was that engineering practitioners are the custodian of the knowledge gates through which tacit knowledge may be acquired, disseminated, and used in knowledge-intensive engineering companies. Therefore, these engineering

practitioners have the capability to identify the enablers and barriers to tacit knowledge conversion in the companies. My final assumption was that participants who agreed to participate in this study would be representative of other engineering practitioners within the specific population.

Scope and Delimitations

The scope and delimitations of study are the boundaries set by researchers to ensure that the purpose of the study is achievable (Theofanidis & Fountouki, 2018). The scope of study refers to the intended population and other parameters that define the focus of the study while delimitations refer to boundaries that are related to the research design, time horizon, and participants in line with the purpose of the study (Crawford et al., 2016). The boundaries defined by scope and delimitations help to focus on achieving the objectives of the study.

The scope of this study was limited to engineering practitioners in engineering companies in the Nigerian oil and gas industry. This scope was consistent with the purpose of this qualitative case study which is to understand the enablers and barriers to tacit knowledge conversion in engineering companies as perceived by engineering practitioners working within the Nigerian oil and gas industry. Other contexts were excluded from the study to narrow the scope with a view to providing in-depth understanding of the phenomenon in such a manner that could inform research in other developing countries or contexts.

The delimitation of the study was premised on focusing on engineering practitioners in the Nigerian oil and gas industry and the exclusion of other categories of

knowledge workers and other industries outside of the oil and gas. This exclusion was consistent with the problem, purpose, design, population, and sampling strategy for the study. Also, the 4I and SECI frameworks were used to explore the enablers and barriers to tacit knowledge conversion in line with the purpose of the study. Other knowledge management and organization learning frameworks, such as the knowledge management process framework and the enterprise organizational learning framework that do not focus on tacit knowledge conversion were not considered for this study.

Another delimitation to this study was the issue of researcher interpretive bias associated with a qualitative case study of this nature. To minimize the effect of interpretive bias, I demonstrated objectivity and reflexivity before, during, and after the data collection and analysis process. I used the bracketing technique and keep a reflective journal of all daily entries and experiences during process of data collection and analysis. Also, I kept a conscious effort to continuously reflect on how my background, experiences, and assumptions may impact the study.

The choice of population was 22 engineering practitioners in Nigeria. The population choice was based on a purposive sampling strategy and was a delimitation to the study. Using purposive sampling technique to identify the participants that could provide rich, in-depth data could improve the transferability of findings (see Yin, 2016). The choice of research design, research questions, and framing of interview questions were also delimitations to this study.

Limitations

Limitations of a study highlights the inherent weaknesses of the research approach, design, and methods (Crawford et al., 2016). Highlighting limitations in a study demonstrates sincerity on the part of the researcher and this may improve the trustworthiness of the qualitative case study of this nature. It is therefore important to highlight in the study, the ways by which limitations will be addressed by researcher (Crawford et al., 2016). According to Theofanidis and Fountouki (2018), limitations of a study are the inherent weakness in the research design and approach of a study which are usually out of the control of the researcher.

However, these limitations may impact the findings and conclusions that are drawn from the study and should therefore be adequately acknowledged in the study (Theofanidis & Fountouki, 2018). A limitation of my study was that engineering practitioners who agreed to participate in the study may not be representative of the population. The dearth of literature on knowledge management within the context of engineering companies in the Nigerian oil and gas industry impacted the generalizability of the findings of this study as there were limited reference points from the existing literature in this regard. This limitation was addressed by referring to relevant literature from other developing countries that share contextual similarities with Nigeria.

The nonrandom sample size of 22 participants in one setting was a limitation that could have implications for transferability of the study findings. This limitation was as a result of the scope of study, which focused on engineering practitioners within the context of Nigerian oil and gas companies. The peculiarity of the socioeconomic and

political conditions in the setting and context may limit the transferability of the study to another context. However, using purposive sampling to identify and recruit participants based on their experience and knowledge on the phenomenon towards the provision of rich in-depth data and findings (Yin, 2016). Collection of in-depth data facilitated the provision of thick descriptions which may enrich the understanding and facilitate transfer of contextual components of the study (Ravitch & Carl, 2016). This could potentially enhance the transferability of findings to another context.

Another limitation was related to the choice of case study method. This limitation has implications for researcher bias and transferability. However, presenting a detailed justification for the case study method in line with the purpose of the study helped to address this limitation. Strict adherence to the steps for data collection and analysis facilitated transferability of findings (Ravitch & Carl, 2016). Also, as I was the primary research instrument for data collection and analysis, there was the limitations posed by cognitive bias which may be based on my professional experience as an engineering practitioner. My experience as an engineering practitioner in the Nigerian oil and gas industry could impact my ability to separate my personal and professional experiences from the findings from the literature of the participants. The use of audit trails and reflexive journals during the data analysis stage and the member checking process helped to minimize this limitation.

Significance of the Study

It is important to highlight the significance of a study to emphasize how it would contribute value to theory and practice. Significance of study answers the “so what”

question of the research. The significance of study accentuates how a study could potentially impact organizational behavior, shape policy formation, contribute to the body of knowledge, and bring about social change (Crawford et al., 2016). For a qualitative study aimed at understanding the perspectives of engineering practitioners in Nigeria on enablers and barriers to tacit knowledge conversion, it is important that I highlight how this study could improve theory and practice in knowledge management and organizational learning.

Significance to Practice

Knowledge capital has become the basis for competitive advantage in knowledge-intensive organizations (Wahyono, 2020). It is therefore imperative that knowledge-intensive engineering companies adopt knowledge management practices that will ensure optimization of knowledge resources. For oil and gas engineering companies in the Nigerian oil and gas industry to remain as competitive as counterparts in other parts of the world, optimization of knowledge resources is imperative. Optimization of knowledge resources could be achieved through the implementation of initiatives that will facilitate the conversion of tacit knowledge to organizational knowledge.

Findings from this study could provide insights into how oil and gas engineering companies in Nigeria could implement effective knowledge management systems and practices that will positively impact organizational performance. This study could also provide oil and gas engineering companies in Nigeria with insights into how to develop strategies that will allow for the optimization social capital and knowledge socialization which are embedded in knowledge worker interactions and interrelationships.

Significance to Theory

There is a dearth in the literature on knowledge management in Nigeria (Ejeh & Hall, 2018), especially in relation to the conversion of tacit knowledge to organizational knowledge. Most of the research on tacit knowledge management has been conducted within the context of developed economies, and very little research has been carried out within the context of developing countries such as Nigeria (Arrau, 2016). Knowledge management practices applicable in developing countries may or may not apply in developing countries. Hence, the contextual socioeconomic conditions and cultural and structural organizational peculiarities makes it imperative to conduct a study that will make unique contributions to existing literature on knowledge management and organizational learning.

The uniqueness of this study laid in the fact that it is the first study that focuses on the perceived enablers and barriers to tacit knowledge conversion in engineering companies in the Nigerian oil and gas industry. There is currently no study that I found with specific focus on how engineering companies in Nigeria can convert tacit knowledge to organizational knowledge. This study provides a Nigerian perspective to the scholarly discourse on tacit knowledge conversion and has the potential of making unique contributions to the body of knowledge in this regard.

Significance to Social Change

Social change is an alteration of social action by actors in an organization, society, or community (Leuven, 2011). In other words, social change is the effect of an individual's action or collective actions of a group of people on the organization,

community, and larger society. Stephan et al. (2016) defined positive social change as the transformation of mindset, behavioral patterns, social structure, and relationships in such a way that it is beneficial to individuals, organizations, environment, and the society. A shift in mindset, attitude, behavioral patterns, and organizational culture and structure may be required in Nigerian engineering companies with regards to the management and development of knowledge capital and resources. This study identified and proffered solutions to the issues relating to the mindset, attitude, and behavioral patterns, of engineering practitioners and leaders, and the culture in engineering companies that could hinder knowledge management implementation.

Application of findings from this study has the potential of bringing about positive social change at the individual, organizational, trans-organizational, and societal levels. This is consistent with Walden's vision of scholarly change which promotes the application of new knowledge to positive impact and resolve issues at the individual, organizational, and societal levels (Walden Social Change Report, 2017). At the individual and organizational levels, this study could contribute to positive social change as it highlights personal, interpersonal, systemic, structural, leadership, and cultural enablers of organizational knowledge creation in Nigerian oil and gas engineering companies.

This study could also enhance the ability in Nigerian engineering companies to compete favorably with their counterparts in other parts of the world by facilitating good returns on the investment on knowledge resources and assets. At the trans-organizational and societal levels, the findings of this study could serve as a reference point for policy

makers and governmental stakeholders in the oil and gas industry, in the development of policies and strategies that could improve knowledge management practices in Nigeria.

Summary and Transition

The process of conversion of tacit knowledge to organizational knowledge encompasses the implementation of knowledge management practices that facilitate the effective identification and removal of the barriers to tacit knowledge conversion. The importance of effective tacit knowledge conversion for organizational knowledge creation cannot be overemphasized. The ability of organizations to effectively harness, store, disseminate, use, and retain tacit knowledge in knowledge-intensive organizations is critical for sustainability and optimization of knowledge resources and assets.

There is gap in literature with regards to the barriers that impede the holistic conversion of tacit knowledge to organizational knowledge in Nigerian companies. This gap in literature also extends to enablers of tacit knowledge conversion. This study bridged the gap in literature by providing a context specific contribution by to this scholarly discourse. The perspective of Nigerian engineering practitioners on barriers to tacit knowledge conversion provided insights into how barriers could be removed and replaced with enablers. Findings from this study could influence ways by which Nigerian engineering companies in the oil and gas industry develop and implement knowledge management practices as a driver of organizational knowledge creation and innovativeness.

In this chapter I presented the problem statement, purpose of study, and research questions. I described the integrated conceptual framework provided a two-fold approach

to identifying enablers and barriers to tacit knowledge conversion. I also highlighted the nature, assumptions, scope, delimitations, limitations, and significance of the study. In Chapter 2, I provided a more detailed analysis of the conceptual framework and theoretical underpinnings for the study. I also presented a critical synthesis of the literature on knowledge management and organizational learning with emphasis on the conversion of tacit knowledge to organizational knowledge.

Chapter 2: Literature Review

Emphasis on effective knowledge management through conversion of tacit knowledge to organizational knowledge is not a common practice in Nigeria (Oluikpe, 2015; Omotayo & Babalola, 2016). Many Nigerian companies have not made sufficient efforts to implement effective knowledge management initiatives (Ejeh & Hall, 2018; Ibidunni, 2020). This is also the case in some other developing countries (Badpa et al., 2018; Torabi & El-Den, 2017). Knowledge-intensive companies in Nigeria are not able to fully harness their knowledge potential to drive organizational knowledge creation, innovation, and competitiveness (Chete et al., 2017; Ugochukwu & Onyekwena, 2016). This is as a result of barriers that impede the ability of Nigerian companies to share knowledge (Awodoyin et al., 2016; Lawal et al., 2017).

The process of effective tacit knowledge conversion in developed countries transcends knowledge sharing to include knowledge acquisition, knowledge dissemination, knowledge utilization, and knowledge retention (Costa & Monteiro, 2016; McQueen & Janson, 2016; Spraggon & Bodolica, 2017). Therefore, Nigerian companies in addition to identifying barriers to knowledge sharing, need to also identify barriers to knowledge acquisition, knowledge dissemination, knowledge utilization, and knowledge retention. Identifying the barriers to tacit knowledge conversion and replacing the barriers with enablers is critical to unlocking knowledge potential of engineering companies in the Nigerian oil and gas industry.

The purpose of this qualitative case study was to understand the enablers and barriers to tacit knowledge conversion in engineering companies as perceived by

engineering practitioners working within the Nigerian oil and gas industry. This understanding could facilitate the replacement of the barriers with enablers that will enhance the process of acquisition, sharing, transfer, use, and retention of knowledge to drive innovation and competitiveness. This may improve the knowledge management practices of Nigerian engineering companies in the oil and gas industry.

This chapter presented a critical review and synthesis of relevant literature on knowledge management and organizational learning in relation to the research questions and problem statement. I included a summary of the strategy for the literature search, theoretical underpinnings, and conceptual framework that support this study. This chapter also included a review of contemporary peer-reviewed and seminal literature on knowledge management and organizational learning within the context of organizational knowledge creation. A critical review of the central concepts and provided justification for the selected approach to the study with evidence from the literature.

Literature Search Strategy

Using the appropriate strategy when searching for relevant literature is critical to identifying the relevant articles and materials on the topic of knowledge management. Beyond getting results from search engines, it is important to scrutinize the articles from the search page results for relevance and applicability to the study. One way to do this is to skim through the abstract, methodology, and key findings from the article (Pezalla, 2016). I used this approach to select relevant peer-reviewed journal articles for the study.

Databases

For this study, peer-reviewed scholarly journals were selected from several business management databases including Emerald Insight, Business Source Complete, ProQuest, and Science Direct. The Emerald Insight and Business Source Complete databases provided access to recent and relevant articles on knowledge management. Additionally, journals articles were retrieved from the Social Work and Information Systems & Technology databases. These two databases provided supplementary articles on subjects related to my study, such as social change, organizational memory, and information management.

Search Engines

Walden University's library was the primary search engine and source of information for this study. The library allowed access to contemporary studies, seminar papers, dissertations, and other articles on knowledge management, tacit knowledge creation, and organizational knowledge. The Google search engine was used to gather more generic information and data on knowledge management in Nigeria. The dearth of contemporary studies on knowledge management in Nigeria was a limiting factor in obtaining as many peer-reviewed journal articles as would be required. However, the Google search engine provided relevant and recent documentation and information that supplemented the literature reviewed for the study.

Other search engines used included ResearchGate, Google Scholar, and Google Books. These search engines provided additional resources for the study. The Research Gate search engine was configured to prompt for updates on subjects or key words linked

to my study. Also, Google Books provided access to books that provided the theoretical foundation for the study.

Search Terms

The search terms used for the study included a combination of key words, combined words, and phrases. For instance, terms like *knowledge management*, *organizational learning*, *organizational memory*, *knowledge workers*, and *organizational knowledge* were combined and also used separately to vary the search results and get a comprehensive list of relevant scholarly works. The search terms related to the purpose, problem statement, and research questions were *knowledge barriers*, *knowledge enablers*, *tacit knowledge*, and *knowledge conversion*. These terms provided a list of contemporary studies that were related to the research problem and research.

Furthermore, the search for *systems theory*, *complexity theory*, *complex adaptive systems*, *knowledge conversion*, and *SECI framework and 4I framework* yielded relevant articles for the theoretical foundations and conceptual framework for the study. Other phrases such as *knowledge management in developing economies*, *knowledge management in Nigeria*, *knowledge management in developed economies*, and *knowledge management in the oil and gas industry* provided information and articles on knowledge management from the different contexts, which was used for a comparative analysis of knowledge management from various perspectives in relation to this study.

Conceptual Framework

SECI Tacit Knowledge Conversion Framework

Nonaka (1994) developed a framework that illustrates how tacit knowledge is converted to organizational knowledge using the SECI model. This framework was further expanded by Nonaka and Takeuchi (1995) to describe how Japanese companies created the dynamics of innovation, thereby giving their companies competitive advantage. Tacit knowledge conversion is the process by which tacit knowledge is effectively identified, captured, shared, disseminated, used, and retained in such a way that it forms part of the organizational knowledge system (Dahou et al., 2018).

The SECI framework was built on the theory of organizational knowledge creation earlier developed by Nonaka (1990) and describes the four processes of tacit knowledge conversion namely, socialization, externalization, combination, and internalization. According to Nonaka (1994), socialization involves the process of creation knowledge through the conversion of one individual to another. Externalization involves the conversion of tacit knowledge to explicit knowledge (Nonaka, 1994). Socialization and externalization stages describes the process through which new tacit knowledge is acquired, captured, and transferred in an organization.

Combination involves the conversion of explicit-to-explicit knowledge (Nonaka et al., 2006). In other words, it involves the creation of new explicit knowledge from an existing one. Internalization involves the process of converting explicit knowledge into tacit knowledge. The combination and internalization stages describe the process through which knowledge is codified, used, and retained within the organization (Nonaka, 1994).

The SECI framework summarizes the process of tacit knowledge conversion and organizational knowledge creation by the continuous interplay of the four tacit/explicit knowledge from the individual to the organization and vice versa.

Several researchers have used the tacit knowledge conversion framework to explore the barriers to knowledge creation, knowledge transfer, knowledge utilization, and knowledge retention in organizations. For instance, Lievre and Tang (2016) used the tacit knowledge conversion framework to study the barriers to knowledge conversion in a multicultural organization. Similarly, Terhorst et al. (2018) used tacit knowledge conversion as a framework to explore the enablers and barriers to knowledge sharing on projects. Both studies showed that trust, autonomous motivation, spatial proximity, collaboration, and knowledge brokerage enhance the process of knowledge sharing on projects, and if extended to other parts of the organization can facilitate innovativeness. The studies emphasized the significance of the tacit knowledge conversion framework in identifying enablers and barriers to tacit knowledge conversion in knowledge-intensive organizations.

The SECI framework could be used to better understand the enablers and barriers to the conversion of tacit knowledge to organizational knowledge. Tacit knowledge conversion encompasses the process of knowledge acquisition and sharing, knowledge dissemination, knowledge utilization, and knowledge retention (Dahou et al., 2018). These processes are consistent with the socialization, externalization, combination, and internalization stages (Lievre & Tang, 2016). An understanding of the SECI tacit knowledge conversion process may provide insights into the causes and nature of barriers

to knowledge acquisition, sharing, dissemination, utilization, and retention in oil and gas engineering companies in Nigeria.

4I Framework of Organizational Learning (Crossan et al., 1999)

The 4I framework of organizational learning introduced by Crossan et al. (1999) consists of four organizational learning stages: intuiting, interpreting, integration, and institutionalization. According to Crossan et al., intuiting refers to the process by which individuals acquire and store new tacit knowledge in their conscious or subconscious mind. Interpreting involves the individual process of developing cognitive maps from a newly acquired knowledge often resulting in a change in an individual's understanding). Integrating involves coherent and collective action based on shared understanding amongst team members. Also, Crossan et al. described institutionalizing as the process whereby individual or group knowledge is embedded in the organizational strategy, systems, structures, and processes. The four stages of the organizational learning framework summarize the process by which tacit knowledge is converted to organizational knowledge.

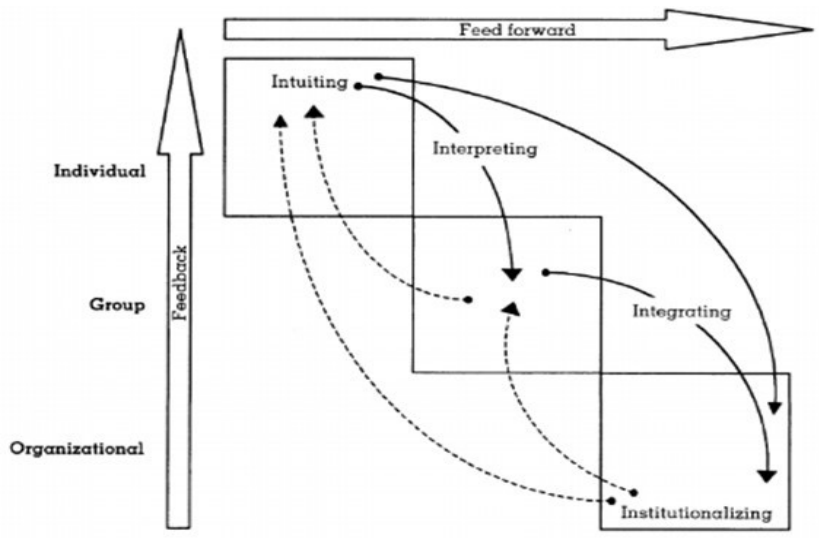
Schilling and Kluge, (2009) used the 4I framework of organizational learning to identify barriers to organizational learning by describing impediments to organizational learning at the intuiting, interpreting, integrating, and institutionalizing stages. Replacing barriers with enablers at each of the stages will facilitate the process on conversion of new tacit knowledge to organizational knowledge. Also, Matthews et al. (2017) used the 4I organizational learning conceptual framework to investigate how process improvement initiatives can result in organizational learning in SMEs. The 4I framework of

organizational learning provided new insights into processes improvement initiatives by enabling SMEs translate processes improvement opportunities at the individual level to initiatives that will be implemented at the organizational level.

The 4I framework of organizational learning provides a great opportunity of identifying enablers and barrier to tacit knowledge conversion at each of the intuiting, interpreting, integrating, and institutionalizing stages of the organizational learning process. These stages are consistent with the consistent with the socialization, externalization, combination, and internalization stages of the SECI model (Matthews et al., 2017). Figure 1 presents the 4I framework of organizational learning.

Figure 1

4I Framework of Organizational Learning



Note: From "An organizational learning framework: From intuition to institution," by, M.M. Crossan, H.W. Lane, and R.E. White, 1999, *Academy of Management Review, 24*(3), p. 532.

Integrated Framework for Organizational Knowledge Creation

The conceptual framework for this study was an integration of SECI tacit knowledge conversion and 4I of organizational learning frameworks. This integrated framework highlights the relationship between the socialization, externalization, combination, and internalization processes of tacit knowledge conversion and the intuiting, interpreting, integrating, and institutionalizing processes of organizational learning. Both frameworks can be summarized into three knowledge conversion gates namely, knowledge acquisition (capture), knowledge transfer (which consists of knowledge sharing, dissemination, and utilization), and knowledge retention.

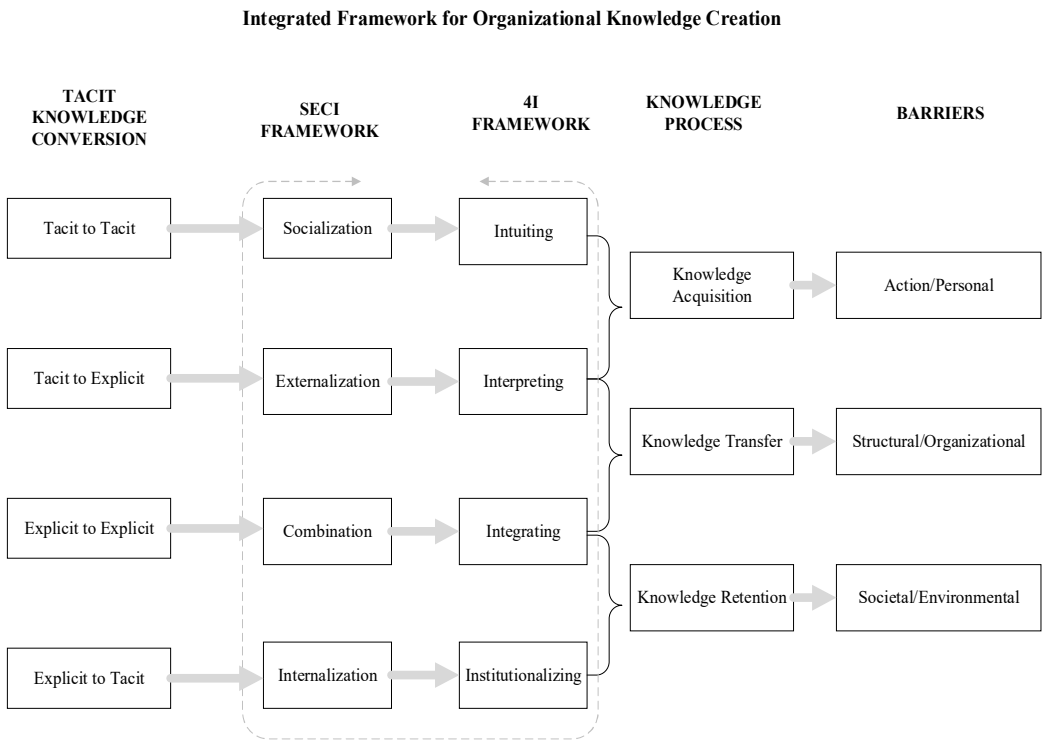
Knowledge acquisition occurs at the intersection between socialization and externalization (Dahou, et al., 2018; Hubers et al., 2016) and intuiting and interpreting (Grah et al., 2016; Mahmood et al., 2019) phases of the SECI and 4I processes, respectively. Knowledge transfer occurs at the intersection between externalization and combination (Alonso & Alexander, 2017; Balde et al., 2018), and the intersection between interpreting and integrating (Michell & McKenzie, 2017) phases of the SECI and 4I processes respectively. Knowledge retention occurs at the intersection between combination and internalization phases (Shahzad et al., 2016; Torres et al., 2020), and integrating and institutionalization (Limba et al., 2019) phases of the SECI and 4I processes respectively. These three knowledge intersections are critical to the tacit knowledge conversion process.

The integrated framework was used to identify barriers at each of the knowledge conversion intersections, with a view to replacing these barriers with enablers. Barriers to

tacit knowledge conversion can be categorized into action or personal barriers, structural or organizational barriers, and societal or environmental barriers (Schilling & Kluge, 2009). Identifying these barriers is the first step in replacing these barriers with enablers that will facilitate the process of tacit knowledge conversion. Figure 2 illustrates the integrated framework for organizational knowledge creation.

Figure 2

Integrated Framework for Organizational Knowledge Creation

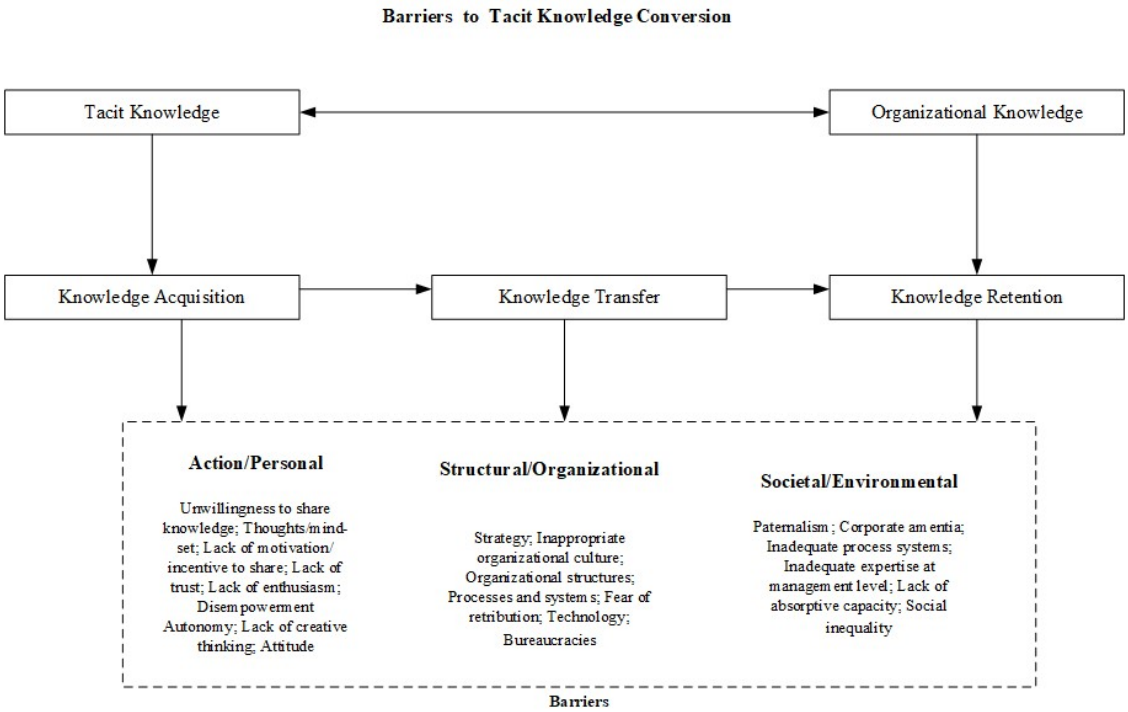


Action or personal barriers include unwillingness to share knowledge; biased mindset; lack of motivation, trust, and enthusiasm; and disempowerment and nonautonomy (Akgun et al., 2017; Chugh, 2017; Omotayo & Babalola, 2016). Structural

or organizational barriers include inappropriate organizational culture and structures, inadequate processes and systems, communication issues, fear of retribution, red-tape syndrome, and dystechnia (Chugh, 2017; Lievre & Tang, 2016; Oluikpe, 2015; Xu et al., 2018). Societal or environmental barriers include paternalism, corporate amentia, lack of absorptive capacity, and social inequality (Arrau, 2016). Identifying barriers at the knowledge creation, knowledge transfer, and knowledge retention offer the opportunity to convert the barriers to enablers. The replacement of barriers with enablers may facilitate the conversion of tacit knowledge to organizational knowledge. Figure 3 highlights the barriers to the conversion of tacit knowledge to organizational knowledge.

Figure 3

Barriers to Tacit Knowledge Conversion



Literature Review

The existing literature on knowledge management and organizational learning is very robust and vast, spanning several economies and contexts across several sectors around the globe. Several researchers and practitioners have lent scholarly voice to the discourse on different aspects of knowledge management and organizational learning using qualitative, mixed method, and quantitative approaches. In this section, I provided an overview of the Nigerian oil and gas industry to provide a brief description of the context of this study. I critically synthesized contemporary works in knowledge management, organizational learning, tacit knowledge conversion, and organizational knowledge creation within the context of companies in developing economies and Nigeria in particular.

The Nigerian Oil and Gas Industry – An Overview

Nigeria is located in the west coast of Africa and is one of the biggest producers of oil and gas in the world with an average production of 2.1 million barrels of oil per day, and a gas production of 47.2 billion cubic meters (Akinyetun, 2016). The oil and gas sector is the major contributor to the Nigeria's economy contributing about 90% of the country's export commodity and more than 80% of the revenue. (Mordor Intelligence, 2018). Nigeria has the largest oil and gas reserve in the African region. With approximately 37 billion barrels of oil and 5.2 trillion cubic meters of gas reserve, Nigeria has remained a dominant force in the African oil and gas sector (Akinyetun, 2016). Consequently, engineering companies in the Nigerian oil and gas industry are

important players and stakeholders in the nation's development as they play a very strategic role in contributing to the commonwealth of the country.

Despite the enormous oil and gas reserves, inadequate infrastructure, security challenges, uncertainties with government policies and regulations, and inadequate indigenous capabilities have hindered Nigeria from maximizing full potential particularly with regards to optimization of human and mineral resources (Mordor Intelligence, 2018). The failure to fully optimize the use of local competences and resources towards national growth and development has been a major challenge.

Notwithstanding the increase in number of indigenous engineering companies operating in the country, the gap in knowledge and competence is not closing at a corresponding rate (Akinwale et al., 2018). It is imperative that Nigerian engineering companies strive to close this gap in knowledge and competence to enable them to compete favorably with their counterparts in other parts of the world. In order to promote the development and use of local resources in the Nigerian oil and gas sector, the Nigerian government in 2010 signed into law the Local Content Act (Ayonmike & Okeke, 2016). According to Ayonmike and Okeke (2016), the act was enacted to address the lack of indigenous competence, capacity, and capabilities in the Nigerian oil and gas industry. The local content act provides a framework for increased participation of Nigerian human and material resources by prescribing the minimum thresholds for activities within the Nigerian oil and gas industry. These activities include all works connected with the exploration, development, exploitation, transportation, and sale of Nigerian oil and gas resources. (Osagie, 2018). The local content act has promoted the

participation of Nigerian companies at every stage of the oil and gas value chain based on availability of indigenous competences and capabilities.

So far, the local content act has empowered indigenous companies in Nigeria, especially engineering companies, through increased participation in oil and gas contracts and projects (Ayonmike & Okeke, 2016). Consequently, a new generation of oil and gas professionals and engineers are beginning to emerge. Also, there has been an increase in the number of indigenous Nigerians in leadership positions in oil and gas companies. However, in spite of the increased participation of Nigerians in the oil and gas industry, there is little evidence of effective acquisition and transfer of knowledge and technology (Mordor Intelligence, 2018). There is need for indigenous oil and gas companies in Nigeria to develop and implement knowledge management strategy that facilitates organizational knowledge creation, use, and retention.

Knowledge Management Research

The knowledge asset of organizations is rapidly becoming the most sustainable source of competitive advantage for most organizations (Guo, 2019; Wahyono, 2020; Yee et al., 2019). Organizations that will succeed in this era will be those that are able to effectively manage knowledge assets (Millar et al., 2016) by continually harnessing individual tacit knowledge, in the form of competencies and technical know-how, and integrating it into the organizational knowledge base (Rovik, 2016). This will give such an organization the agility to respond to the ever changing internal and external environment (Heisig et al., 2016). This agility lies in the adaptability, competencies, and learning abilities of the knowledge workers within the organization.

Several studies have been carried out to illustrate how effective knowledge management can drive competitiveness in organizations (Heisig et al., 2016; Inkinen, 2016; Kianto et al., 2019; Yee et al., 2019). Yee et al., (2019) pointed out that putting in place an effective knowledge management system helps organizations to create value and provides competitive advantage. This way leaders within the organization can leverage on effective knowledge management systems to motive knowledge workers to share knowledge.

Knowledge management systems encompasses three components which are knowledge management practices, knowledge management processes, and knowledge management infrastructure (Kianto et al., 2019; Wahyono, 2020). Inkinen (2016) established that effective knowledge management practices are significant drivers of creativity and innovation. It is therefore important to ensure that the leadership and organizational structure supports the effective management of knowledge resources.

Effective and efficient management of knowledge resources facilitate the development of intellectual capital, organization learning, and innovation (Heisig et al., 2016). Also, knowledge management is said to have positive impact on the productivity of knowledge workers in developing economies (Owusu-Manu et al., 2018; Ramjeawon & Rowley, 2020). According to Kianto et al. (2019), knowledge worker productivity can be measured by timeliness of delivery of tasks, level of autonomy, and knowledge of the job to be done. Knowledge in this context has to do with the ability to deploy tacit and explicit knowledge on the job.

Timeliness and autonomy are indications of the efficiency of knowledge workers (Iazzolino & Laise, 2018). Knowledge management processes involves the development, acquisition, storage, dissemination, and utilization of knowledge (Costa & Monteiro, 2016). Knowledge management infrastructure encompasses the network of people, structure, culture, and technology within the organization that enables and stimulate knowledge creation, sharing, and utilization (Masadeh et al., 2019). Putting in place systems, processes, and infrastructure that enhances knowledge management will foster a business environment that promotes innovation and gives the organization a competitive advantage (Sumbal, et al., 2017). This kind of environment is critical to the implementation of knowledge management systems and practices.

Knowledge Management in the Oil and Gas Industry

Knowledge management has been implemented within the context of the oil and gas companies such as Shell Petroleum, Chevron, British Petroleum, Petrobras, Halliburton, and Schlumberger (Edwards, 2008; Reinmoeller & van Baardwijk, 2005). While some oil and gas companies recorded instant success with the implementation of knowledge management initiative as in the case of British Petroleum and Halliburton (Reinmoeller & van Baardwijk, 2005), some others did not record immediate success as in the case of Petrobras (Edwards, 2008). Notwithstanding the experiences and outcomes of the implementation of knowledge management in oil and gas companies, effective knowledge management has continued to remain relevant in the global oil and gas industry.

According to Ochieng et al. (2018), the oil and gas sector has continued to face performance challenges such as the inability to effectively manage data, information, and knowledge. For oil and gas companies to achieve effective knowledge management, there needs to be a transformation in cultural behaviors at the strategic, operational, and project levels (Ochieng et al., 2016). Organizational culture and leadership play a significant role in effective knowledge management. Leadership styles can either negatively or positively impact knowledge management practices in an organization (Feili et al., 2018). According to Klepic and Madzar (2018), organizational culture creates a social interaction context that ultimately determines how an organization effectively manage the process of knowledge management. The role of organizational culture in facilitating knowledge management cannot be overemphasized.

Knowledge management has been used by oil and gas companies as a tool to navigate the dynamic and complex business environment in the oil and gas industry. To facilitate such flow of information and knowledge in oil and gas companies, attention must be paid to human resource policies, information policies, group dynamics, departmental cooperation, and organizational structure (Ramanigopal, 2013). Some of the positive effects of knowledge management implementation in oil and gas companies are cost reductions as a result of improved technologies, industry growth through mergers and acquisitions, and provision of indigenous solutions to environmental issues (Ghasemi & Valmohammadi, 2018). Oil and gas companies, regardless of location, size, and set-up, are encouraged to leverage on knowledge for effective acquisition, transfer, dissemination, and utilization of knowledge resources.

The complex nature of oil and gas operations makes it imperative for companies to invest time and resources in effective and innovative knowledge management practices (Ghasemi & Valmohammadi, 2018). In spite of the investments by some oil and gas companies in Nigeria in implementing knowledge management practices, more still needs to be done in the area of identifying factors that may improve these knowledge management practices (Iyamah & Ohiorenoya, 2015). Indigenous oil and gas companies in Nigeria are still faced with the challenges of knowledge acquisition, dissemination, and retention (Ochieng et al., 2018). For instance, knowledge workers in Nigerian oil and gas companies expend valuable time and resources trying to retrieve (information (Ochieng, et. al, 2018). This inefficiency may be as a result of ineffective or non-functional knowledge management practices, which may have an adverse effect on efficiency, profitability, and competitiveness.

The shortcomings of the knowledge management practices in some Nigerian oil and gas companies include; emphasis on knowledge mining rather than utilization of knowledge (Ochieng et al., 2018); restriction of the use of knowledge management initiatives to deal with operational issues rather than deploying it as a source of strategic and competitive advantage (Sumbal et al., 2017); and emphasis on explicit knowledge and at the expense tacit knowledge (Ibidunni, 2020). The shortcomings highlighted above hinder oil and gas companies in Nigeria from optimizing their full knowledge potentials.

Ovbagbedia and Ochieng (2016), established that organizational culture plays a very vital role in the successful implementation of knowledge management initiatives. Having multiple cultures that are not aligned can stifle knowledge management efforts

(Ghasemi & Valmohammadi, 2018). On the other hand, an agreeable organizational culture brings about empowerment and drives innovativeness within the organization (Ovbagbedia & Ochieng, 2016). An agreeable organizational culture also encourages and rewards knowledge sharing. Knowledge sharing is the first step towards knowledge acquisition, transfer, utilization, and retention.

Knowledge Management Barriers and Enablers

While there are several barriers to the implementation of knowledge management initiatives in organizations (Akgun et al., 2017; Bloice & Burnett, 2016; Oliva, 2014; Oliva & Kotabe, 2019; Omotayo & Babalola, 2016; Yee et al., 2019), there are equally knowledge enablers that could be used to facilitate knowledge management implementation in organizations (Acharya & Mishra, 2017; ; Chugh, 2017; Dang et al., 2018; Lievre & Tang, 2016; Millar, et al., 2016; Ramjeawon & Rowley, 2020). According to Dang et al. (2018), effective leadership, decentralization of knowledge sources, collaboration, trust, provision of incentives, appropriate use technology, and openness in communication are knowledge enablers in knowledge-intensive organizations. Also, Ramjeawon and Rowley, (2020) identified knowledge self-efficacy, top management support, reciprocal benefits, supportive organizational culture, effective knowledge management infrastructure, and encouragement of face-to-face interactions as enablers of knowledge management practices in organizations.

Oliva and Kotabe (2019) pointed out that barriers to knowledge management in organizations can be categorized into environmental, human, and organizational barriers. Environmental barriers are related to the highly dynamic business environment such as

pressures resulting from the need to continually adapt and evolve thereby hindering the process of knowledge dissemination in some cases (Akgun et al., 2017; Oliva & Kotabe, 2019). Organizational barriers stem from deficiencies in knowledge resources such as personnel, technology, systems, and time required to implement knowledge management initiatives (Akgun et al., 2017). Human barriers include resistance to documentation and lack of creative thinking (Oliva & Kotabe, 2019) and inability to find the right balance between theoretical and practical knowledge in decision making (Bloice & Burnett, 2016). A combination of these barriers may impact the ability of an organization to capture, acquire, store, disseminate, apply, and retain knowledge. It is imperative that these barriers can be replaced by enablers in order to facilitate organizational knowledge creation.

Tacit and Explicit Knowledge

The first step towards knowledge acquisition is to be able to make a distinction between what constitutes existing knowledge and what constitutes new knowledge. Explicit or already documented knowledge is typically a small fraction of the potential knowledge an organization can harness (Ganguly et al., 2019). This is usually regarded as existing or known knowledge which is usually about five percent of the knowledge readily available for use (Dalkir, 2011). However, there is a much larger percentage of tacit knowledge which remains unknown and untapped. It is important for organizations to be able to capture and codify new tacit knowledge.

Capturing and sharing tacit knowledge has been a challenge for many organizations (Ganguly et al., 2019). The process of capturing tacit knowledge involves

the capturing of individual skills, expertise, and experience such that it is assessable and usable by others within the organization. (McQueen & Janson, 2016). Similarly, capturing explicit knowledge requires a systematic approach whereby information is organized, refined, and stored in a way that allows for easy retrieval and utilization (Saini et al., 2018). This is the essence of converting tacit knowledge to organizational knowledge.

Organizations are only able to fully optimize tacit and explicit knowledge potential if it is assessable and usable when required, otherwise organizational leaning and innovativeness will be impeded (McQueen & Janson, 2016). There are several studies that have highlighted the techniques to acquire, capture, codify, and use tacit and explicit knowledge (Akhavan et al., 2018; Ganguly et al., 2019; Saini et al., 2018). Tacit knowledge sharing been said to have a positive correlation with the innovative capabilities of an organization (Ganguly et al., 2019). The capability of an organization to innovate is an essential survival tool in this era of business environment unpredictability and uncertainty.

Innovation capability also improves business performance (Akhavan et al., 2018). Akhavan et al. 2018 pointed out that personality of knowledge worker, knowledge management processes, and environmental influences are factors that impact tacit knowledge acquisition and utilization. Saini et al. (2018) identified trust between knowledge workers, motivation to share knowledge, leadership support for tacit knowledge sharing, capability to capture and share tacit knowledge, identification of tacit knowledge sources and recipients, and alignment of organizational strategy to facilitate

tacit knowledge sharing, as critical success factors for effective tacit knowledge acquisition and utilization.

Social media has ushered in new unconventional avenues for both tacit and explicit knowledge acquisition and conversion (Irum, & Pandey, 2020; Kane, 2017; Leonardi, 2017; Sun et al., 2019). According to Irum, and Pandey (2020), social media platforms serve as sources of tacit knowledge and offer the opportunity for knowledge workers to collaborate and capture tacit knowledge. Unlike traditional information and knowledge management systems that are storage-focused and require documentation, social media is able to bring together all kinds of stakeholders regardless of geographical location, time difference, and demographics (Leonardi, 2017). Social media therefore offer opportunities for initiation of knowledge sharing conversations which facilitates the conversion of tacit knowledge to explicit knowledge.

The process of tacit to explicit conversion using social media includes knowledge creation, knowledge transfer, and knowledge utilization, and knowledge retention (Irum, & Pandey, 2020). The first two steps take place at the individual level while the third step takes place at the organizational level. However, there are a number of demerits associated with relying solely on social media as a knowledge source. One of the demerits is knowledge losses as a result of technological or systems issues (Sun et al., 2019), and breach of privacy or misuse of data (Irum, & Pandey, 2020). Notwithstanding, social media has evolved into a platform for knowledge creation, transfer, transfer, and retention which has the potential of increasing the organizational knowledge base if used appropriately.

Organizational knowledge acquisition occurs when there is a successful transfer of expertise or information from an individual or document, often referred to as knowledge source, to a corporate memory knowledge repository (Dalkir, 2011). In the case of tacit knowledge transfer from individuals, there is usually a requirement for up-front analysis and organization of information in such a manner that knowledge can be easily presented. Explicit knowledge, though already well presented in most cases, may also need to be codified and presented in a way that is easily usable (Irum, & Pandey, 2020). Knowledge codification allows for the organization-wide access and utilization (Ganguly et al., 2019). A typical example of knowledge codification is the conversion of knowledge into documents such as work procedures, which can be widely disseminated organization wide and forms part of corporate memory (Saini et al., 2018). However, in codifying knowledge, it is important to ensure that it is readable, accurate, understandable, credible, and accessible (Attar, 2020). Knowledge codification can therefore be summarized as the process of converting tacit knowledge to explicit knowledge.

Knowledge codification allows for the conversion of tacit to explicit knowledge that can be used or shared in the form refined tacit knowledge. This goes on in a continuous cycle and forms part of the organization's knowledge management system (Ganguly et al., 2019). Knowledge management systems facilitates the capture and conversion of tacit knowledge to explicit knowledge which is then organized and stored as part of corporate memory for long-term retention and utilization (Audretsch et al., 2020). Both forms of knowledge are form important components of organizational

knowledge and there needs to be a continuous interaction and conversion of one form to the other within the organization.

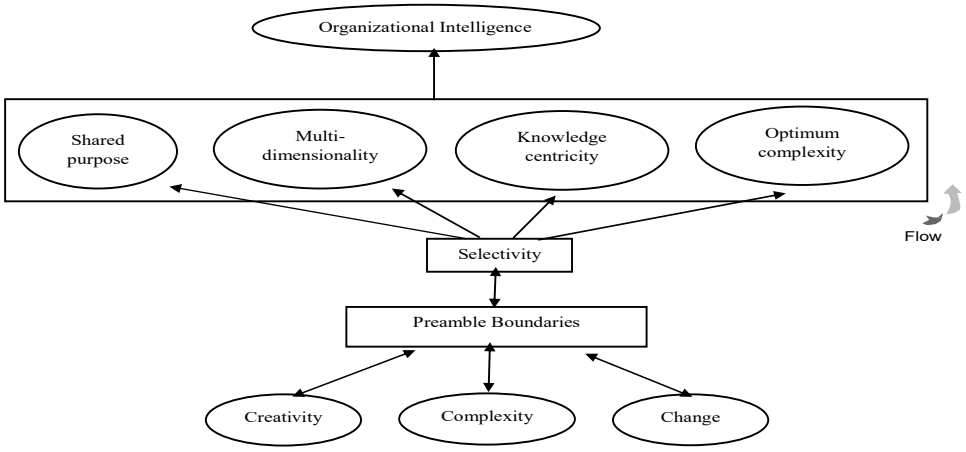
Knowledge Management in Complex Adaptive Systems

The complex adaptive systems model of knowledge management describes organizations as complex adaptive systems comprising of self-organizing components with each component seeking to achieve individual goals whilst still maintaining dynamic interactions with other members of the system and the external environment (Dalkir, 2011). According to Sweetman and Conboy (2018), knowledge-intensive organizations are complex adaptive systems consisting of empowered individuals, as part of a corporate hierarchy who are able to self-organize. Jorge (2021) established that knowledge-intensive that operate as complex adaptive systems better maximize their knowledge management capabilities and respond better to an ever-changing environment. Dynamic capabilities driven by the ability to self-organize is an essential attribute of complex adaptive organizations.

It is important that knowledge-intensive organizations ensure that their business processes are in alignment with the knowledge management strategies (Sweetman & Conboy, 2018). Also, knowledge-intensive organizations continually take inputs from the environment whilst using internal resources to transform these inputs into value-adding outputs through adaptation, a phenomenon described as organizational intelligence (Dalkir, 2011). Figure 4 below illustrates the Intelligent Complex Adaptive System (ICAS) knowledge management model.

Figure 4

ICAS Knowledge Management Model



Note: From "Knowledge management in theory and practice (2nd Ed)," p. 88 by K. Dalkir, The MIT Press. Copyright 2011 by Dalkir. Reprinted with permission.

The model above depicts how knowledge-intensive organizations can develop organizational intelligence through creativity, complexity, and change. Organizational intelligence depicts an organization's ability to be creative, learn, evolve, and apply knowledge to problem solving situations for the benefit of the organization (Dalkir, 2011). Organizational intelligence brings about agility in knowledge-intensive organizations which is enhances the ability to be flexible enough to respond changes in the external environment (Oliva et al., 2019) by being able to make the required changes to their strategies, structure, processes, and services (Oliva & Kotabe, 2019). Knowledge is critical to addressing organizational issues as they emerge in the face of uncertainty (Oliva et al., 2019). Knowledge in this context implies information, expertise, judgment, insight, and experience, readily at the disposal of knowledge workers.

The complex adaptive systems model emphasizes the role of knowledge workers as decision makers and drivers of knowledge management systems in organizations (Statsenko et al., 2018). The ability of knowledge workers to take decisions and actions by leveraging on competencies, skills, and learnings through tacit knowledge acquisition is a critical requirement of complex adaptive systems. Andersen (2019) noted that the ability of knowledge-intensive organizations to function as complex adaptive systems is influenced by the level of organizational intelligence, shared purpose, multidimensionality, knowledge centricity, boundaries permeability, and complexity optimization inherent in the organization. These emergent characteristics are a function of the nonlinear synergistic relationships attributable to self-organizing systems. Consequently, knowledge-intensive organizations, as self-organizing systems, are well positioned to respond to the ever-changing and dynamic internal and external environment.

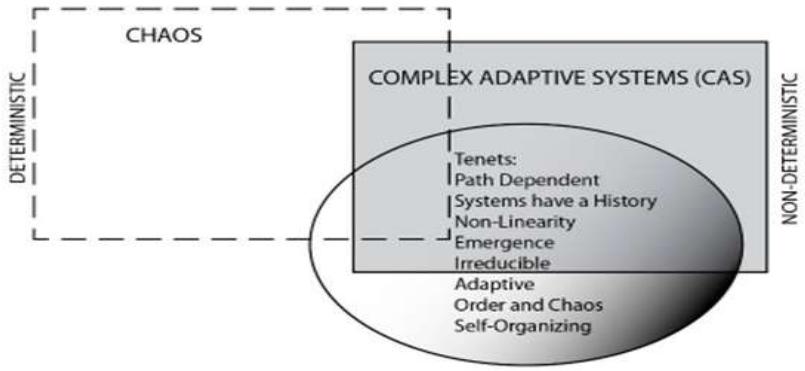
Mamedio and Meyer (2020) explored complex adaptive systems within the context of knowledge and project intensive organizations. They noted that managing complex projects require strategic improvisation, adaptability, self-organization, and flexibility. Knowledge-intensive organizations are also mostly project-intensive organizations (Medina & Medina, 2017). According to Poutanen et al. (2016), organizations that will be successful will have to operate as complex adaptive systems with focus on innovation. The process of innovation is usually complex and non-linear requiring several interactions with multiple stakeholders (Medina & Medina, 2017). The

competitive advantage of a knowledge-intensive organization lies in its ability to manage knowledge resources, self-organize, leverage on dynamic capabilities, and innovate.

Self-organization in complex adaptive systems is possible through continuous sharing of information, knowledge, and other relevant resources with the internal and external environment (Turner & Baker, 2019). Knowledge-intensive organizations are complex adaptive systems because they have organic interactions within and between structures that are continuously taking place as components of the structures learn to respond to external influences. Figure 5 presents the key tenets of complex adaptive systems within the framework of complexity theory.

Figure 5

Complex Adaptive Systems



Note: From "Complexity Theory: An overview with potential applications for the social sciences" by J. R. Turner and R. M. Baker, 2019, *Systems*, p. 13. https://doi.org/10.3390/systems7010004. Copyright 2019 by Turner and Baker. Reprinted with permission.

Organizational Learning and Organizational Memory

Organizational learning is an informal process focused on mutual learning between individuals and the organization (Medina & Medina, 2017) which is vital in knowledge-intensive organizations (Secundo, et al., 2017). While some researchers believe that organizational learning has been absorbed within the concept of knowledge management (Castaneda, et al., 2018; Zappa & Robins, 2016), other researcher argue that both concepts differ though closely related and are mutually inclusive (Eken et al., 2020; Purushothaman, 2016). The mutual inclusiveness between organizational learning and knowledge management is appears to be more evident within the context of knowledge-intensive organizations.

The rate of turnover of knowledge workers in knowledge-intensive organizations has continued to increase over the years (Ghosh et al., 2019). Consequently, the rate of loss of organizational knowledge due to knowledge turnover, outsourcing, and downsizing has continued to increase (Sweetman & Conboy, 2018). This is because tacit knowledge, which resides with knowledge workers may be lost when an employee exits the organization. In knowledge-intensive organizations, knowledge workers within the organization have the responsibility for creating value (Ghosh et al., 2019). It comes at a huge cost when a knowledge worker leaves an organization and goes with the know-how without a system of capturing such know-how.

Knowledge-intensive organizations require a system that facilitates the acquisition and conversion of knowledge worker know-how to organizational knowledge, hence forming part of the organizational memory (Cegarra-Navarro & Martelo-

Landroguez, 2020). Organizational memory helps to prevent against corporate amnesia through loss of tacit knowledge. The lessons learned framework deployed on projects is one of the most widely used organizational learning tools (Eken et al., 2020). Lessons learned process results in the identification and acquisition of new knowledge (Herbst, 2017) and knowledge sharing (Navidi, et al., 2019). Organizational learning allow organizations to continually update its corporate memory through the effective and continuous conversion of tacit knowledge to organizational knowledge.

Knowledge Management in the Context of Developing Economies

In developing economies, the impact of knowledge management practices is similar to those experienced in developed economies (Masadeh et al., 2019; Roy & Mitra, 2018; Vendrell-Herrero et al., 2020). However, differentiators between knowledge management practices in developed and developing economies are embedded in their respective organizational cultures, organizational structures, and knowledge management strategies (Zapata-Cantu, 2020). While some researchers argue that there is a direct correlation between the level of economic development and the ability to effectively implement knowledge management strategies (Kianto et al., 2019; Ramjeawon & Rowley, 2020), some believe that economic development does not have any significant impact on the ability to effectively implement knowledge management (Masadeh et al., 2019; Wahyono, 2020). There is no consensus on the effect of the level of economic development on the ability to effectively implement knowledge management initiatives.

Most researchers agreed that leadership support, technology, organizational strategies, policies, culture, and structure play critical roles in knowledge management

(Owusu-Manu et al., 2018; Ramjeawon & Rowley, 2020; Zapata-Cantu, 2020). For instance, Zapata-Cantu, (2020) identified organizational culture, supportive leadership, and openness as a major driver of innovation and knowledge management in Latin American countries. Also, Owusu-Manu et al., (2018) established a positive correlation between knowledge enablers and knowledge sharing.

Similarly, Razzaq et al. (2019) emphasized the role of organizational commitment as a catalyst to facilitate the relationship between knowledge management practices and knowledge-work performance in developing economies. Furthermore, Youssef et al. (2017) examined the relationships between knowledge sharing behaviors of companies operating in emerging economies and its impact on the competitiveness. They found that knowledge sharing behavior, backed by trust, openness, leadership support, and reward has a positive impact on companies' competitiveness. Evidence from these studies suggest that leadership support, empowerment, collaboration, professionalism, and opportunities to learn gives organizations in developing economies capacity to innovate and stay competitive.

Knowledge Management in Nigerian Companies

Knowledge management has had a positive effect on Nigerian companies and institutions (Ibidunni, 2020; Madase & Barasa, 2019; Omotayo & Babalola, 2016; Ugwu & Ekere, 2018). For instance, Ugwu and Ekere, (2018) established that effective capture, sharing, and utilization of knowledge had a positive effect on innovation in Nigerian university libraries. Omotayo and Babalola (2016) empirically analyzed the factors that

influenced knowledge sharing amongst ICT worker in Nigeria. They found that shared goals and perceived benefits had a positive effect on knowledge sharing.

Ibidunni (2020), investigated the influence of organizational knowledge on performance and noted that the ability to convert tacit knowledge to organizational knowledge is critical to achieving higher levels of organizational performance. Oluikpe (2015) explored how socially constructed knowledge can be shared and used across several project teams. Oluikpe (2015) placed emphasis on the identification of knowledge processes that support sharing and utilization of tacit knowledge between project teams, and how these processes can be enhanced. Projects have been regarded as one of the main sources of new knowledge (Lindgren et al., 2018) as engagement and interactions of project members usually from diverse fields often result in exchange of tacit knowledge. Project based companies can therefore leverage on capturing new knowledge on projects and integrate into the organizational knowledge base.

In spite the positive effect of knowledge management in many Nigerian companies, many Nigerian companies have not taken advantage of the potential benefits of knowledge management (Ibidunni, 2020; Olatokun & Njideaka, 2020; Oluikpe, 2015). Olatokun and Njideaka (2020) opined that tacit knowledge generated in Nigerian companies are lost due to lack of awareness and availability of the tools to adequately capture such tacit knowledge. Similarly, Ibidunni (2020) established that ICT companies in Nigeria are not leveraging on technology to effectively implement knowledge management strategies that will enhance organizational performance. One of the main challenges faced by Nigerian companies is in the area of knowledge sharing (Ibidunni,

2020). Some of knowledge sharing challenges identified in Nigerian companies include tribal differences, work related pressure, lack of financial motivation, lack of training and willingness to learn (Awodoyin et al., 2016; Olatokun & Njideaka, 2020). These challenges underscore the issues with knowledge management implementation in Nigerian companies.

Lawal et al. (2017) carried out a survey to understand how demographics influence knowledge sharing in research institutes in Nigeria. They established that willingness to share knowledge varies with age, gender, religion, and educational levels of respondents. This underscores the role demographics play in knowledge sharing and the need for leaders of knowledge-based organizations to take a systematic approach that it takes into consideration the demographic distribution of the knowledge workers. In addition to knowledge sharing challenges, Nigerian companies also find it difficult to harness tacit knowledge towards the creation of new knowledge (Oluikpe, 2015). The ability to convert tacit knowledge to organizational knowledge is critical to unlocking key to innovation and competitiveness.

Justification of Organizational Knowledge Creation through Tacit Knowledge Conversion

The body of knowledge on organizational knowledge creation is very diverse. Several studies have highlighted the importance of knowledge sharing in facilitating knowledge creation and innovation in organizations (Dahou et al., 2018; Sumbal et al., 2017; Wahda, 2017; Xu et al., 2018; Yao et al., 2020). Some researchers have studied the role organizational culture and structure play in facilitating knowledge creation and

innovation (Arrau, 2016; Ejeh & Hall, 2018; Ovbagbedia & Ochieng, 2016; Owusu-Manu et al., 2018; Zapata-Cantu, 2020). Some explored the importance of knowledge-intensive business processes on organizational knowledge creation (Kianto et al., 2019; Oluikpe, 2015; Oliva & Kotabe, 2019; Wahyono, 2020). Other researchers examined the effect of knowledge sharing barriers (Akgun et al., 2017; Bloice & Burnett, 2016; Omotayo & Babalola, 2016; Yee et al., 2019) and enablers (Acharya & Mishra, 2017; Chugh, 2017; Dang et al., 2018; Lievre & Tang, 2016; Millar et al., 2016; Ramjeawon & Rowley, 2020) on organizational knowledge creation. Organization knowledge creation remains an important topic within the context of knowledge management and organizational learning.

Yao et al., (2020) established that middle-level leadership, organizational culture, structure, and systems had positive effect on an organization's capacity to harness and use tacit knowledge. According to Stojanovic-Aleksic et al. (2019), a supportive organizational structure positively influences tacit knowledge sharing. How an organization is structured with regards to grouping into departments, allocation of personnel, communication channels, and hierarchical relationships, can either have a positive or negative impact on its knowledge management capabilities (Del Giudice & Della Peruta, 2016). In the same vein, a knowledge-supporting organizational culture is required to facilitate the acquisition, sharing, and utilization of tacit knowledge (Stojanovic-Aleksic et al., 2019). A knowledge-supporting culture creates an enabling environment that promotes effective and efficient flow of information and knowledge from the source to where it is required.

In developing economies, researchers have identified collectivism, lack of trust and collaboration, centralization of knowledge sources, lack of leadership support, and inappropriate organizational culture and structures as barriers to knowledge sharing and knowledge creation (Akgun, et al., 2017; Durmusoglu et al., 2018; Oliva & Kotabe, 2019). However, Durmusoglu et al. (2018) noted that knowledge barriers can at times act as catalyst for innovation through transformational leadership. This can be achieved by reversing the negative effect of barriers with emphasis on knowledge strategy, systems, and processes. With good leadership, knowledge barriers can be replaced with enablers that could facilitate knowledge creation.

Good leadership, knowledge self-efficacy, top management support, reciprocal benefits, appropriate organizational culture and structures, fit-for-purpose knowledge management strategy and infrastructure, and perceived benefits were identified as enablers of tacit knowledge organizational knowledge creation (Goswami & Agrawal, 2020; Oluikpe, 2015; Omotayo & Babalola, 2016; Owusu-Manu et al., 2018; Ramjeawon & Rowley, 2020). Other knowledge enablers include openness, training, transformational leadership, and shared goals (Durmusoglu et al., 2018; Madase & Barasa, 2019), These enablers should be embedded into organizational systems and processes (Durmusoglu et al., 2018). Knowledge enablers allows for the development of knowledge resources by facilitating self-organizations and adaptive capabilities, resulting in knowledge creation and innovation.

In Nigeria, lack of trust and collaboration, tribal differences, organizational culture, work-related pressure, lack of financial motivation, lack of training and

unwillingness to learn were identified as barriers to knowledge sharing (Awodoyin et al., 2016; Olatokun & Njideaka, 2020; Oluikpe, 2015; Omotayo & Babalola, 2016). Bamgboje-Ayodele and Ellis (2015) likened the implementation of knowledge management within the organizational culture of Nigerian companies to fitting a round peg in a square hole. This suggests a misalignment between the organizational culture in Nigerian companies and tenets of effective knowledge management practices. The Nigerian organizational culture and climate is characterized by hierarchical structures, centralized decision making, and top-bottom flow of information (Awodoyin et al., 2016; Omotayo & Babalola, 2016). These attributes are not consistent with the tenets of complex adaptive systems which is required for knowledge-intensive organizations to perform optimally.

According to Olatokun and Njideaka (2020), hierarchical structures, centralized decision making, and top-bottom flow of information are counterproductive to organizational knowledge creation in Nigerian companies. Consequently, knowledge-intensive organizations in Nigeria find it difficult to and effectively acquire, share, disseminate, use, and retain tacit knowledge (Bamgboje-Ayodele & Ellis, 2015). Also, Bamgboje-Ayodele and Ellis (2015) pointed out that high turnover of knowledge workers, as a result of socioeconomic factors, resulting in knowledge loss is common in Nigerian organizations.

Organizations that continually (in a cyclic manner) acquire, share, disseminate, use, and retain tacit knowledge are better positioned for knowledge creation (McQueen & Janson, 2016) and competitiveness (Shahzad et al., 2016; Spraggon & Bodolica, 2017).

Organizational knowledge is demonstrated through culture, knowledge history, shared knowledge, and decision-making processes and patterns (Kianto et al., 2019). These attributes are consolidated at the internalization phase of the tacit knowledge conversion process (Zapata-Cantu, 2020). Tacit knowledge has to be internalized for organizations to fully harness both latent and active knowledge resources. This can be achieved by knowledge management practices that will aid the identification and removal of barriers. These barriers are to be replaced with enablers that will facilitate the optimal utilization of knowledge assets and resources.

There is need for further research organizational knowledge creation through the replacement of barriers to tacit knowledge conversion with enablers. Most research, especially in developing economies, have focused more on barriers to the knowledge sharing and transfer (Akgun et al., 2017; Durmusoglu, et al., 2018; Madase & Barasa, 2019; Oliva & Kotabe, 2019; Shahzad et al., 2016;). However, effective conversion of tacit knowledge to organizational knowledge requires a holistic and iterative approach that encompasses the acquisition and documentation of tacit knowledge; knowledge sharing and dissemination between knowledge workers; integration of knowledge in the explicit form; and utilization and retention of knowledge for competitiveness and innovation (McQueen & Janson, 2016; Spraggon & Bodolica, 2017). Therefore, taking a holistic approach to the identification of barriers to knowledge conversion and creation, and replacing these barriers with enablers, is important for knowledge-intensive organizations.

Review of the Central Concepts

The concept of tacit knowledge conversion is interrelated within the frameworks of knowledge management and organizational learning. The feed-forward and feed-backward processes of SECI and 4I are mutually inclusive within the context of organizational knowledge creation (Grah et al., 2016; Shahzad et al., 2016). Both processes highlight the manner through which knowledge is created, transferred, disseminated, retained, and institutionalized in organizations (Balde et al., 2018; Dahou et al., 2018). The mutual inclusiveness of the SECI and 4I frameworks allow for a deeper understanding of the barriers to tacit knowledge conversion through a dual lens involving both frameworks.

The SECI and 4I frameworks have been widely used to explore the process of tacit knowledge conversion, organizational knowledge creation, and organizational learning (Shahzad et al., 2016; Torres et al., 2020). Tacit knowledge has been conceptualized as an important asset in knowledge-intensive organizations which include intuitions, technical and cognitive know-how, mental models, and beliefs (Shahzad et al., 2016). However, tacit knowledge may be difficult to capture, articulate, formalize, and disseminate (Torres et al., 2020). Balde et al., (2018) established the SECI process helped to regulate the interrelationships between creativity on an individual level and the intrinsic drive and trust at the team and organizational levels. This underscores the roles of trust and motivation as enablers of tacit knowledge conversion. Dahou et al. (2018) established that the 4I framework had positive effect on organizational learning.

Socialization, Externalization, Combination, and Internalization (SECI)

Socialization process describes the conversion of tacit knowledge emanating from shared experiences to new knowledge (Alonso & Alexander, 2017). Socialization is a very important process in the knowledge conversion process as it is at this stage where tacit knowledge acquisition takes place (Hubers et al., 2016). It is important for knowledge-intensive organizations to always create an environment that allows knowledge workers to socialize and exchange tacit knowledge (Dahou, et al., 2018). Externalization is the process by which tacit knowledge is formulated into explicit knowledge and transferred within the organization (Alonso & Alexander, 2017; Papa et al., 2018). This is a very important process in the conversion of tacit to explicit knowledge.

At the externalization stage, knowledge is translated and codified into forms that will be understandable throughout the organization (Papa et al., 2018). Combination involves the conversion of explicit knowledge into more complex forms (Alonso & Alexander, 2017) by combining, disseminating, and processing explicit knowledge (Dahou et al., 2018). Combination involves the integration of several sources of explicit knowledge to create new knowledge (Hubers et al., 2016). At the internalization stage, explicit knowledge is converted into the organization's tacit knowledge to facilitate organizational knowledge creation and innovation (Balde et al., 2018). This completes the cyclic process of tacit knowledge conversion.

The SECI process of tacit knowledge conversion is self-transcending (Alonso & Alexander, 2017) and can be facilitated by putting in place mechanisms that support tacit

knowledge conversion (Papa et al., 2018; Shahzad et al., 2016). Socialization and internalization enhance organizational learning by facilitating instinctive tacit knowledge acquisition and transfer. Combination and externalization facilitate the creation of strategic organizational knowledge from tacit knowledge (Dahou et al., 2018). Hubers et al. (2016) used the SECI process to understand the process of knowledge creation in data teams and found that the process of knowledge creation is cyclical and iterative. In other words, tacit knowledge is converted to explicit knowledge which is then converted to tacit organizational knowledge in a continuous cycle of organizational knowledge creation.

Hubers et al. (2016) argued that the socialization and internalization processes of the tacit knowledge conversion process are more important than the externalization and combination processes, and that the former allows for the sharing and utilization of tacit knowledge while the latter focuses more on conversion of tacit to explicit knowledge. On the contrary, Alonso and Alexander (2017) explained that each of the processes in the SECI tacit knowledge conversion cycle are of equal importance as far as the knowledge creation value chain is concerned. Therefore, organizations should pay equal attention to each of the SECI components to ensure optimization of knowledge resources.

Intuiting, Interpreting, Integrating, and Institutionalizing (4I)

Crossan et al. (1999) summarized the process of organization learning using the intuiting, interpreting, integrating, and institutionalizing (4I) framework. The 4I framework of organizational learning has since been used to evaluate the barriers to organizational learning (Limba et al., 2019; Matthews et al., 2017; Zhou et al., 2018).

While some studies highlighted the deficiencies in the 4I framework leading to the expansion of the framework to include information foraging (Pyrko & Dorfler, 2013), others argued that the 4I framework adequately explained the process of organizational learning (El-Awad et al., 2017; Zhou et al., 2018). However, a point of convergence for most researchers was the concurrence that in the 4I framework allows for the identification of barriers to organizational learning at the individual, team, and organizational levels. Identifying barriers to tacit knowledge conversion at the intuiting, interpreting, integrating and institutionalizing stages of the organizational learning framework is critical to unlocking organizational knowledge creation potentials.

El-Awad et al. (2017) described intuition as the organization learning process creating new ideas and insights which are hinged on personal individual experiences. At the interpreting stage, the individual explains new insights and ideas to other individuals or groups of individuals (Zhou et al., 2018). Integration takes place at the team level and involves dialoguing and collective engagements leading to a shared understanding of new knowledge (Limba et al., 2019). This new knowledge is thereafter embedded into an organization's system in a process described as institutionalization (Matthews et al., 2017). At the institutionalization stage, shared understanding is developed into structures, strategies, procedures, and processes which forms part of the knowledge management system (Limba et al., 2019). Understanding the 4Is of organization learning and how it works within the framework of knowledge management is critical to implementing process improvement initiatives that can drive organizational knowledge creation and innovativeness.

Relationship between the central concepts

A strong interrelationship and interdependency exist between knowledge management and organizational learning (Andrews & Smits, 2019). Dahou et al. (2018) described knowledge management as a facilitator of organizational learning. Furthermore, the SECI process of tacit knowledge conversion and the 4I framework of organizational learning are interrelated and interdependent within the context of organizational knowledge creation (Grah et al., 2016). Grah et al. (2016) established similarities between the SECI framework and 4I framework of organizational learning by integrating both frameworks into a single model. Similarly, Mahmood et al., (2019) found that SECI and 4I frameworks of knowledge management and organizational learning when used as a combined knowledge management tool brings about organizational ambidexterity. Organizational ambidexterity gives knowledge-intensive organizations the flexibility to innovate, while at the same time ensure that they do not lose sight of their core functions.

Also, both the SECI and 4I frameworks have been deployed in the development of lessons learned process on projects (Michell & McKenzie, 2017), and for improvement of knowledge management practices (Andrews & Smits, 2019). Andrews and Smits (2019) explored the similarities between the 4I and SECI frameworks within the context of tacit knowledge exchange and pointed out that efforts should be made by organizations to improve the synergistic utilization of the 4I and SECI for effective knowledge management. Using an integrated SECI and 4I framework to develop knowledge management improvement initiatives geared towards organizational knowledge creation

offers a more robust approach to knowledge management and organizational learning. Table 1 below summarizes the similarities between SECI and 4I frameworks.

Table 1

Comparison between SECI and 4I Frameworks

SECI Framework	4I Framework
Socialization: Acquisition & conversion of new tacit knowledge through shared experience & Social interactions (Alonso & Alexander, 2017)	Intuiting: Developing & sharing new tacit knowledge based on experience (Limba et al., 2019)
Externalization: Classifying & codifying tacit knowledge to explicit knowledge (Torres et al., 2020)	Interpreting: Translating ideas or insights into explicit knowledge (El-Awad et al., 2017)
Combination: Organizing and integrating knowledge (Balde et al., 2018)	Integrating: Developing & organizing shared knowledge & understanding (Mathews et al., 2017)
Internalization: Consolidating explicit knowledge into an organization's tacit knowledge by embedding in structures & systems (Papa et al., 2018)	Institutionalizing: Embedded knowledge & learning into organizational systems & structures (Limba et al., 2019)

Organizational Learning and Knowledge Barriers

Grah et al., (2016) established that barriers to organizational leaning exist at the individual, group, organizational, and inter-organizational levels. This grouping was further categorized into action/personal barriers, cultural/structural barriers, and external/environmental barriers (Schilling & Kluge, 2009). Individual or personal barriers affect the acquisition and sharing of tacit knowledge (Omotayo & Babalola, 2016). Lack of trust, autonomy, enthusiasm, and motivation were identified as barriers at this level (Akgun, et al., 2017). Cultural and structural barriers were found to impede the conversion of tacit knowledge to explicit knowledge and the ability to organize and

integrate the explicit knowledge for organization-wide utilization (Lievre & Tang, 2016; Xu et al., 2018). External/environmental barriers were said to negatively impact the ability of organizations to consolidate and embed explicit knowledge into the organization's systems and structures such that it facilitates the creation of new knowledge (Akgun, et al., 2017; Limba et al., 2019). It is imperative that barriers to organizational learning are replaced with enablers at each level in order to facilitate the conversion of tacit knowledge to organizational knowledge.

The Meaningfulness of Selected Approach

Organizational knowledge creation has continued to dominate the discourse on knowledge management and organizational learning (Heisig et al., 2016; Kianto et al., 2019; Yee et al., 2019). This is more relevant in knowledge-intensive organizations that rely majorly on knowledge workers (Dahou et al., 2018) to continually capture and develop tacit knowledge resources into organizational knowledge (Shahzad et al., 2016; Spraggon & Bodolica, 2017). Several researchers have identified several barriers knowledge management and organizational learning (Akgun et al., 2017; Oliva & Kotabe, 2019; Yee et al., 2019) and how these barriers can be replaced with enablers (Chugh, 2017; Dang et al., 2018; Lievre & Tang, 2016; Ramjeawon & Rowley, 2020). Replacing barriers with enablers is critical to organizational knowledge creation.

However, most of the studies have focused more on barriers and enablers to knowledge sharing in organizations with little emphasis on other aspects of tacit knowledge conversion process. There is need for a holistic approach centered on the identification and understanding of enablers and barriers to organizational knowledge

creation at each stage of the tacit knowledge conversion process. Globally, centralization of knowledge sources, internal competition, lack of knowledge sharing incentive and lack of leadership support were identified as some of the barriers to organizational knowledge creation (Akgun, et al., 2017; Oliva & Kotabe, 2019; Yee et al., 2019). On the other hand, collaboration amongst knowledge workers, adequate knowledge management infrastructure, reciprocal benefits and incentives, leadership support, and openness in communication were identified as enablers of knowledge management and organizational learning (Dang et al., 2018; Oliva & Kotabe, 2019; Ramjeawon & Rowley, 2020). Organizations that will optimize its knowledge resources are those that are able to replace knowledge management barriers with enablers.

In most developing countries, knowledge management and organizational learning enablers and barriers are similar to those identified in organizations in develop economies. For instance, Chugh, (2017) identified unwillingness to share knowledge, lack of motivation and trust, and lack of incentives as barriers to knowledge management in developing economies. However, relatively poor economic conditions brought about peculiar challenges to knowledge management practices in developing economies (Bamgboje-Ayodele & Ellis, 2015). Social inequality, inadequate technological infrastructure, red tape syndrome, and inappropriate culture were identified as barriers that are common in developing economies (Arrau, 2016; Lievre & Tang, 2016; Xu et al., 2018). Some of these barriers may not be found in developed countries with better socio-economic conditions.

Barriers to knowledge management and organizational learning in Nigeria are similar to that of other developing countries. Hierarchical organizational structures, centralized decision making, lack of leadership support, unwillingness to share knowledge, and top-bottom flow of information were identified as the most common barriers to knowledge sharing in Nigerian companies (Awodoyin et al., 2016; Oluikpe, 2015; Omotayo & Babalola, 2016). Also, high turnover rate of knowledge workers was found to impede tacit knowledge sharing in Nigerian companies (Bamgboje-Ayodele & Ellis, 2015). Some of the barriers to knowledge management in Nigeria, like in developing economies, may be as poor socio-economic conditions.

There is need for a holistic approach centered on the identification and understanding of enablers and barriers to organizational knowledge creation at each stage of the knowledge conversion process. In order words, identifying barriers to the acquisition, sharing, dissemination, utilization, and retention of tacit knowledge, and replacing with enablers. This is imperative towards the implementation of effective knowledge management and organizational learning initiatives in Nigerian companies. This holistic approach will facilitate the identification of barriers to tacit knowledge conversion at the individual, organizational, and trans-organizational levels.

The SECI framework provides organizations with a better understanding of the enablers and barriers to tacit knowledge conversion. Integrating this SECI framework with the 4I framework of organizational learning allows for a two-fold approach to identifying barriers to tacit knowledge conversion. Also, integrating both frameworks further empathize the roles of all stakeholders in the conversion of tacit knowledge to

organizational knowledge. The most important stakeholder in the conversion process of tacit knowledge to organizational knowledge are knowledge workers (Ganguly et al., 2019). It is therefore important to identify and understand, from the perspective of knowledge workers, the enablers and barriers which may either facilitate or impede the conversion of tacit knowledge to organizational knowledge.

Summary and Conclusions

Knowledge management and organizational learning have remained a source of competitive advantage for most organizations and as such continued to attract the attention of both academics and practitioners across several fields of management (Inkinen, 2016; Kianto et al., 2019; Rovik, 2016; Yee et al., 2019; Wahyono, 2020). This is more so for knowledge-intensive organizations whose activities are knowledge driven and rely more on the use of knowledge workers to drive business activities (Ganguly, et al., 2019; Secundo et al., 2017; Sweetman & Conboy, 2018). Effective management of knowledge resources and assets is therefore critical to the performance of knowledge-intensive organizations.

Effective knowledge management allows organizations to leverage on collective knowledge to create a pathway for innovation and competitiveness (McQueen & Janson, 2016; Spraggon & Bodolica, 2017; Wahyono, 2020; Yee et al., 2019). Similarly, effective organizational learning enables organizations to share, acquire, create, use, transfer, and retain knowledge (Costa & Monteiro, 2016; Heisig et al., 2016; Masadeh et al., 2019; Medina & Medina, 2017). The general adoption of knowledge management and organizational learning practices by organizations in both developed and developing

economies is a testament to their importance in today's competitive and dynamic business environment.

The review of literature on knowledge management and organizational learning with emphasis on the conversion of tacit knowledge to organizational knowledge showed that several researchers have approached these topics from a quantitative, qualitative and mixed method perspective (Castaneda et al., 2018; Eken et al., 2020; Owusu-Manu et al., 2018; Ramjeawon & Rowley, 2020; Zapata-Cantu, 2020; Zappa & Robins, 2016). These different approaches have provided various insights into the importance of knowledge management and organizational learning in driving innovation and competitiveness in organizations. Also, researchers identified several barriers to knowledge sharing that could impede the effective conversion of tacit knowledge to organizational knowledge (Akgun et al., 2017; Grah et al., 2016; Lievre & Tang, 2016; Omotayo & Babalola, 2016; Xu et al., 2018). It is important that these barriers are replaced with enablers that will facilitate the acquisition, transfer, utilization, and retention of knowledge.

In Nigeria, limitations as a result of poor socioeconomic conditions offer peculiar challenges to knowledge sharing in most organizations (Awodoyin et al., 2016; Bamgboje-Ayodele & Ellis, 2015; Omotayo & Babalola, 2016). The SECI and 4I framework of knowledge management and organizational learning, respectively, have been used extensively by researchers, albeit in isolation, to identify and categorize barriers to organizational knowledge creation at the individual, organizational, and trans-organizational levels in developed economies (Andrews & Smits, 2019; Dahou et al., 2018; El-Awad et al., 2017; Hubers et al., 2016; Matthews et al, 2017; Papa et al., 2018;

Shahzad et al., 2016; Zhou et al., 2018). There has been no application of the SECI and 4I frameworks in the context of Nigerian engineering companies.

This study contributed to the body of knowledge by using an integrated SECI and 4I frameworks to provide a unique perspective to knowledge management and organizational learning in Nigeria. Secondly, most of the knowledge management and organizational learning studies in Nigeria have focused more on barriers to knowledge sharing (Ibidunni, 2020; Lawal et al., 2017; Olatokun & Njideaka, 2020; Omotayo & Babalola, 2016) with little emphasis on barriers to knowledge acquisition, dissemination, utilization and retention. Identifying barriers to tacit knowledge conversion requires a holistic approach that takes into consideration, the kind and nature of barriers at every stage of the knowledge conversion process This study provided a holistic evaluation of the barriers to knowledge conversion at every stage of the organizational knowledge creation process as perceived by engineering practitioners in the Nigerian oil and gas industry.

Findings from this study could assist engineering companies in the Nigerian oil and gas industry to better optimize their knowledge resources and assets in order to remain competitive and innovative. A qualitative case study involving multiple participants from several engineering companies in the Nigerian oil and gas industry was used for this study. This will be discussed in in the next chapter where I highlighted in detail, the research design and methodology.

Chapter 3: Research Method

The purpose of this qualitative case study was to understand the enablers and barriers to tacit knowledge conversion in engineering companies as perceived by engineering practitioners working within the Nigerian oil and gas industry. An understanding of the perceived enablers and barriers for tacit knowledge conversion from the perspectives of knowledge workers provides an opportunity for improving knowledge management practices in the Nigerian oil and gas industry. I used the integrated SECI and 4I conceptual frameworks to understand the barriers to tacit knowledge conversion at every stage of the organizational knowledge value chain. Replacing these barriers with enablers may empower engineering companies in the Nigerian oil and gas industry optimize their knowledge resources and assets.

In this chapter, I will discuss my considerations for conducting a qualitative case study. The discussion will incorporate the rationale behind the choice of research design in relation to other alternative designs. I will also clearly define and describe my role as the researcher with respect to the research instrument and relationship with the participants. I will discuss the research methodology that will highlight the rationale behind the selection of participants, research instrument, data collection, and data analysis. The methodological sequence of actions leading to the provision of answers to central research question of this study will be clearly articulated in this chapter.

Research Design and Rationale

The research question for this study was "What are the enablers and barriers to the conversion of tacit knowledge to organizational knowledge as perceived by engineering practitioners working in oil and gas engineering companies in Nigeria?" The main concept central to this research question is tacit knowledge conversion. Tacit knowledge conversion encompasses the process through which tacit knowledge is acquired, shared, stored, disseminated, used, and retained within an organization to facilitate organizational knowledge creation (Balde et al., 2018; Dahou et al., 2018; Grah et al., 2016; Shahzad et al., 2016). Tacit knowledge conversion is a very important process within the framework of knowledge management and organizational learning (Dahou et al., 2018; Torres et al., 2020). It is therefore imperative for organizations to implement knowledge management practices that will facilitate the effective conversion of tacit knowledge to organizational knowledge.

Research Tradition and Design

To answer the research question highlighted above, a qualitative case study with focus on understanding the perspectives of knowledge workers on the enablers and barriers to tacit knowledge conversion was ideal for this study. The research tradition of a qualitative study is consistent with the quest to provide answers to the central research question. According to Gallifa (2018), research traditions depict ways by which knowledge is built and validated. This encompasses the ontological, epistemological, and methodological aspects knowing, providing a framework for which more detailed empirical interventions take place in a research study (Babbie, 2017). Social

constructivism involves the analysis of multiple perspectives that are subjective in nature towards the creation of new knowledge (Creswell & Poth, 2018). The qualitative research approach deployed for this study was based on an inductive approach which is consistent with interpretivist social constructivism.

According to Bogna et al., (2020), social constructivism is a philosophical perspective used to evaluate how social objects that are constructed, negotiated, and shared by people to make sense of their world. A social constructivist's point of view is based on the premise that reality is socially constructed and is dynamic (Chipangura et al., 2016). Social constructivism is used to focus on how humans make meaning through the interaction between their experiences and their ideas. This philosophical perspective suggests that the reality of organizations is constructed in the minds of the individuals who think about it (Creswell & Poth, 2018). This can be used to get multiple perspectives on a phenomenon and a subjective evaluation of reality.

Conversely, the quantitative research tradition is used when a deductive approach to a research study is preferred. Quantitative research tradition is hinged on positivism which depicts an understanding of the world in such a way that is predictable and controllable (Greener, 2008). According to Babbie (2017), positivists make use of deductive reasoning to develop hypothesis which are subjected to empirical testing. The outcome of such tests may result in subsequent revisions to existing theories so that reality can be accurately predicted. However, quantitative research tradition with a focus on statistical procedures and emphasis on causality and measurement and are not suitable

for in-depth investigation and gathering of rich data (Creswell & Poth, 2018). It is on this basis that the quantitative research tradition was not considered for this study.

Rationale for Choice of Case Study Design

In arriving at the choice of the qualitative research design that was most suitable for this study, I considered the case study, action research, phenomenology, ethnography, and the narrative research designs. Out of all the qualitative research designs considered for this study, case study design was the most suitable. Yin (2018) defined a case study as in-depth investigation into a contemporary phenomenon within its real-life context. Case studies are consistent with the constructivist epistemological approach and are suitable for the capturing in-depth perspectives of different participants on the topic of discussion (Yin, 2018).

Case studies are used for intensive studies involving a unique group of people with emphasis on understanding their perspectives on a phenomenon within a real-life context (Yin, 2018). Qualitative case studies are subjective in nature and focus more on depth and richness rather than quantity of data gathered (Greener, 2008). This implies that findings from qualitative case studies may not be transferable to other contexts. This limitation could be overcome by collecting data from multiple data sources. This study included multiple participants (cases) from several engineering companies in the Nigerian oil and gas industry. Multiple case studies involve the collection and comparison of data from multiple sources (Yin, 2018). Also, multiple-case study designs are suitable for studies with two or more cases believed to be lateral replications and predictable similar outcomes (Yin, 2018).

There are similarities between qualitative case study and other qualitative research designs. For instance, ethnography, case study, and narrative research designs share many similarities when the units of analysis are narrowed down to single individuals as all the research designs focus on in-depth exploration of a phenomenon from the perspective of individuals (Creswell & Poth, 2018). However, the differences lie in the implementation strategy for each of the designs. In narrative research design for instance, individual stories are arranged in chronological order (Ravitch & Carl, 2016). Also, narrative research can only be used when the objective of the study is to focus on one case at a time (Yin, 2016). Ethnography involves a study of a culture based on stories, artifacts, and observation. (Dalmer, 2019). Ethnography is therefore more appropriate for studies that require large-scale investigation into a culture. I determined that neither action research nor narrative research were appropriate given the purpose of my study.

Furthermore, qualitative case studies share many similarities with phenomenology. For instance, both methods require in-depth investigations into a phenomenon (Creswell & Poth, 2018). However, while case studies are used to focus on individuals or a group of individuals within a specific case or cases (Ravitch & Carl, 2016), phenomenology is used more for studying several individuals that share similar lived experiences (Churchill, 2018). Also, data collection from case studies can be carried out using multiple sources such as interviews, observations and documents (Yin, 2018). On the other hand, data collection for phenomenological studies are mainly through interviews (Creswell & Poth, 2018). Another difference between case studies and phenomenology is with regards to the data analysis strategy. For phenomenological

studies, data is analyzed for contextual descriptions and significant statements and meanings (Ravitch & Carl, 2016), while for case studies, data is analyzed for both within case themes in the case of single case studies and cross-case themes in the case of multiple case studies (Creswell & Poth, 2018). A case study approach was therefore adjudged to be more beneficial to this study for collection of multiple sources of rich data that can be compared across cases.

Role of the Researcher

It is important to highlight the role of the researcher in a qualitative study which involves obtaining insights of research participants on a topic. The role of the researcher, with regards to the worldview and underlying biases, may impact the validity of the study (Ravitch & Carl, 2016). For this qualitative case study, I was the primary research instrument. As the primary research instrument, I adopted strategies that helped to mitigate against adverse effect of biases in relation to my role as the researcher. These strategies were incorporated into the data collection and analysis stages of the study.

Qualitative data for this study was collected using semi structured interviews. Due to constraints as a result of the Covid 19 pandemic, one-on-one interviews were conducted and recorded using Microsoft Teams videoconferencing software program. To ascertain the smooth running of the interview process, and to ensure that the interviewees can contribute meaningfully, I provided adequate background information on the central concepts and terminologies to the participants and also enlighten them on the purpose of my study.

My passion and connection to the topic is linked to my professional experience as an engineering practitioner in the Nigerian oil and gas industry. The decision to explore knowledge management within the context of a developing country such as Nigeria is based on an intrinsic motivation to contribute to the improvement of knowledge management practices, particularly in engineering companies in the Nigerian oil and gas industry. Therefore, as a critical stakeholder and potential beneficiary of this study, I was fully aware of the personal perspective and bias I may be bringing into this study, especially as it relates to my role as the primary research instrument. To manage the impact of any potential bias, I incorporated reflexivity and peer debriefing into the research design process. I also kept a reflective journal of all daily entries and experiences during the process of data collection.

Methodology

Research methodology is the procedure used to define, select, process, and evaluate data and information about a topic (Creswell & Poth, 2018). Critically describing the methodology is required for a critical evaluation of the validity, reliability, replicability, and transferability of a study (Ravitch & Carl, 2016). It is imperative that the research methodology is in alignment with the central research question. In this section, I highlighted considerations for selection of participants, research instrument, pilot study, participant recruitment procedures, and plan for data collection and analysis. Also, ethical procedures and issues of trustworthiness are highlighted as an integral part of methodology to demonstrate credibility, reliability, confirmability, and dependability of findings.

Participant Selection Logic

The general population for the study consists of engineering practitioners in Nigeria. This general population constitutes about 53,000 registered engineers (Adeh, 2020). The specific population were engineering practitioners in engineering companies within the Nigerian oil and gas industry. Sampling for this study was purposive and non-probabilistic, using the snowball strategy sampling. The judgment of the researcher with regards to the suitability of the participants is very critical to the selection of participants in purposive sampling (Yin, 2016). Selection of participants for the study was therefore based on some predetermined criteria.

According to Yin (2016), selection of participants using purposive sampling is based on their experience and knowledge on a concept or phenomenon towards the provision of rich data. In contrast to random sampling where participants are selected randomly (West, 2016), purposive sampling is used in the selection of a representative sample that will provide the required in-depth insight towards answering the research questions (Crawford et al., 2016; Merriam & Tisdell, 2016). Random sampling is more appropriate for quantitative studies where statistical methods used. It was therefore not considered for this study.

Selected participants were those considered to be knowledgeable about the topic or central concept. This strategy of selecting knowledgeable participants is consistent with purposive sampling (Ravitch & Carl, 2016). As part of the participant selection process, it was important to establish the criteria for including and excluding participants (Crawford et al., 2016). Participants' selection criteria included engineering practitioners

with a minimum of 8 years' experience in the Nigerian oil and gas industry. Participants that had below 8 years' experience were not included in the study as they may not have adequate experience to provide the meaningful insight on the phenomenon.

Also, as part inclusion criteria, participants had to have spent a minimum of 2 years in their respective companies. This was to ensure that participants have a good understanding of the organizational culture, structure, and practices as it relates knowledge management. Furthermore, only participants that had participated in at least two oil and gas engineering projects were included in the study. Projects are one of the gates through which tacit knowledge is acquired, shared, retained in an organization (Michell & McKenzie, 2017), and adequate knowledge of project dynamics with regards to capturing lessons learned was critical to this study.

Engineering practitioners, from various engineering disciplines in engineering companies within the Nigerian oil and gas industry, were recruited from my professional network. However, friends or colleagues from my place of work were not included in this study as this could potentially cause conflict of interest. Snowball sampling strategy was used to recruit additional participants as required during the data collection stage. According to Merriam and Tisdell (2016), snowball sampling strategy is an effective way to recruit additional participants based on the recommendations of the initial participants Twelve engineers were initially recruited from my professional network. Ten additional engineers were recruited based on the recommendations of some of the initial engineers recruited, as part of the snowball sampling strategy.

All recruited participants were sent a formal invitation to participate in the study. This invitation was sent by email and contained an informed consent form. The informed consent form included a brief description of the purpose of the study and data collection procedure. The consent form included information on privacy, confidentiality guarantees, benefits, and risks associated in participating in the study. The consent form also included the contact information of research participant advocate for Walden University.

All the recruited participants responded to the invitation/consent email with the words “I consent” to confirm willingness and consent to participate in the study. At the beginning of the interview sessions, each participant was given another opportunity to review the informed consent form and decide whether they would still want to participate in the study. Clarifications and question regarding the purpose and scope of the interview was treated with utmost transparency and sincerity.

According to Creswell and Poth (2018), the sample size for most qualitative studies is between 15 to 20 participants. For this study, I interviewed 22 participants before data saturation was reached. Data saturation occurs at the point where no new information is derived from collecting additional data and new data becomes redundant (Faulkner & Trotter, 2017). At this point, a researcher is assured that collecting new data becomes redundant and collecting further data will most likely be the same with already established themes. According to Fusch and Ness (2015), ensuring data saturation has a positive impact on the validity and reliability of a research study. It was therefore important that I engage as many participants as required to reach saturation. The snowball sampling strategy was ideal in this regard.

Instrumentation

In a qualitative case study, the researcher is the primary instrument for data collection (Ravitch & Carl, 2016; Yin, 2018). As the primary research instrument, I collected qualitative data using semi structured interviews. The secondary instrument was an interview protocol (see Appendix B) which formed part of the case study protocol. A case study protocol is a formal document that contains the procedure for data collection (Yin, 2018). The interview protocol included an interview guide, formal invitation letter, consent form, and the detailed steps for the interview process (Castillo-Montoya, 2016). The interview guide contained a series of open-ended questions related to the central research question and topic.

Semi structured interview protocol as a research instrument was suitable and sufficient to provide answers to the central research question. The open-ended nature of semi structured interviews enabled participants to respond freely and provide their in-depth perspectives on the phenomenon (Fusch & Ness, 2015). The interview questions (see Appendix A) were developed from the synthesized literature on knowledge management with emphasis on enablers and barriers to the conversion of tacit knowledge to organizational knowledge in developing economies. Understanding what exists in the literature and the gaps therein was the premise on which the interview questions and the interview protocol were developed.

The process of framing interview questions from the literature involves review of patterns and themes in relevant studies on knowledge management in the context of developing economies, particularly Nigeria. The studies of Ibidunni (2020), Kianto et al.

(2019), Madase and Barasa (2019), Owusu-Manu et al. (2018), Razzaq et al. (2019), Ramjeawon and Rowley (2020), Ugwu and Ekere (2018), and Zapata-Cantu (2020) were referenced in this regard. Similarly, in the development of interview questions on tacit knowledge conversion the following studies were referenced (Dahou et al., 2018; Ejeh & Hall, 2018; Sumba et al., 2017; Wahda, 2017; Xu et al., 2018; Yao et al., 2020).

Furthermore, a significant part of the interview questions was developed from the review of patterns and themes in current studies on enablers and barriers to the knowledge sharing and transfer. The studies of Andrews and Smits (2019), El-Awad et al. (2017), Ibidunni (2020), Lawal et al. (2017), Olatokun and Njideaka (2020), Papa et al. (2018), and Zhou et al. (2018) were used for this purpose. The interview questions developed from the studies highlighted above were further refined using the interview protocol refinement framework.

The interview protocol refinement framework is used to demonstrate rigor in the development of interview questions in qualitative studies (Castillo-Montoya, 2016). Interview protocol refinement involves the systematic and iterative process of developing and refining interview protocol by aligning the interview questions with the purpose of the study and the central research questions. The process will facilitate an investigation-based engagement with peers and experts, whereby feedback is provided and applied to the research instrument with a view to improve its reliability and validity (Castillo-Montoya, 2016). As part of the interview protocol refinement framework, I engaged an expert panel to review the research instrument. Feedback from the expert panel was used to improve to the interview protocol.

Expert Review

As part of the process of validating the research instrument an expert panel was constituted to review the research instrument prior to the actual collection of data for the study. According to Dikko (2016), it is important to validate the research instrument to ascertain its adequacy in respect of providing answers to the research questions. Outcomes from the expert review was used to make relevant improvements on the interview guide, protocol, process, and procedure. For this study, I engaged an expert panel to review the research instrument. This expert panel consisted of the methodology expert on my dissertation committee and a member of faculty in the school of management at Walden. The expert panel provided useful feedbacks and made suggestions that improved my research instrument. Feedback from expert panel was used to make necessary modifications to the interview questions, protocol, and other factors that could affect process of data collection process such as the sequence of events, timelines, and other logistical considerations.

Procedures for Recruitment, Participation, and Data Collection

Recruitment of participants is a very important step in the data collection process (Creswell & Poth, 2018). Recruitment of participants was based on the inclusion and exclusion criteria. Participants were recruited from engineering companies in the Nigerian oil and gas industry. Getting access to recruited participants was relatively easy as the participants were engineering practitioners within my professional and social networks. However, close friends and co-workers were excluded from participating in the study.

In recruiting the participants, all protocols with regards to gaining access to participants were observed in line with the guidelines of Walden University Institutional Review Board (IRB). Twelve participants were initially recruited from within my professional and social network. An additional 10 were recruited using the snowball strategy based on the inclusion criteria. However, in requesting for referrals using snowball sampling, I ensured that the referral source did not have a top-down relationship with the referred participants. In addition to this, to avoid unanticipated perception of coercion by the referred persons, I emphasized the core of the voluntary nature of the study section in the invitation/consent form. Also, referred participants were assured that their decision to either decline or accept to participate in the study would not be discussed with the referral source.

Recruitment of participants commenced upon receipt of IRB approval from Walden University. Formal invitation, including consent forms, were sent via emails to potential participants with a view to recruiting them for my study. Participants that were interested in the study responded to the email with the words “I consent.” For participants who gave consent to participate, I set-up a 5–10-minute pre-interview phone call to have preliminary engagements with the consenting participants. The pre-interview call was also an avenue to address any clarifications the participants might have. Most importantly, the pre-interview was an opportunity for me to determine whether the participants met the inclusion criteria and their willingness to participate in recorded interview sessions. Thereafter, interview dates were scheduled, at the convenience of each of the participants.

Interviews for the study took place virtually in Lagos Nigeria, using Microsoft Teams videoconferencing software. The interview was conducted over a period of two weeks, subject to availability of the participants. The estimated time for each interview session was between 60 to 90 minutes. With the permission of the participants, the interview sessions were automatically recorded using Microsoft Teams. During the interviews, I took note of unspoken gestures, body language, and nonverbal cues from the participants. Paying attention to nonverbal clues could improve the richness of the information provided (Greener, 2008). I used field notes to document other contextual information and observations with a view to improving the richness of the data. Verbatim transcription is used to ensure that every word and other non-verbal communications such as laughter, are captured for future reference (Phillippi & Lauderdale, 2017). Verbatim transcription of the interview recordings was carried by a transcription service provider, Rev.com.

During the interview, the participants were notified that they could discontinue the interview at any point if they were no longer willing to continue. This was to ensure that participants did not feel coerced into participating as this could negatively impact the trustworthiness of the data. At the end of each interview session, participants were informed that a copy of the transcript would be sent to them for validation to guide against misinterpretation of data collected from the participants. Participants were given one week to revert with clarifications or corrections to the transcripts. In a few cases, some of the participants did not revert after a week and I had to follow-up with a telephone call.

Data Analysis Plan

As part of the overarching case study protocol, it is important to clearly articulate steps to be taken in organizing and analyzing qualitative data. Data analysis involves the critical examination the data collected in such a manner that the researcher is able to provide answers to the central research questions (Ravitch & Carl, 2016). However, organizing and analyzing a large amount of data and making meaning out of it can be challenging especially when trying to relate it with the central research question (Saldana, 2016). It is therefore important to adopt data analysis strategies and techniques for effective analysis of data with the aim of providing data to the central research question.

According to Yin (2018), data analysis for case studies can be carried out using four strategies which are; reliance on conceptual and theoretical propositions; working on the data from the "ground up"; developing a case description; and defining and testing plausible rival explanations. For this study, I relied on conceptual propositions from the literature as the basis for analyzing the data from the case study. More specifically for data analysis technique, thematic analysis was used for the study.

Thematic analysis facilitates flexibility in analyzing qualitative data, either by analyzing meanings and patterns across the entire dataset, or by focusing on a particular component on the data for in-depth analysis (Jugder, 2016). Thematic analysis also facilitates the reporting semantic or latent meanings (Yin, 2018) and examining the underlying assumptions behind the dataset (Nowell et al., 2017). Thematic analysis technique was used to implement a robust data analysis strategy that provided insights

into the research question based on the perspectives of engineering practitioners on enablers and barriers to the conversion of tacit knowledge to organizational.

Data Organization and Coding

The process of data analysis starts by organizing the data (Saldana, 2016). Data organization for this study started from collating the interview transcripts and field notes. I familiarized with the data from each transcript to narrow the focus to only part of the data that are critical to providing answers to the central research question. Thereafter, manually generated codes and themes from the data using thematic analysis.

According to Saldana (2016), coding involves the iterative process of using words or short phrases to summarize important components of the data collected. Coding is therefore a critical part of the data analysis process as it allows for tagging and making meaning of key elements in the data that are critical to providing answers to the research question (Manning, 2017). Manual coding of qualitative data requires that the researcher reads through the entire dataset and manually generate codes and themes (Saldana, 2016). Although coding the dataset manually was time consuming and cumbersome, it brought me very close to the dataset and this helped to streamline the thematic analysis process.

Data Analysis Tool and Software

Micosoft Team software was used for data collection and recording. Interview recordings were transcribed by a transcription service provider from audio to text format. Field notes were summarized to be analyzed alongside the transcribed data texts. As earlier mentioned, every other component of the data analysis process was done manually. I considered using a computer-assisted qualitative data analysis software

(CAQDAS) such as Nvivo for my data analysis. The use of data analysis software is recommended for organizing and analyzing large datasets (Ravitch & Carl, 2016). However, given the scope of the study, and coupled with the fact that I had little proficiency in the use of Nvivo, I decided that manual analyzing the dataset would be more suitable and rewarding.

Discrepant cases

As part of the data analysis process, it is important to include a strategy on how to identify and resolve data discrepancy issues. Data discrepancies occur when there are contradicting information within two or more comparable data within the dataset (Merriam & Tisdell, 2016). This results in inconsistencies in the patterns established from the data and by extension may impact the credibility of the findings of the study (Merriam & Tisdell, 2016). Saldana (2016) suggested taking a closer examination of the data with a view to develop more trustworthy finding as a way to address discrepant cases in the data.

For this study, I addressed discrepant cases by isolating and critically evaluating the dataset causing such discrepancies. Yin (2016) recommended taking a critical review of the discrepant cases from a skeptical standpoint as a way of resolving it. This may include going back to review the collected data in the original format and questioning the motive and underlying assumptions for the responses with a view to provide alternative interpretations and explanations (Ravitch & Carl, 2016). Discrepant cases were coded, analyzed, and discussed as part of the data analysis. In some cases, they were used to provide support for the alternative interpretations. According to Yin (2016), discrepant

cases and alternative explanations may provide a basis for further research and improve the trustworthiness of the study. Therefore, l included discrepant cases and alternative explanations while presenting the findings.

Issues of Trustworthiness

In qualitative studies, several researchers have used various indicators to demonstrate reliability and validity (Creswell & Poth, 2018; Ravitch & Carl, 2016). It is important, as a quality requirement, to demonstrate trustworthiness which is an indication of rigor in the research process and findings based on established quality criteria and indicators (Creswell & Poth, 2018). The quality indicators for trustworthiness in a qualitative study are based on the credibility, transferability, dependability, and confirmability of the research process and findings (Ravitch & Carl, 2016). I have presented below the strategy adopted to improve the each of the quality indicators.

Credibility

Credibility, also known as internal validity, in qualitative research is the degree to which rigor is demonstrated in the research process which includes the approach, design, instrumentation, method, and findings (Ravitch & Carl, 2016). Credibility encompasses the accuracy of the data collection and analysis process, the information obtained and alternative interpretations (Ravitch & Carl, 2016). In other words, credibility bridges the gap between the research findings and reality, hence it is a very important indicator of trustworthiness.

Strategies for ensuring credibility include peer debriefing and participant validation. Peer debriefing encompasses a process where someone who is not part of the

research process reviews interview transcripts and research findings with a view to determine whether the researcher has misinterpreted, overemphasized, or underemphasized a point (Ravitch & Carl, 2016). Participant validation or member checking helps to ensure that information provided by the participants is not misconstrued and interpretations of data are a true reflection of the insights of the participants on the phenomenon (Birt et al., 2016).

Participant validation and member checking are used to address issues power disparity and expert-learner binary as it relates to qualitative data collection and analysis (Ravitch & Carl, 2016). Participant were made to review and validate the interview transcripts to avoid misinterpretations of the information provided. I carried out peer debriefing with two independent assessors, one a professional colleague and the other a recent doctoral graduate from Walden, to improve analytical triangulation. In addition to this, the iterative process of analyzing the discrepant cases were documented by providing detailed descriptions to enhance the credibility of the study.

Transferability

Transferability is the extent to which findings from this study may be applied to another context. Transferability allows for other researchers to better understand the research process such that they are able apply it within other contexts (Ravitch & Carl, 2016). In other words, transferability of a study is reflected in how the researcher is able to present the research process and relevance such that other researchers can also replicate and determine its relevance in another context. The role of the researcher is to facilitate transferability as the burden of applying findings of one study within another

context does not rest with the researcher (Korstjens, & Moser, 2018). However, the onus is on the researcher to provide thick descriptions that will facilitate an understanding of the contextual components of the study (Ravitch & Carl, 2016). To ensure transferability in this study, I provided thick descriptions of the objectives, research context, and procedure for data collection and analysis.

Dependability

Dependability is an indicator of trustworthiness that has to do with the reliability of the research process which includes the research design, data collection and analysis strategy, and research findings (Ravitch & Carl, 2016). Dependability encompasses a detailed description of the steps taken in the research process and a justification for the choice of design and method which are consistent with the research purpose (Gunawan, 2016). This description will articulate how each component of the research process aligns with the central research question.

One of the ways of ensuring dependability in a qualitative study is through the use of audit trails. Audit trails contain a detailed chronological record of the steps, events, and choices involved in research process (Ravitch & Carl, 2016). Audit trails are also used to document changes in field events and the justification for such changes. I kept an audit trail of all research proceedings, particularly at the data collection and analysis stages. I also carried out a reflexive examination of recordings and field notes as part of the data collection phase. To ensure dependability in this study, I maintained documented evidence and justification of the critical choices made during the research process, especially as it impacts on the research procedure, design, and methodology.

Confirmability

Confirmability is the degree to which findings from a study could be independently confirmed. Confirmability of a qualitative research encompasses the demonstration that findings from a study are a true reflection of the perspectives of the participants on the phenomenon and research questions and not based on opinion or experiences of the researcher (Chowdhury, 2016). According to Ravitch and Carl (2016), confirmability as a criterion for trustworthiness requires a demonstration that findings from a study have not been impacted by the researcher's biases.

A way to deal with biases is to identify and highlight these biases and present ways to minimize the effects of the biases. Reflexivity entails a researcher's examination of personal beliefs, biases, experiences, and practices that may influence certain decisions or choices during the research process and the impact on the research findings (Palaganas et al., 2018). Issues relating to researcher bias in this study were addressed by maintaining audit trails and reflexive notes during the data collection and analysis stage.

Ethical Procedures

Ethics is a major consideration for academic research projects. Merriam and Tisdell (2016), described ethics in research as careful consideration of ethical issues that come up when conducting a study that involves people. It is imperative to anticipate and identify ethical issues that may come up while carrying out research and document how these issues will be addressed (Agwor & Adesina, 2017). Some of the ethical issues related to this study included access to participants, voluntary participation, confidentiality, conflict of interest, potential harm to participants, manipulation of

findings, convenient sampling, transparency, and bias (Ravitch & Carl, 2016). These ethical issues are best addressed by adhering to ethical codes and guidelines established by relevant professional or institutional bodies directly or indirectly involved in the research (Babbie, 2017). For this study, I adhered strictly to the ethical guidelines of Walden University's IRB. The study was approved by the IRB with approval number 05-25-21-0280518.

During data collection, participants were notified that they were free to withdraw from the interview process at any point if they no longer feel comfortable for any reason whatsoever. As a part of the recruitment process, participants who volunteered to be a part of the study were required to send their consent, in writing, to the invitation email/consent form. All the engineering practitioners that participated in the study responded to the invitation email with the words "I consent" to confirm willingness and consent to participate. The consent form contained a brief background to the study and highlight the procedures, potential benefits and risks, information on privacy and confidentiality, and Walden University's contact details for the advocate for the research participants. Also, participants were notified that they could withdraw from the research if they are uncomfortable with any part of the informed consent form.

On a broader note, participants were encouraged to ask questions that may relate to the purpose or scope of the study. All questions from participants, in relation to the study, were provided with honest responses. Also, all information provided by the participants were treated with confidentiality devoid of any impression of power

disparity. The responses of the participants and their perspectives were respected and captured irrespective of the level of knowledge or experience.

In presenting, documenting, and archiving data, I ensured that confidential and sensitive information was protected. As pointed out in Babbie (2017), I ensured that components of the data that may reveal the identity of the participants were expunged. Information that could reveal personal data from the transcripts were also not included. PINS were used to code participants' information using a combination of letters and numbers. For example, a male civil engineer with 14 years of experience, who has worked on 10 projects, was tagged as "CVE1410". Similarly, a female mechanical with 16 years of experience, and who has worked on14 projects, was tagged as "FME1614" and so on.

Recordings on Microsoft Teams was copied and saved locally in an encrypted folder on a password protected hard drive, and thereafter deleted permanently from the Microsoft Teams platform. Local copies of the recordings of the interview sessions will be securely stored for a period of 5 years in line with Walden University policy, after which the recordings will be permanently deleted. All related hard copy documents generated from the data collection process will be shredded, and all electronic files will be wiped off using Bleachbit data erasing software upon the expiration of the 5 years' timeline.

Personal information on the participants and information on the companies where they work was not required for the study. However, data relating to the inclusion criteria, such as years of experience in the oil and gas industry and number of projects worked on

were captured. Also, data relating to the perspectives of the engineering practitioners on enablers and barriers to the conversion of tacit knowledge to organizational knowledge was required for this study. Where necessary, I used codes to further conceal some information I deemed sensitive.

The fact that I belong to the same categorization of engineering practitioners as the participants to be recruited for the study may raise issues of bias or conflict of interest. To mitigate against such bias and conflict of interest, I ensured that I demonstrate an objective posture and reflexivity before, during, and after the data collection and analysis process. Furthermore, I explained my role and interest in the study and presented a summary of my professional background and experience to the participants.

Summary

The purpose of this qualitative case study was to understand the enablers and barriers to tacit knowledge conversion in engineering companies as perceived by engineering practitioners working within the Nigerian oil and gas industry. The central research question was focused on obtaining in-depth data from engineering practitioners in the Nigerian oil and gas industry based on the perceived enablers and barriers to tacit knowledge conversion geared towards the development and implementation of effective knowledge management practices. In this regard, the qualitative case study research design was appropriate to provide rich contextual insights which is based on the perspectives and experiences of the engineering practitioners. Participants were recruited

from engineering companies in the Nigerian oil and gas industry. Sampling was purposive and non-probabilistic using the snowball strategy.

A semi structured interview protocol was developed to facilitate the acquisition of rich, in-depth data. Due to the Covid-19 restrictions, interviews were conducted and recorded using Microsoft Teams software. A Microsoft Teams was also be used to record and transcribe the interview sessions. Transcription of the interview recordings was done by a transcription service provider. Field notes were used to capture additional information to facilitate audit trail. Manual coding method was adopted develop data into codes and themes.

Thematic analysis technique was used to analyze patterns and themes in relation to the central research questions. The issues of trustworthiness were carefully considered to ascertain that the study is ethical, credible, confirmable, transferable, and dependable in line with Walden University's IRB guidelines. In the next chapter I presented details of the field tests, contextual research setting, data collection, data analysis, evidence of trustworthiness, and the study results.

Chapter 4: Results

The purpose of this qualitative case study was to understand the enablers and barriers to tacit knowledge conversion in engineering companies as perceived by engineering practitioners working within the Nigerian oil and gas industry. This understanding could provide an opportunity to improve knowledge management practices in the Nigerian oil and gas industry. Replacing these barriers with enablers can empower engineering companies in the Nigerian oil and gas industry to optimize their knowledge resources and assets. The central research question focused on collecting in-depth data based on perceived enablers and barriers to tacit knowledge conversion in the development and implementation of effective knowledge management.

In this chapter, I will describe the process and findings from the data collection and analysis. This will include a description of the field test, research settings, and demographics of the participants. I will discuss the strategies I deployed to enhance the trustworthiness of the data collection and analysis process. I will also present the results of the data analysis and highlight the major themes, supported by direct quotes from the data collected from participants in a number of cases. I will conclude this chapter by summarizing the major findings from the data collection and analysis process.

Expert Review

As part of the process of validating the research instrument, I carried out expert reviews on the research instrument prior to the actual collection of data for the study. According to Dikko (2016), it is important to validate the research instrument as an indication that the instrument is sufficient with regards to providing answers to the

research questions. Feedback from the expert reviews was used to improve the interview guide, protocol, process, and procedure. For this study, I engaged an expert panel for the field tests on the research instrument. This expert panel consisted of an expert on the research design and the second member of my dissertation committee.

The expert panel provided useful feedback and made suggestions that improved my research instrument as suggested by Lysaght et al. (2018). For instance, suggestions were made with regard to elaborating on the interview questions (see Appendix A) that are directly related to the central research question. With this feedback I expanded on the questions relating to the enablers and barriers to the conversion of tacit knowledge to organizational knowledge. Also, feedback from an expert panel was used to make modifications to the interview protocol related to the process of data collection such as the sequence of events, timeline, and other logistical considerations.

Research Setting

Participants recruited for the study were engineering practitioners working in engineering companies in the Nigerian oil and gas industry. Almost all participants work in indigenous engineering companies, apart from one of the participants who works in company which is a subsidiary of a multinational company. Data collection was carried out virtually using Microsoft Teams software at a convenient location and time proposed by the participants. Apart from the inherent challenges associated with carrying out virtual interviews such as internet or network issues, there were no other signs of external or organizational influences that may have impacted the participants' responses to the interview questions.

On a general note, the study was conducted within the context of a developing country, Nigeria. Nigeria, just like other country, is currently dealing with the effects of the Covid-19 pandemic. This is in addition to other economic, security, and political challenges currently facing the country. These challenges are causing tensions and unrest in certain parts of the country. However, nothing from the countenance and expressions of the participants suggested that their participation in the study, and responses to the interview questions were influenced by these challenges. The participants demonstrated enthusiasm, keen interest, and good spirits during the interview sessions. Therefore, nothing observed during the data collection process suggested that the current socioeconomic and security issues in Nigeria may influence the collection, analysis, and interpretations of findings from the study.

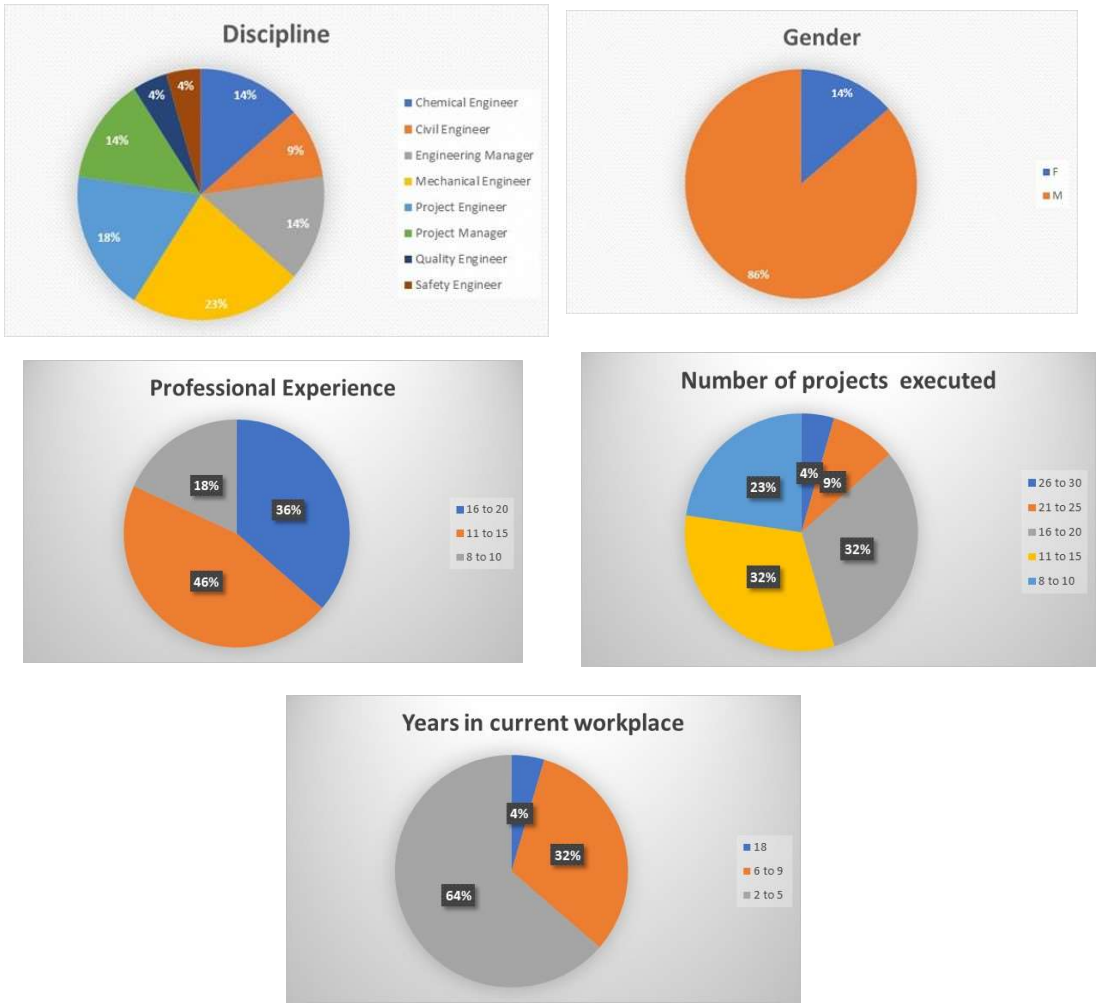
Demographics

A total number of 22 participants were interviewed for this study, 19 male engineering practitioners and three female engineering practitioners. Participants were recruited based on their willingness to participate in the study, having met the inclusion criteria. These participants included three project managers, four project engineers, three engineering managers, five mechanical engineers, three chemical engineers, two civil engineers, one safety engineer, and one quality engineer. The number of years for professional experience of these engineering practitioners ranged from 8 to 20 years, with each participant having worked for a minimum of two years in in their current workplace. Similarly, the number of projects executed by the participants ranged from 8 to 30. All

participants communicated fluently in English language, hence there was no need for translation. Figure 6 below shows a summary of the demographics.

Figure 6

Demographics



Data Collection

Qualitative data was collected from all the 22 participants using a semi structured interview protocol (see Appendix B). The interview protocol consisted of 15 open-ended questions, most of which had follow-up questions. The open-endedness of the semi

structured interview questions enabled each of the 22 participants to respond freely, thereby providing in-depth perspectives on the phenomenon (see Fusch & Ness, 2015). After interviewing the first 17 participants, I observed consistent and recurring themes and patterns that suggested data saturation. However, I interviewed five more participants to ensure saturation making a total of 22 participants. Data collection was carried out between 21st of June 2021 and 15th of July 2021, after receiving IRB approval.

Due to the Covid 19 pandemic, the semistructured interviews were conducted virtually using Microsoft Teams. Microsoft Teams was also used to record the interview sessions. The interview recordings from Microsoft Teams were saved in a password protected storage device. Each participant proposed a convenient date and time, within the comfort of their private offices or homes, for the interview. The interview sessions lasted between 60 to 90 minutes. I interviewed an average of six participants in a week over a period of almost 4 weeks.

I planned to use Microsoft Teams to transcribe the interview recordings. However, the subscription package on my Microsoft Teams account did not allow for transcription and therefore I engaged a transcription service provider (Rev.com) to transcribe the recordings. Recording the interview sessions using Microsoft Teams software allowed me to pay full attention to the participants without any distractions. Automatic recording of the interview sessions using Microsoft Teams also allowed me to interject and ask follow-up questions as required.

In addition to recording the interview sessions, I used field notes to capture additional information that could improve the audit trail. The field notes facilitated a

reflexive examination of the qualitative data collected. Apart from the challenge faced in getting the participants to keep to the interview schedule, there were no unusual circumstances or situations encountered during data collection. There was no deviation from the data collection plan described in Chapter 3, except that I engaged a transcription service provider to transcribe the interview recordings. However, a nondisclosure agreement (See Appendix D) was signed with the transcription service provider for the purpose of confidentiality.

Data Analysis

Data analysis was completed using the thematic analysis approach (Braun & Clarke, 2006; Yin, 2018). Thematic analysis facilitates flexibility in analyzing qualitative data, either by analyzing meanings and patterns across the entire dataset, or by focusing on a particular component on the data for in-depth analysis (Jugder, 2016). Thematic analysis also facilitates the reporting of semantic or latent meanings (Yin, 2018) and examining the underlying assumptions behind the dataset (Nowell et al., 2017). According to Braun and Clarke (2006), thematic analysis entails the following steps: familiarizing with the dataset, generating initial codes, searching for themes, reviewing themes, defining and naming themes, producing the report.

Familiarizing With the Dataset

At the familiarization stage, I immersed myself in the data by reading each transcript and listening to each recording from the interview sessions several times. I also took additional notes as I read through the transcripts and listened to the recordings. Beyond reading and listening to the data I started making meaning of the dataset by

critically examining how each participant made sense and interpreted their experiences based on their responses to the interview questions and in line with the central research question. At the end of this phase I became intimately familiar with the dataset and began to observe portions of the data relevant to the central research question.

While familiarizing myself with the data I made a conscious effort to set aside prior knowledge, understanding, and experiences in relation to my role as an engineering practitioner, and from the review of the literature. To achieve this, I took an objective posture and exercised reflexivity on my judgments and positions on the key elements of the data collected. This was necessary to ensure that I remained open, unbiased, and honest in my reflections about my prior knowledge and experiences. More importantly, it allowed me to develop a new understanding based on the perspectives of the participants. The process of manually coding the data from the transcripts facilitated the process of familiarizing with the dataset.

Generating Initial Codes

At this stage, I generated initial codes by reading through the dataset line by line. Coding was done manually using a self-developed Excel spreadsheet. The initial codes generated consisted of descriptive and interpretive codes. Descriptive codes are close to the content of the data and are usually a reflection of the participants' exact words while interpretive codes provide more meanings about the content of the data (Braun & Clarke, 2006). I used a combination of both descriptive and interpretive codes to enrich the quality of coding. The coding process was iterative, involving making series of

modifications to initial codes based on further review of the data. This iterative process continued until I completed coding all relevant components of the dataset.

Some of the initial codes generated included collaboration (e.g., SE1315 – "When the project organizational chart comes out, everyone has a role to play, and people are mobilized to the project from various departments based on their expertise."). Additional codes included teamwork, cordial relationships, communication, interdiscipline interface, cross-functional teams (e.g., PM1516 – "In a nutshell, I supervise a multidiscipline team of engineers working together towards project delivery and success."), interrelationships, and knowledge sharing. Other codes generated were on-the-job training, document management (e.g., CVE1410 – "My organization has a document control system that archives all project information."), leadership commitment, organizational culture, and unhealthy competition.

Codes such as knowledge hoarding (e.g., PM1720 – "You find out that some employees are hoarding knowledge."), deficient infrastructure, lack of trust, and ineffective leadership style were generated initially from questions relating to barriers to tacit knowledge conversion. Other codes generated under this category included lack of training (e.g., PE810 – "First would be lack of training, training and retraining is required for anybody to acquire knowledge.") and lack of collaboration. Initial codes generated from questions relating to enablers of tacit knowledge conversion included mentor-mentee relationships, socialization, rewards, and recognition.

Other codes included professional memberships (e.g., CHE1415 – "As a project management professional, I am a member of the project management institute, I receive

their newsletters and resources materials from time to time which helps to update my knowledge.") and provision of incentives. Additional codes generated under this category were improved knowledge database, continuous improvement, and lessons learned (e.g., EM1422 – "Lessons learned is a key element in any project and has to be documented as part of the continuous improvement process."). More codes were generated from participants' responses to all the interview questions covering knowledge management systems and practices, lessons learned on projects, and interrelationships in knowledge-intensive organizations.

Codes such as collaboration, teamwork, cordial relationships, communication, interdiscipline interface, cross-functional teams, and interrelationships clustered around the participants' responses to questions on their role as engineering practitioners and the relationships between the functional roles in their organizations. Codes such as knowledge sharing, lessons learned workshops, on-the-job training, document management, leadership commitment, and organizational culture clustered around the participants' responses to questions on the knowledge management systems, and practices in their organizations. Codes such as lessons learned workshops, knowledge sharing sessions, improved knowledge database, continuous improvement, and organizational learning clustered around the participants' responses to questions on lessons learned on projects.

Several codes were generated in direct relation to the central research question Codes such as lack of collaboration, unhealthy competition, knowledge hoarding, deficient knowledge infrastructure, lack of trust, ineffective leadership style, and lack of

motivation clustered around participants' responses to questions on barriers to tacit knowledge acquisition were created. Codes such as mentorship, professional memberships, socialization, rewards, incentives, good remuneration, technology, enabling environment, and good employee retention strategy clustered around participants' responses to questions on enablers of tacit knowledge acquisition were also created..

Searching for Themes

In this phase, I began to review the codes from the dataset with a view to identify patterns and themes in the data. Themes were used to categorize relevant data from the dataset in relation to the central research question (see Yin, 2018). I grouped similar codes together to form subthemes or categories. For instance, I grouped knowledge hoarding, lack of trust, unhealthy competition, and lack of collaboration as "Personal and Interpersonal Barriers" to tacit knowledge conversion. Similarly, I grouped deficient infrastructure, nonexistent knowledge management system, and inadequate use of technology as "Structural and Systemic Barriers" to tacit knowledge conversion. Also, I grouped lack of management commitment, unsupportive organizational culture, ineffective leadership style, and lack of motivation as "Cultural and Leadership Barriers" to tacit knowledge conversion. These categorization into subthemes reflected a meaningful and coherent pattern in the dataset based on a clustering of codes.

Also in this phase, I explored the relationships between the subthemes and how the subthemes combine to tell a comprehensive story about the dataset. It is important that themes generated from codes are not isolated but made to work together as parts of a

whole (Braun & Clarke, 2006). All other codes that could not be grouped into any subtheme, and that were not relevant to the research questions, were either discarded or included as part of the provisional themes and discrepant cases. The relevant provisional themes and discrepant cases were included and discussed in detail as part of the findings. For example, codes such as standardization of work processes, impossible to harness knowledge, economic situation, and unknown knowledge were grouped either as part of the provisional themes or discrepant cases.

Reviewing Themes

At this phase I reviewed the subthemes and explored the relationships between the subthemes. Exploring the relationships between subthemes facilitated the development the organizing themes. Reviewing the subthemes also allowed for congruency and coherency checks in relation to that dataset. This process involved relocating some codes between subthemes and organizing themes, and in some cases relocating some subthemes from one from organizing theme to another. During this phase some codes and themes were discarded and only codes and themes that captured the relevant data in relation to the central research question were retained.

Defining and Naming Themes

The next phase was to define what each organizing theme means. This involved naming and summarizing each theme with a short phrase or sentence. According to Yin (2018), naming of the themes should demonstrate the relationships between the codes within the dataset. The objective at this phase was to define the themes in an analytical manner such that it demonstrates the relationships between the organizing themes

towards the formation of a central theme. At the end of this phase, the themes were defined, analyzed, and organized in such a way that tells the story about the data collected in relation to the central research question. A central theme "Organizational Knowledge Creation" emerged as a result of exploring the relationship between the organizing themes.

Producing the Report

The last phase of the thematic analysis approach entailed producing a report which tells a compelling story about the dataset. While producing the report, the order at which the themes are presented are very important. Braun and Clarke (2006) emphasized the need for the connections between themes should be logical to ensure coherency in the dataset in relation to the central research question. As part of the report a thematic map was generated showing the relationships between codes, subthemes, organizing themes, and the central theme.

Also, in preparing the final report, I further reviewed the discrepant cases to see if they fit anywhere within the dataset. However, the discrepant cases were counterintuitive in relation to other datasets and were therefore discarded. For instance, participant FPE98 argued that "it is impossible to harness tacit knowledge." Similarly, Participant PE108 stated that "Project-based organizations are not set-up for tacit knowledge acquisition." However, these discrepant cases were included in the analysis and may provide a basis for further research.

Evidence of Trustworthiness

Issues around trustworthiness in qualitative research cannot be overemphasized. As highlighted in Chapter 3, trustworthiness is an indication of rigor in the research process and findings based on established quality criteria and indicators (Creswell & Poth, 2018). These quality indicators are based on the credibility, transferability, dependability, and confirmability of the research process and findings (Ravitch & Carl, 2016). I have highlighted below how each of these indicators of trustworthiness were addressed.

Credibility

Credibility, also known as internal validity, in qualitative research is the degree to which rigor is demonstrated in the research process which includes the approach, design, instrumentation, method, and findings (Ravitch & Carl, 2016). Credibility encompasses the accuracy of the data collection and analysis process, the information obtained and alternative interpretations (Ravitch & Carl, 2016). For this study I used member checking, peer debriefing, and identification of discrepant cases as part of the strategies to facilitate the credibility of findings.

As part of the member checking process, copies of the interview transcriptions were sent to all 22 participants for validation. Feedback from this process was incorporated into the data analysis process. In addition to member checking, I carried out peer debriefing with two independent assessors, one a professional colleague and another a recent doctoral graduate from Walden. Feedback from the peer debriefing also contributed to the refinement of the data analysis process thereby enhancing credibility.

Credibility of the study was also enhanced by identifying and capturing discrepant cases in the data which could be critical for future considerations.

Transferability

Transferability is the extent to which findings from this study may be applied to another context (Ravitch & Carl, 2016). The role of the researcher is to facilitate transferability as the burden of applying findings of one study within another context does not rest with the researcher (Korstjens & Moser, 2018). However, the onus still lies on the researcher to provide thick descriptions that will enable an understanding and transfer of contextual components of the study (Ravitch & Carl, 2016). To facilitate transferability in this study, I provided detailed descriptions of the objectives, research context, and procedure for data collection and analysis.

Dependability

Dependability has to do with the reliability of the research process including the research design, data collection and analysis strategy, and research findings (Ravitch & Carl, 2016). Dependability encompasses a detailed description of the steps taken in the research process and a justification for the choice of design and method which are consistent with the research purpose (Gunawan, 2016). This description will articulate how each component of the research process aligns with the central research question. To facilitate dependability, I kept an audit trail of the data collection and analysis process. I also carried out a reflexive examination of recordings and field notes as part of the data collection phase and retained documented evidence and justification of the choices made

during the research process as it impacts on the research procedure, design, and methodology.

Confirmability

Confirmability is the degree to which findings from a study could be independently confirmed. Confirmability underscores the importance of demonstrating that findings from a study have not been impacted by the researcher's biases (Ravitch & Carl, 2016). To facilitate confirmability, it was important to identify, highlight, and minimize biases and incorporate reflexivity into the data collection and analysis process. Reflexivity entails a researcher's examination of personal beliefs, biases, experiences, and practices that may influence certain decisions or choices during the research process and the impact on the research findings (Palaganas et al., 2018). To facilitate confirmability, I identified and highlighted all biases relating to my role as a researcher. I also kept audit trails and reflexive notes during the data collection and analysis process.

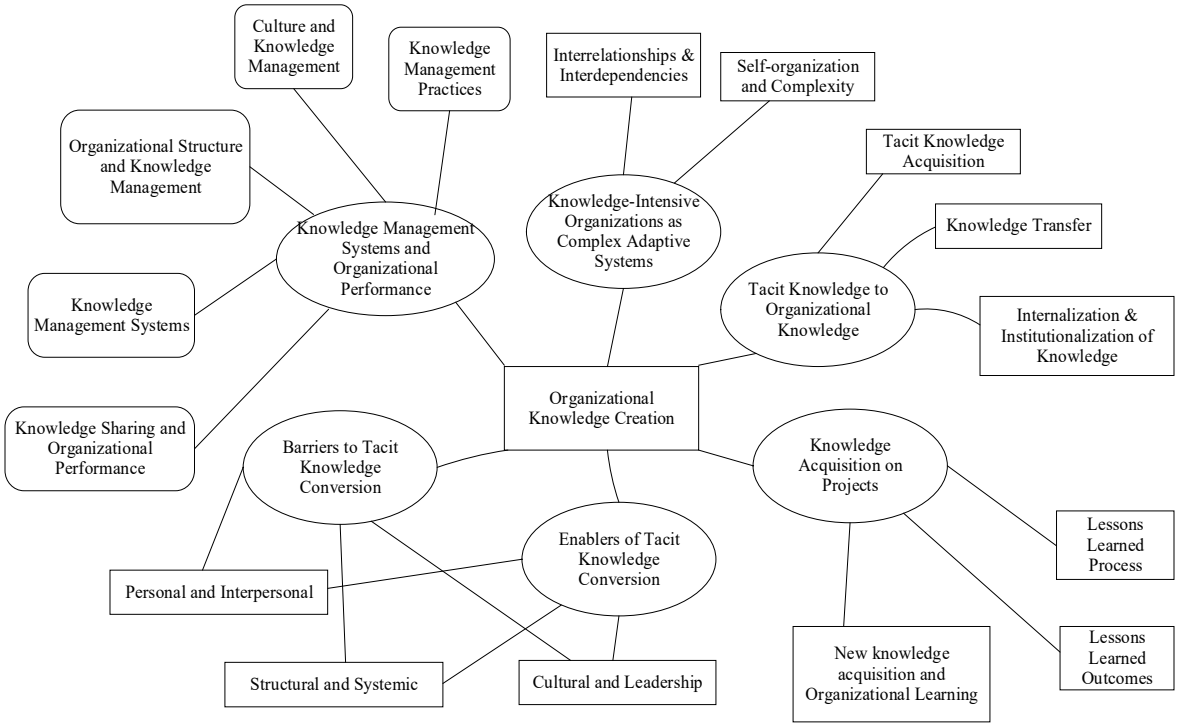
Results

The central research question for this study focused on the perspectives of engineering practitioners in the Nigerian oil and gas industry on the enablers and barriers to the conversion of tacit knowledge to organizational knowledge. The perspectives of the engineering practitioners encompassed, knowledge management systems and practices, enablers and barriers to tacit knowledge conversion, projects as tacit knowledge acquisition gateways, and knowledge-intensive organizations as complex adaptive systems. Figure 7 below shows the overall thematic network map highlighting the

relationships between the subthemes and organizing themes in relation to the central theme which encapsulates organizational knowledge creation.

Figure 7

Thematic Network Map



Organizational Knowledge Creation

Organizational knowledge creation emerged as the central theme from the thematic analysis process. Organizational knowledge creation is the systematic process by which tacit knowledge is continuously harnessed from knowledge workers, and then internalized, integrated, and institutionalized as part of the organizational knowledge base (Nonaka et al., 2006). The central theme emerged as a result of the relationships between the organizing themes. The organizing themes are knowledge management and

organizational performance, tacit knowledge to organizational knowledge, tacit knowledge conversion barriers, tacit knowledge conversion enablers, knowledge acquisition on projects, and knowledge-intensive organizations as complex adaptive systems. Each of the organizing themes and subthemes are further explained in details.

Knowledge Management and Organizational Performance

Responses from almost all the participants on the effect of knowledge management systems and practices in facilitating organizational performance were in the affirmative. These responses cut across their perspectives and experiences with regards to implementing knowledge management systems and practices, and the role organizational culture and structure play in knowledge management implementation. Participants also discussed the impact of knowledge sharing on organizational performance. However, most of the participants alluded to the fact that knowledge management systems were nonexistent, and knowledge management practices were inconsistent in their organizations. The table 2 below illustrates Theme 1: knowledge management and organizational performance.

Table 2

Theme 1: Knowledge Management and Organizational Performance

Subthemes	Codes	Participants
Knowledge Management Practices	• Unstructured KM practices	18
	• Inconsistent KM practices	18
	• Knowledge sharing	17
	• Lessons learned workshops,	17
	• On-the-job Training,	17
	• Document Management System	17
Knowledge Management Systems	• KM Systems Non-existent.	17
	• QMS facilitates KM implementation.	12
Culture and Knowledge Management	• Top Management commitment is critical,	16
	• Culture drives knowledge management	16
	• Lack of leadership commitment	13
	• Non-supporting organizational culture	13
Knowledge Sharing and Organizational Performance	• Improved organizational reputation	14
	• Increased revenue/bottom line	14
	• Enhances business continuity/sustainable growth	14
	• Enhances efficiency and productivity.	13
	• Improved workforce competence,	13
Organizational Structure and Knowledge Management	• Accountability and Responsibility,	14
	• Effective communication,	14
	• Unsupportive organizational structure	11

Knowledge Management Practices

Eighteen of the 22 participants mentioned that knowledge management practices in their organizations were either inconsistent or unstructured. Participant FME1614 said "I don't think knowledge management practices are being done well, maybe because it is just starting." Participant FCHE1620 noted that "What the organization is starting to do is to broaden everybody's mind and enlighten people on knowledge management, but they have not been consistent so far."

Seventeen of the 22 participants mentioned knowledge sharing, lessons learned workshops, on-the-job training, and document management system as knowledge management practices in their companies. Participant CHE1415 mentioned that "I share my knowledge with the project team and share project information and documents to support the knowledge." Participant CHE1415 said "We also carry out knowledge sharing sessions to break down any barrier that you know could come up, you know unknowingly, because we are interpreting information differently." Participant FPE98 stated that "For instance, one of the practices which we have here are basically the project lessons learned workshops and registers." Similarly, Participant CVE1730 said "After a project is completed, we organize what we call lessons learnt workshops, during project close out, where everybody discusses and documents project lessons which are applied to future projects."

Participant CVE1410 stated that "My organization has a document control system that archives all project information, including the challenges faced and how they were resolved." Participant CVE1410 added that "All these things should be documented and

there should be a system that when a new project comes up, you have a way of going back to your documented knowledge on the previous project." Participant ME1113 said "Within the team we have interns and younger engineers that participate in the process, by learning on the job thereby also participating in knowledge sharing."

Knowledge Management Systems

Seventeen of the 22 participants mentioned that knowledge management systems were nonexistent in their organizations. Twelve of the 22 participants were of the opinion that quality management systems can facilitate the effective implementation of knowledge management systems. Participant FPE98 said "In my own opinion apart from the lessons learnt session that we have after projects or during a milestone, knowledge management system does not exist." Participant QE812 noted that "Although we do not have a documented system on how knowledge should be managed, ISO standard for quality management has some components on how knowledge should be managed." Similarly, participant PE108 stated that "When you have good quality management system and if the provisions within the ISO 9001, which is the quality management system is implemented, these provisions facilitate knowledge management."

Culture and Knowledge Management

Sixteen of the 22 participants opined that organizational culture drives knowledge management implementation and that top management commitment is critical to the effective implementation of knowledge management systems and practices. Also, 13 out of the 22 participants stated that the culture in their organization does not support the effective implementation of knowledge management systems and practices. Similarly, 13

out of the 22 participants noted that there was lack of leadership commitment to the implementation of knowledge management systems and practices.

Participant CHE1318 said “I think organization culture is a key thing in ensuring that tacit knowledge is properly used in terms of being acquired or disseminated properly, so top management plays a key role by envisioning these things, they are the drivers of these things.” Participant CHE1415 stated that “within culture of the organizational system, knowledge management is not part of it.” Participant ME1620 mentioned that “decisions and policies from the top management do not support creative ideas that can move the organization forward.”

Knowledge Sharing and Organizational Performance

Fourteen of the 22 participants opined that knowledge sharing improves organizational reputation, enhances business continuity and sustainability, and increased profitability. Similarly, thirteen of the 22 participants mentioned that knowledge sharing enhances efficiency and productivity and improves the competence levels of the workforce. Participant CHE1318 said “Knowledge sharing brings efficiency and effectiveness into the system or into projects and by that, informed and accurate decisions can be made better.”

Participant ME1214 pointed out that “Knowledge sharing helps the organization’s performance and basically helps in the, I mean, overall positive outlook.” Participant CVE1730 mentioned that “Sharing of information and knowledge transfer goes a long way, it makes everybody competent and have a sense of belonging.” Participant PM1920

said “Knowledge sharing will ultimately lead to enhanced reputation, and in fact it will even lead to increased revenue because it draws attention.”

Organizational Structure and Knowledge Management

Fourteen of the 22 participants were of the opinion that supportive organizational structure facilitates accountability, responsibility, and effective communication. Eleven of the 22 participants also mentioned that their organizational structure does not support the effective implementation of knowledge management systems and practices. Participant CVE1410 said “Most organizations are not structured to handle knowledge management.” Participant FME1614 noted that “There are organizational structures that hierarchical and the ones that are a flat structure, but whatever the case, structure is key because it tells who is responsible and who is accountable.”

Tacit Knowledge to Organizational Knowledge

All the participants provided their perspectives on the process through which tacit knowledge is converted to organizational knowledge. Their perspective included harnessing tacit knowledge from knowledge workers, internalizing the acquired knowledge, and integrating the knowledge into the organizational knowledge base. Table 3 below illustrates Theme 2, tacit knowledge to organizational knowledge.

Table 3

Theme 2 - Tacit Knowledge to Organizational Knowledge

Subthemes	Codes	Participants
Internalization & Institutionalization of Knowledge	• Knowledge retention strategies	14
	• Knowledge management infrastructure	14
	• Personalized knowledge and experience	14
Tacit Knowledge Acquisition	• Socialization	13
	• Understudy	13
	• Knowledge capture on projects	13
Knowledge Transfer	• Mentor-mentee relationships,	13
	• Empowerment and Encouragement	13
	• Enabling environment	13
	• Knowledge sharing	12
	• Knowledge codification	12
	• Knowledge utilization	12

Internalization and Institutionalization of Knowledge

Fourteen of the 22 participants mentioned that knowledge retention strategies, and knowledge management infrastructure are critical to the internalization and institutionalization of tacit knowledge in organizations. Participant PE1115 pointed out that "There must be available infrastructure for knowledge acquisition, knowledge transfer, knowledge retention in an organization." Participant PE108 stated that "If there are proper knowledge and employee retention strategy, not that at the end of every project people are dismissed, one will be able to retain knowledge within the organization, this will also enhance the overall knowledge retention strategy."

Tacit Knowledge Acquisition

Fourteen of the 22 participants mentioned that tacit knowledge is personalized knowledge which is often instinctive and gotten from experience. Thirteen of the 22 participants identified socialization, understudy, and knowledge capture on projects as ways by which tacit knowledge can be acquired. Participant ME1113 said "If you look at the Local Content Act that is in effect in the country, this is the essence, you bring in expats on projects and attach locals to understudy them and acquire knowledge." Participant EM1422 said "I believe that tacit knowledge gained by experience." PM1920 stated that "Tacit knowledge is knowledge that exist within an individual."

Knowledge Transfer

Thirteen out of the 22 participants pointed out that encouragement and empowerment, enabling environment, and mentor-mentee relationships facilitate knowledge transfer. Twelve of the 22 participants opined that knowledge sharing, knowledge codification, and knowledge utilization are the processes through which knowledge is transferred within their organizations. Participant EM1614 said "I believe if you make a conducive environment for workers, this can facilitate the transfer of knowledge." Participant CHE1415 noted that "A scheme or system of a mentor to mentee relationship must be encouraged within the organization." Participant PM1720 said that "Our GM here has an open-door policy that encourages people to speak out, come face to face and then air your view."

Tacit Knowledge Conversion Barriers

Participants discussed their perspectives on the barriers to tacit knowledge conversion to organizational knowledge. The barriers were grouped into personal and interpersonal barriers, structural and systemic barriers, and cultural and leadership barriers. These barriers are summarized in Table 4 below.

Table 4

Theme 3: Tacit Knowledge Conversion Barriers

Subthemes	Codes	Participants
Personal and Interpersonal	• Lack of training and professional development	15
	• Lack of collaboration	15
	• Unhealthy internal competition	15
	• Job Insecurity	14
	• Unwillingness to share	14
	• Lack of Trust	14
Structural and Systemic	• Non-existent knowledge management system	16
	• Inappropriate organizational structure	16
	• Inadequate use of technology	14
	• Inadequate information management infrastructure	14
Cultural and Leadership	• Lack of management commitment	15
	• Unsupportive organizational culture	15
	• Ineffective leadership style	15
	• Lack of Motivation	15
	• Casualization of labor	14
	• Lack of Succession planning	14
	• High employee turnover.	14
	• Unfair/imbalanced remuneration structure	13
	• Lack of time	12
	• Lack of Project opportunities	12

Personal and Interpersonal Barriers

Personal and interpersonal barriers are associated with individual knowledge workers and in relation to other knowledge workers. Fifteen of the 22 participants identified lack of training and professional development, lack of collaboration, and unhealthy internal competition as barriers to tacit knowledge conversion. Fourteen of the 22 participants mentioned job insecurity, unwillingness to share, and lack of trust as barriers to tacit knowledge conversion.

Participant PM1720 said "You find out that some employees are hoarding knowledge." Participant ME1113 mentioned that "Basically, this barrier stems from job insecurity and people spend so much time trying to impress the leadership rather doing what is best for the system." Participant EM1614 stated that "Sometimes when they do not understand the importance of your input, you can hold back knowledge because you are not comfortable with what the management is doing and there is no trust."

Participant QE812 noted that "People do not want other people to know the things they know, probably it may be a personality thing." Participant PM1920 mentioned that "The barriers that I see here for transfer of knowledge is, I still dare say, is internal competition between teams and people." Participant PE810 said "From the top of my head, I mean I think I can think of two right now, first would be lack of training, training and retraining is required for anybody to acquire knowledge."

Structural and Systemic Barriers

Structural and systemic barriers are associated with organizational structures, systems, and processes. Sixteen of the 22 participants identified non-existent knowledge management system and inappropriate organizational structure as barriers to tacit knowledge conversion. Fourteen of the 22 participants identified inadequate use of technology and inadequate information management infrastructure as barriers to tacit knowledge conversion.

Participant QE812 stated that "You know I spoke about how technology is used in my organization, some people are not familiar with technology." Participant SE1315 stated that "My Company doesn't invest in knowledge and data storage infrastructure, through the information technology department, it is difficult to retain knowledge." Participant CHE1415 mentioned that "When technology is not embraced, it will hinder retention of knowledge." Participant PE108 said "These barriers are caused by the fact that knowledge management system does not exist and there is no proper system for knowledge documentation and retention." Participant CVE1410 pointed out that "Most organizations are not structured to handle knowledge management."

Cultural and Leadership Barriers

Cultural and leadership barriers are associated with inherent cultural and leadership issues in organizations. Fifteen of the 22 participants mentioned lack of management commitment, Unsupportive organizational culture, ineffective leadership style, and lack of motivation as barriers associated with organizational culture and leadership. Fourteen of the 22 participants identified casualization of labor, lack of

succession planning, and high employee turnover as leadership barriers. Thirteen of the 22 participants mentioned imbalanced remuneration structure as one of the cultural barriers to tacit knowledge conversion. Twelve of the 22 participants mentioned lack of time and lack of project opportunities as barriers to tacit knowledge conversion.

Participant PE108 stated that "There is no management commitment to knowledge retention, people come in and people go." Participant CHE1415 said "High turnover of staff hinders retention of knowledge because your knowledge investment in that individual, in that employee is gone, and that will introduce a whole lot of other barriers." Participant PM1920 said "Barriers within my organization as at today will be one the people, two is the culture." Participant ME1113 mentioned that "Most times barriers have to do with the leadership style."

Participant CVE1410 said "The first challenge is how to ensure availability of projects. When there are no projects, you really don't have those opportunities for learning and knowledge acquisition." Participant FME1614 said "My organization just does short term contracts; they employ people who just do their work and go. They don't have many long-term employments with succession planning in view." Participant PE108 pointed out that "In the case of project-based company like mine, where personnel come in and go out at any point in time, such arrangement has an adverse impact on knowledge acquisition."

Tacit Knowledge Conversion Enablers

Participants discussed their perspectives on the enablers of tacit knowledge conversion. The enablers were group into personal and interpersonal, structural, and

systemic, and cultural and systemic enablers. Table 5 below illustrates theme 4, enablers of tacit knowledge conversion.

Table 5

Theme 4: Tacit Knowledge Conversion Enablers

Subthemes	Codes	Participants
Personal and Interpersonal	• Mentor-mentee relationships	16
	• Membership of Professional Associations	16
	• Socializing and social media	13
Structural and Systemic	• Effective knowledge management systems	15
	• Leveraging on technology	15
	• Information management Infrastructure	15
Cultural and Leadership	• Reward and Recognition	17
	• Provision of incentives	17
	• Good Remuneration	17
	• Good Employee Retention Strategy	17
	• Enabling environment,	15
	• Investment in Human Capacity development	15
	• Encouragement, Empowerment.	15
	• Top Management Commitment	15
	• Proper employee onboarding	15
	• Providing project opportunities	15
	• Succession planning	15

Personal and Interpersonal Enablers

Personal and interpersonal enablers are either associated with individual knowledge in relation to other knowledge workers. Sixteen of the 22 participants identified mentor-mentee relationships and membership of professional associations as enablers of tacit knowledge conversion. Thirteen of the 22 participants mentioned socializing and social media as tacit knowledge conversion enablers. Participant CVE1410 stated that "If we can leverage on social media, I think it will help with knowledge transfer, especially for the millennial." Participant CHE1415 said "Being a part of professional associations, is also an enabler. As a member of the project management institute, I receive their newsletters and resources materials from time to time which helps to update my knowledge." Participant ME1620 noted that "If you want to transfer or acquire knowledge, mentor and mentee relationship must be in place for such a thing to happen."

Structural and Systemic Enablers

Structural and systemic enablers are either associated with organizational structures and systems. Fifteen of the 22 participants identified effective knowledge management systems, leveraging on technology, and information management infrastructure as enablers of tacit knowledge conversion. Participant QE812 stated that "The use of technology is one way we can facilitate knowledge retention and there needs to be a lot of awareness about this." Participant said ME1214 "There should be an ISO compliant knowledge management system in place, where information is managed and are being stored centrally on a server, so that people can have access to information."

Participant PE1115 stated that “Another enabler is having the right infrastructure in place or facilities on ground to receive and transfer knowledge.”

Cultural and Leadership Enablers

Cultural and leadership enablers are associated with organizational culture and leadership. Seventeen of the 22 participants mentioned reward and recognition, provision of incentives, good remuneration and good employee retention strategy as enablers of tacit knowledge conversion. Fifteen of the 22 participants identified enabling environment, investment in human capacity development, encouragement, empowerment, and top management commitment as tacit knowledge conversion enablers. Fifteen of the 22 participants identified proper employee onboarding, providing project opportunities, and succession planning as enablers of tacit knowledge conversion.

Participant QE812 said “There needs to be succession planning which will ensure that whatever knowledge is acquired is passed down to the subordinate, this will facilitate deliberate transfer of knowledge.” Participant PE108 pointed out that “One enabler is having a good knowledge management system.” Participant CHE1415 said “When you create a system that encourages human capacity development, it facilitates knowledge acquisition, I have seen that happening in my organization.” Participant PM1720 said “If the environment is made to be convenient and comfortable, of which you have that kind of environment whereby people are at peace with each, it can facilitate knowledge transfer.”

Participant EM2025 noted that “Some of the enablers are a good working condition and incentives.” Participant PE810 mentioned that “Putting in place some

motivational or recognition strategies in to reward contribution to knowledge management initiatives." Participant PE1115 pointed out that "Good employee retention strategy can facilitate knowledge retention." Participant ME1214 said "First and foremost, onboarding is very important for every employee or personnel that is coming into an organization, because that is the very first point of knowledge sharing." Participant SE1315 noted that "Total commitment from top management is important to ensure that knowledge is being transferred and retained." Participant QE812 pointed out that "One way to encourage people is good and decent remuneration."

Knowledge Acquisition on Projects

Participants discussed their perspectives on how knowledge can be acquired on projects and internalized as part of the organization's knowledge base. Participants described the lessons learned processes and outcomes in their respective organizations. They also shared their experiences and opinion on how projects facilitate organizational learning. Table 6 below illustrates Theme 5, knowledge acquisition on projects.

Table 6

Theme 5: Knowledge Acquisition on Projects

Sub-Themes	Codes	Participants
New knowledge acquisition and Organizational Learning	• Organizational learning	17
	• Tacit knowledge acquisition	15
	• Project-based learning	15
Lessons Learned Process	• Lessons learned workshops	16
	• Knowledge sharing sessions	16
Lessons Learned Outcomes	• Improved knowledge base	15
	• Continuous improvement	15

New knowledge acquisition and Organizational Learning

Seventeen of the 22 participants opined that project facilitate organizational learning. Fifteen of the 22 participants mentioned that projects offer opportunities for tacit knowledge acquisition. Fifteen of the 22 participants mentioned that projects provide project-based learning opportunities. Participant PE810 mentioned that "I have gained new knowledge and experiences by virtue of working on different projects." Participant PE108 said "My Company is a project-based company and it's also a contracting company as well." Participant FCHE1620 noted that "A method should also be developed to see how we can transfer experiences and knowledge that has been gained over the years on projects into becoming a part of the organization."

Lessons Learned Process

Almost all the participants mentioned that lessons learned process on projects is a common in their respective organizations. Sixteen of the 22 participants identified lessons learned workshops and knowledge sharing sessions as critical aspects of the lessons learned process. Participant FME1614 pointed out that "In my current role, lessons learned process are done as part of the knowledge sharing sessions." Participant ME1420 stated that "Most projects require that we do a lessons learned workshop at the end of the project."

Lessons Learned Outcomes

Fifteen of the 22 participants identified improved knowledge base and continuous improvement as outcomes of the lessons learned process in their respective organizations. Participant EM1422 said "Lessons learned is a key element in any project, and it has to be properly documented as it is part of the continuous improvement process." Participant CHE1415 noted that "Once the lessons learned process is completed, we archive it into the knowledge database of the organization which resides with the document control department."

Knowledge-Intensive Organizations as Complex Adaptive Systems

Participants described several characteristics of their organizations that are similar to complex adaptive organizations. Some of the characteristics included interrelationships, interdependencies, self-organization, and complexity. Table 7 below illustrates theme 6, knowledge-intensive organizations as complex adaptive systems.

Table 7

Theme 6: Knowledge-Intensive Organizations as Complex Adaptive Systems

Sub-themes	Codes	Participants
Interrelationships and Interdependencies	• Interdependent and interrelated departments	20
	• Cross-functional teams	20
	• Collaboration and teamwork	18
	• Cordial relationships and communication	18
Self-organization and Complexity	• Matrix organizational structure	15
	• Self-organizing teams	15

Interrelationships and Interdependencies

Twenty of the 22 participants mentioned that departments within their organizations were interrelated and interdependent. Similarly, twenty of the 22 participants noted that departments within their organizations work as cross-functional teams. Eighteen of the 22 participants identified collaboration, teamwork, cordial relationships, and communication as evidence of interrelationships and interdependencies within their organizations.

Participant PM1720 mentioned that "We interface with different units and require inputs from different departments within the company while working on projects." Participant PE1115 pointed out that "All the engineering disciplines involved in a project come together to agree on our next input and agree on how they want a facility to be set up." Participant PM1920 said "For example, when I need to put together an office

infrastructure for my project, I will need to communicate with the admin department and let them understand it is a requirement."

Self-organization and Complexity

Fifteen of the 22 participants mentioned that their organization run a matrix organizational structure with teams self-organizing based on project or operational requirements. Participant SE1315 said "When the project organizational chart comes out, everyone has a role to play, and people are mobilized to the project from departments in the company based on their expertise." Participant PM1516 noted that "In a nutshell, I supervise a multidiscipline team of engineers working together towards project delivery and success." Participant CVE1730 said "When issues come up on projects, project team members consisting of engineers from different discipline self-organize to brainstorm on the best approach to tackle such issues."

Discrepant Cases

Participant FPE98 posited that tacit knowledge cannot be acquired from knowledge workers and stated that "In my opinion, it is impossible to harness tacit knowledge." Only one participant expressed the opinion that tacit knowledge cannot be acquired. The closest statement to this position was by participant FME1614 who stated that "not all tacit knowledge is useful." The participant explained that the onus is on the knowledge worker, and by extension the organization, to decipher which tacit knowledge is "useful" and harness accordingly for the benefit of the organization.

Similarly, Participant PE108 posited that project-based organizations are not able to acquire tacit knowledge. Participant PE108 stated that "Project-based organizations are

not set-up for tacit knowledge acquisition." Also, participant FME1614 was of the opinion that standardization of work processes is a barrier to tacit knowledge conversion. Furthermore, there were several discrepancies in some of the responses from participant PE1115 regarding questions on to knowledge management systems and practices. For instance, while most participant described knowledge management systems in their respective organizations as "non-existent", "inconsistent," and "unstructured", participant PE1115 described knowledge management system in his organization as "enviable," "something everybody will really want to have." Furthermore, participant PE115 said "The organizational culture is what I will describe as all-inclusive, a diversity inclusive culture, one that encourages an open-door policy that is open to suggestions." This is in contrasts to the assertions from most of the other participants who described their organizational culture as "Unsupportive" towards the implementation knowledge management systems and practices.

An important observation is that this discrepancy may be related to the fact that the participant's PE1115 Company has fully functional and well implemented knowledge management system. Participant's PE1115 is a subsidiary of a multinational company and they have been able to leverage on the knowledge management systems and practices of their parent company. Though these discrepant cases were not corroborated by other participants, they were coded and categorized as part of themes emanating from the data. The discrepant cases have also been incorporated into the analysis and subsequent discussions. Given the scope of the study, these discrepant cases could not be confirmed. The discrepant cases however offer an opportunity for future studies.

Summary

In this chapter, I discussed the analysis of the data collected and highlighted the relevant themes including discrepant cases. I also presented the results of the findings to the central research question on the enablers and barriers to tacit knowledge conversion in engineering companies within the Nigerian oil and gas industry. Findings from the study show that effective knowledge management is critical to the performance of engineering companies in the Nigerian oil and gas industry. For organizations to optimize their knowledge potential, through the continual conversion of tacit knowledge to organizational knowledge, they must put in place enablers that will facilitate the acquisition, transfer, and retention of knowledge resources.

I found that there are inherent personal, interpersonal, systemic, structural, cultural, and leadership barriers that hinder tacit knowledge conversion. These barriers include lack training and professional development, lack of collaboration, lack of motivation, lack of trust, job insecurity, unhealthy internal competition, unwillingness to share knowledge, inadequate use of technology, and inadequate information management infrastructure. Other barriers identified are unsupportive organizational culture, lack of project opportunities, lack of management commitment, unsupportive organizational structure, ineffective leadership style, casualization of labor, lack of succession planning, and high employee turnover. The most significant barriers, based on participants' responses, were nonexistent knowledge management systems and inconsistent knowledge management practices.

The participants discussed some of the enablers that can replace these barriers, thereby unlocking knowledge potentials in organizations. These enablers include mentor-mentee relationships, membership of professional associations, leveraging on social media, effective knowledge management systems, information management infrastructure, enabling environment, investment in human capacity development and top management commitment. Other enablers were reward and recognition, provision, onboarding competent workforce, succession planning, and providing project opportunities. The most significant enablers, based on responses from participants, were good knowledge and employee retention strategies, top management commitment, and creating an enabling environment.

In the next chapter, I will interpret the findings within the context of the conceptual framework and body of knowledge discussed in the literature review. I will emphasize the enablers and barriers to tacit knowledge conversion and make recommendations on how the barriers can be overcome by engineering companies in the Nigerian oil and gas industry. I will discuss the study limitations and highlight recommendations for further research. I will also highlight implications for positive social change and other methodological, theoretical, and practical implications. I will conclude that chapter with strong take-home messages that sums up the essence of the study.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this study was to understand the enablers and barriers to tacit knowledge conversion in engineering companies as perceived by engineering practitioners working in the Nigerian oil and gas industry. In the few previous studies that have investigated knowledge sharing barriers in developing countries (e.g., Akgun et al., 2017; Ejeh & Hall, 2018; Owusu-Manu et al., 2018; Xu et al., 2018), and specifically Nigeria (e.g., Oluikpe, 2015; Omotayo & Babalola, 2016), the researchers placed emphasis on the need for organizations to identify and remove barriers to knowledge sharing. However, the process of effective tacit knowledge conversion goes beyond just removing barriers to knowledge sharing.

The holistic process of tacit knowledge conversion encompasses knowledge acquisition, sharing, dissemination, utilization, and retention (Costa & Monteiro, 2016; Masadeh et al., 2019). Developing an understanding of the perceived enabling factors and barriers for tacit knowledge conversion from the perspectives of knowledge workers could influence knowledge management practices in the Nigerian oil and gas industry.

In this study, I employed a qualitative, case study design. Case studies are often used when the purpose of the research is to focus on a unique group of people or to explore a phenomenon within a specific context (Hancock & Algozzine, 2017; Yin, 2018). Qualitative case studies are used to make an in-depth inquiry into a phenomenon within a specific, real-life context (Yin, 2018). Therefore, the qualitative case study design was most appropriate for this study because it aligned with the research purpose.

To collect data for this study, I conducted virtual, one-on-one, semistructured interviews with the participants.

The main findings from the study were that (a) most Nigerian engineering companies are not culturally and structurally set-up in a way that facilitates the conversion of tacit knowledge to organizational knowledge; (b) knowledge management systems are nonexistent in most engineering companies; (c) knowledge management practices are unstructured and inconsistent; (d) projects offer unique opportunities for new knowledge acquisition and organizational learning; (e) there are inherent personal, interpersonal, systemic, structural, cultural, and leadership barriers that hinder tacit knowledge conversion; (f) there are personal, interpersonal, systemic, structural, cultural, and leadership enabling factors that can facilitate tacit knowledge conversion; and (g) implementing effective knowledge management strategies facilitates organizational performance and competitive advantage.

Interpretation of Findings

Findings from this study show that Nigerian engineering companies in the oil and gas industry are not optimizing their knowledge resources by continually converting tacit knowledge to organizational knowledge. Most of the engineering practitioners that participated in the study opined that knowledge management systems were nonexistent and that knowledge management practices were unstructured and inconsistent in their organizations. These findings confirmed the results of previous studies that indicated that effective knowledge management through the conversion of tacit knowledge to organizational knowledge is not a common practice in Nigeria (see Oluikpe, 2015;

Omotayo & Babalola, 2016). The current study results also confirmed the findings of Ejeh and Hall (2018) and Ibidunni (2020) who posited that many Nigerian companies have not made sufficient efforts towards implementing effective knowledge management initiatives.

Findings from this study also confirmed that some Nigerian companies are not able to fully optimize their knowledge potential and compete effectively with their global counterparts (see Ochieng et al., 2018; Ugochukwu & Onyekwena, 2016). Previous studies reported that Nigerian companies remain nonchalant in their commitments towards implementing holistic knowledge management systems and practices (Ejeh & Hall, 2018; Ibidunni, 2020; Ochieng et al., 2018).

Barriers to Tacit Knowledge Conversion

Engineering practitioners that participated in this study identified several barriers that hinder the ability of engineering companies in the Nigerian oil and gas industry to convert tacit knowledge to organizational knowledge. This finding was consistent with previous researchers who posited that barriers exist that may impede the ability of Nigerian companies to share knowledge (see Awodoyin et al., 2016; Lawal et al., 2017). As a result of these barriers, knowledge-intensive companies in Nigeria are not able to fully harness their knowledge potential to drive organizational knowledge creation, innovation, and competitiveness (see Chete et al., 2017; Ugochukwu & Onyekwena, 2016). Engineering companies in Nigeria, as knowledge-intensive companies, are therefore limited in their ability to optimize knowledge resources.

Previous studies showed that the unwillingness to share knowledge and lack of absorptive capability were barriers to effective knowledge management (Akgun et al., 2017). Similarly, Arrau (2016) posited that paternalism and social inequality in the workplace are major barriers to knowledge sharing. Other barriers to knowledge sharing include cultural misalignment and diversity (Lievre & Tang, 2016; Owusu-Manu et al., 2018; Xu et al., 2018). In Nigeria, lack of motivation and incentives for sharing knowledge (see Omotayo & Babalola, 2016) and inappropriate organizational culture and structures (see Oluikpe, 2015) were also identified as some of the barriers to knowledge sharing.

I categorized the barriers to tacit knowledge conversion that emerged in this study as personal and interpersonal, systemic and structural, and cultural and leadership. Previous studies showed that personal barriers include unwillingness to share knowledge; biased mindset; lack of motivation, trust, and enthusiasm; and disempowerment and nonautonomy (Akgun et al., 2017; Chugh, 2017; Omotayo & Babalola, 2016). Several of the participants confirmed that lack of trust, unwillingness to share, lack of motivation, and lack of training as part of the personal and interpersonal barriers. Participants also identified unhealthy internal competition and job insecurity as barriers that were categorized under personal and interpersonal barriers. There was also evidence from the findings to suggest that the barriers related to unhealthy internal competition may have been as a result of job insecurity and other job-related uncertainties. The issue of job insecurity reflects the economic situation in Nigeria, which was identified as a limitation

to knowledge sharing in most Nigerian organizations (see Awodoyin et al., 2016; Oluikpe, 2015).

Similarly, previous studies showed that inappropriate organizational culture and structures and inadequate processes and systems are organizational barriers to knowledge sharing in developing economies (Chugh, 2017; Lievre & Tang, 2016). Xiaofang and Lihua (2018) also identified fear of retribution, red-tape syndrome, and dystechnia as barriers related to organizational structures. Most of the participants confirmed that inadequate use of technology, inadequate information management infrastructure, nonexistent knowledge management systems, unsupportive organizational structure, and ineffective leadership style are barriers to tacit knowledge conversion at the structural and systemic level. A point of convergence between previous studies and the findings of this study is that knowledge and information management systems and infrastructure are critical to tacit knowledge conversion.

Arrau (2016) posited that societal and environmental barriers to knowledge management are paternalism, corporate amentia, lack of absorptive capacity, and social inequality. Findings from the current study extended the findings of previous studies by identifying casualization of labor, lack of succession planning, high employee turnover, imbalanced remuneration, unsupportive organizational culture, use of ineffective leadership styles, and lack of motivation as contextual cultural and leadership barriers to tacit knowledge conversion. Participants opined that the casualization of labor, high employee turnover, and imbalanced remuneration reflect the socioeconomic situation in Nigeria. This finding was consistent with the position of Bamgboje-Ayodele and Ellis

(2015) that the high turnover rate of knowledge workers, as a result of adverse socioeconomic factors, is common in Nigerian organizations. High employee turnover and the casualization of labor could result in corporate amnesia and the loss of valuable knowledge.

Enablers of Tacit Knowledge Conversion

While no existing study has focused on the enabling factors of tacit knowledge conversion or knowledge sharing within the context of Nigerian companies, previous researchers have generally identified enabling factors of knowledge management in organizations. For instance, Dang et al. (2018) posited that effective leadership, decentralization of knowledge sources, collaboration, trust, provision of incentives, appropriate use technology, and openness in communication are knowledge enablers. Findings from the current study confirmed empowerment, provision of incentives, and the leveraging of technology as enablers of tacit knowledge conversion.

Ramjeawon and Rowley (2020) identified knowledge self-efficacy, top management support, reciprocal benefits, supportive organizational culture, effective knowledge management infrastructure, and encouragement of face-to-face interactions as enabling factors of knowledge management practices in organizations. Findings from my study indicated that top management commitment, information management infrastructure, encouragement, reward and recognition, and supportive organizational culture as enablers of tacit knowledge conversion. Goswami and Agrawal (2020) and Owusu-Manu et al. (2018) identified good leadership, knowledge self-efficacy, shared goals, and training and as enablers of organizational knowledge creation, while. My study

findings confirmed that effective leadership, investment in human capacity development, and onboarding competent workforce are enablers of tacit knowledge conversion to organizational knowledge.

The importance of social media and knowledge socialization as an enabler of tacit knowledge conversion was highlighted by the results of this study. This corroborated previous study findings that social media has ushered unconventional means for both tacit and explicit knowledge acquisition and conversion (Leonardi, 2017; Sun et al., 2019). According to Irum and Pandey (2020), social media platforms serve as sources of tacit knowledge and offer the opportunity for knowledge workers to collaborate and capture tacit knowledge. Kane (2017) posited that knowledge socialization offers opportunities for the initiation of knowledge sharing conversations that facilitate the conversion of tacit knowledge to explicit knowledge. Social media and knowledge socialization could be used as an enabler to facilitate knowledge acquisition and knowledge transfer.

Twelve of the participants suggested that quality management systems could be an enabling factor for the implementation of effective knowledge management systems and practices. International Organization for Standardization (2015) specified the requirements for quality management systems and has a section that relates to organizational knowledge. Clause 7.1.6 of the standard highlights the requirements for organizational knowledge and emphasizes the need for organizations to identify, acquire, and retain knowledge for operation of its processes (International Organization for Standardization, 2015).

Criado-García et al. (2020) established the importance of synergies between quality management systems and knowledge management systems and posited that through integrating both systems, organizations are provided with dynamic capabilities and competitive advantages. Findings from my study suggest that implementing a robust quality management system, in line with the ISO 9001 standard, can serve as the foundation on which knowledge management can be built. In other words, engineering companies that already have quality management systems in place can leverage this to implement knowledge management systems.

The findings from my study extended those in the existing literature on knowledge enablers by identifying additional contextual enablers of tacit knowledge conversion. For instance, participants identified succession planning, good remuneration, and good employee retention strategies as enablers of tacit knowledge conversion. These contextual enablers could help to reduce the high employee turnover discussed by Bamgboje-Ayodele and Ellis (2015). Good renumeration will enhance employee motivation and commitment to knowledge acquisition and transfer, while succession planning and employee retention strategies will facilitate knowledge retention.

Knowledge-Intensive Organizations as Complex Adaptive Systems

Study findings confirmed that knowledge-intensive organizations are complex adaptive systems and are characterized by interrelationships, interdependencies, agility, self-organization, and complexity. The complex adaptive system framework encompasses the concepts of complexity, self-organization, adaptation, and emergence (Abbott & Hadzikadic, 2017). Findings from my study showed that attributes, such as

interdependencies, self-organization, teamwork, and interrelationships enhance the agility required for the conversion of tacit knowledge to organizational knowledge. This finding confirmed the position of Heisig et al. (2016), who stated that knowledge management gives an organization the agility to respond to the ever-changing internal and external environment. This agility lies in the adaptability, dynamic capabilities, and learning abilities of the knowledge workers within the organization (Rovik, 2016).

Sweetman and Conboy (2018) established that knowledge-intensive organizations are complex adaptive systems consisting of empowered and self-organizing individuals and teams. Jorge (2021) found that knowledge-intensive organizations that operate as complex adaptive systems better maximize their knowledge management capabilities and respond better to an ever-changing environment. Dynamic capabilities, driven by the agility and ability to self-organize, are an essential attribute of complex adaptive organizations (Jorge, 2021). My findings confirmed that engineering companies in the Nigerian oil and gas industry are complex adaptive systems. Engineering practitioners reported that teams in their companies continually self-organize to adapt to project and operational requirements. The findings of my study emphasized the importance of interdependencies, cordial relationships, interrelationships, and collaboration as facilitators of self-organization, agility, and dynamic capabilities.

Turner and Baker (2019) posited that the continuous sharing of information and knowledge within the internal and external environments enhances self-organization. Findings from my confirmed that cross-functional teams in engineering companies are interdependent and are able to self-organize through effective communication and

information-sharing channels. Knowledge-intensive organizations rely on continuous interactions and dynamic capabilities to deal with internal and external influences.

Knowledge Acquisition on Projects

Michell and McKenzie (2017) posited that projects are one of the gates through which tacit knowledge is acquired, shared, and retained. The current study findings show that the lack of project opportunities is a barrier to tacit knowledge acquisition. This finding confirms those of Michell and McKenzie (2017) that the lack of project opportunities hinders the ability of an organization to acquire tacit knowledge for organizational knowledge creation.

The findings of the current study indicated that projects offer opportunities for tacit knowledge conversion and organizational learning. The lessons learned process on projects is geared towards new knowledge acquisition and organizational learning. This lessons learned process also facilitates continuous improvement and improves the organizational knowledge base. This finding is consistent with the research of Eken et al. (2020) who posited that the lessons learned framework deployed on projects is one of the most widely used organizational learning tools. Similarly, Herbst (2017) argued that the lessons learned process results in the identification and acquisition of new knowledge and facilitates knowledge sharing.

Lindgren et al. (2018) posited that projects are sources of new knowledge acquisition because the interactions of project members, usually from diverse fields, often result in the transfer of knowledge. Project-based companies capture new knowledge on projects and integrate this tacit knowledge into the organizational knowledge base

(Oluikpe, 2015). Organizational learning developed through the lessons learned process helps to improve corporate memory.

Knowledge Management and Organizational Performance

Several studies have emphasized the positive effect of knowledge management on organizational performance. For instance, Ibidunni (2020) investigated the effect of organizational knowledge on performance and concluded that the ability to convert tacit knowledge to organizational knowledge is critical to achieving higher levels of organizational performance. Youssef et al. (2017) found that knowledge sharing has a positive impact on the competitiveness of an organization. Findings from the current study confirmed that the effective implementation of knowledge management systems and practices has a positive effect on organizational performance.

Wahda (2017) stated that establishing an organizational learning culture is critical for knowledge management implementation. Current study findings confirmed that organizational culture drives knowledge management implementation and that securing commitment from top management is a critical success factor. Iyamah and Ohiorenoya (2015) posited that knowledge sharing improves the financial performance, process efficiency, supplier support, and organizational output of Nigerian companies. Most of the participants confirmed that knowledge management enhances productivity, improves organizational reputation and workforce competence, increases profitability, and facilitates business continuity and sustainable growth.

However, findings from the current study also show that the organizational structure and culture in Nigerian engineering companies do not support knowledge

management, and this has a negative effect on performance and competitiveness. Several participants described their organizational culture as unsupportive of the implementation of knowledge management systems and practices. This finding is consistent with the results of Bamgboje-Ayodele and Ellis (2015) who described the implementation of knowledge management within the organizational culture of Nigerian companies as trying to fit a round peg in a square hole. My study confirms a misalignment between the organizational culture in Nigerian companies and tenets of knowledge management systems and practices.

Integrated SECI and 4I Conceptual Framework

The integrated conceptual framework for this study was the focal point for data collection and analysis as well as my interpretation of the findings. The integrated SECI and 4I conceptual framework provided me with the lens for exploring the enablers and barriers to tacit knowledge conversion. The combination of both conceptual perspectives within the framework of organizational knowledge creation and organizational learning (Shahzad et al., 2016; Torres et al., 2020) provided a multidimensional view through which to gain insights into tacit knowledge conversion. I used the integrated framework to establish the various phases of tacit knowledge conversion and identify barriers to tacit knowledge conversion at each of the phases. The framework was also used to identify enabling factors that could facilitate the conversion of tacit knowledge to organizational knowledge.

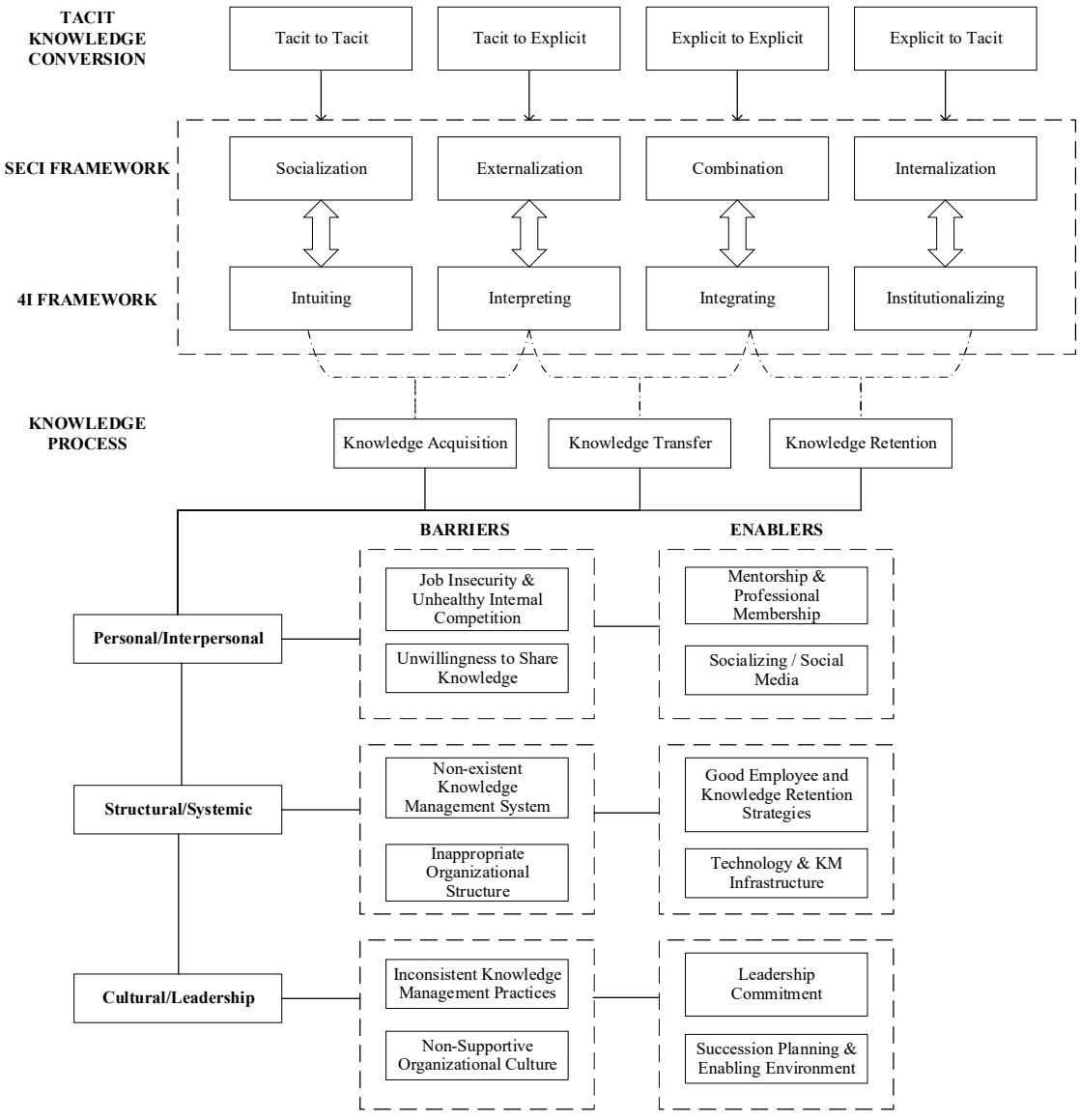
I also used the integrated framework to establish knowledge conversion gates in between the phases of the tacit knowledge conversion process: knowledge acquisition,

knowledge transfer, and knowledge retention. Knowledge acquisition takes place at the intersection between the socialization and externalization (Dahou et al., 2018; Hubers et al., 2016) and intuiting and interpreting (Grah et al., 2016; Mahmood et al., 2019) phases of the SECI and 4I processes, respectively. Knowledge transfer takes place at the intersection between the externalization and combination phases (Alonso & Alexander, 2017; Balde et al., 2018) and the intersection between the interpreting and integrating (Michell & McKenzie, 2017) phases of the SECI and 4I processes. Knowledge retention takes place at the intersection between the combination and internalization (Shahzad et al., 2016; Torres et al., 2020) and integrating and institutionalization (Limba et al., 2019) phases of the SECI and 4I frameworks. The knowledge acquisition, knowledge transfer, and knowledge retention gates are critical to tacit knowledge conversion process.

Current study findings showed that there are barriers at each of the knowledge acquisition, knowledge transfer, and knowledge retention stages of the tacit knowledge conversion process. I categorized these barriers into personal and interpersonal barriers, structural and systemic barriers, and cultural and leadership barriers. These barriers are mostly inherent in the organizations as a result of nonexistent knowledge management systems and deficient knowledge management practices. Removing these barriers and introducing enablers will, therefore, facilitate the process of tacit knowledge conversion. Figure 8 displays how I used the integrated framework to identify enablers and barriers to tacit knowledge conversion in engineering companies in the Nigerian oil and gas industry.

Figure 8

Integrated Framework for Tacit Knowledge Conversion – Enablers and Barriers



In exploring the perspectives of engineering practitioners using the integrated conceptual framework, I determined the contextual barriers and enablers to tacit

knowledge conversion within the context of engineering companies in the Nigerian oil and gas industry (see Figure 8). These contextual barriers are categorized into personal and interpersonal barriers, structural and systemic barriers, and cultural and leadership barriers. Similarly, the contextual enablers are categorized into personal and interpersonal enablers, structural and systemic enablers, and cultural and leadership enablers.

Barriers, such as job insecurity, unwillingness to share, unsupportive organizational culture, casualization of labor, lack of trust, negatively affect the ability of engineering practitioners to collaborate, self-organize, and share knowledge. It is, therefore, imperative that these barriers are addressed by setting up a robust knowledge management system and infrastructure, investing in human capacity development, gaining commitment from top management, employing knowledge retention strategies, and the good use of technology, which are critical to overcoming these barriers. Furthermore, enablers, such as knowledge socialization, membership of professional associations, mentorship, succession planning, provision of incentives, rewards, and recognition, good remuneration, and enabling environment, will facilitate tacit knowledge conversion.

Limitations of the Study

The nonrandom sample size of 22 participants in one setting was a limitation that could have implications for the transferability of the study findings. This limitation resulted from the scope of study, which was focused on engineering practitioners within the context of Nigerian oil and gas companies. The peculiarity of the socioeconomic and political conditions in the setting and context may limit the transferability of the study to

another context. However, using purposive (i.e., nonrandom) sampling to identify and recruit participants based on their experiences and knowledge of the phenomenon helped to provide in-depth data (see Yin, 2016). The collection of in-depth data facilitated the provision of thick descriptions that may enrich the understanding and facilitate the transfer of contextual components of the study (see Ravitch & Carl, 2016). This could potentially enhance the transferability of findings to another context.

Another limitation was related to the choice of case study method. This limitation has implications for researcher bias and transferability. However, presenting a detailed justification for the case study method in line with the purpose of the study helped to address this limitation. Strict adherence to the steps for data collection and analysis facilitated transferability of findings (see Ravitch & Carl, 2016). Because the researcher is the primary research instrument for data collection and analysis in qualitative research, there were also limitations posed by cognitive bias, which may have occurred based on my professional experience as an engineering practitioner. My experience as an engineering practitioner in the Nigerian oil and gas industry could have impacted my ability to separate my personal and professional experiences from the findings of the study. I used audit trails and reflexive journals during the data analysis stage as well as the member checking process to help minimize this limitation.

Recommendations

This study focused on the perspectives of engineering practitioners on enablers and barriers to tacit knowledge conversion in engineering companies in the Nigerian oil and gas industry. However, due to the limitations resulting from the scope of this study,

some of the findings could not be further explored or analyzed in detail. Limitations to this study offer opportunities for recommendations of further research though; therefore, I have made the following recommendations for further research.

The first recommendation for further research is to examine the relationship between quality management and knowledge management in knowledge-intensive organizations, and how both systems can be synergized to facilitate organization knowledge creation. There are suggestions from this study on how organizations can leverage on quality management systems as a first step towards the effective implementation of knowledge management. However, the impact of quality management systems in facilitating effective knowledge management is beyond the scope of this study, hence the recommendation for further research in that regards.

The second recommendation for further study is to explore how social media can enhance knowledge management in developing economies. There are indications from this study that leveraging on social media facilitates knowledge socialization, which takes place at the knowledge acquisition phase of the tacit knowledge conversion process. Beyond knowledge socialization, it might be valuable to explore the effect of social media knowledge sharing, dissemination, utilization, and retention.

The third recommendation is for further study to look into the role of organizational culture and structure in facilitating organizational agility in knowledge-intensive organizations. Organizational agility is required for self-organization, adaptability, and dynamic capabilities in knowledge-intensive organizations. The ability

of knowledge-intensive organizations to learn and acquire new knowledge is a function on how well they are able to develop and sustain organizational agility.

The fourth recommendation is for further research to examine the impact of socioeconomic conditions on the implementation of knowledge management in developing economies. Although some engineering practitioners appreciate the importance of knowledge management, engineering companies in Nigeria are unwilling to dedicate the personnel, time, and investment to drive the implementation of knowledge management. There are indications from this study that this unwillingness may be related to the adverse socioeconomic conditions under which most Nigerian engineering companies operate.

Implications

Implications for Positive Social Change

This study has implications for positive social change at the individual, organizational and societal/governmental levels. Findings from the study show that effective knowledge management is critical to the performance of engineering companies in the Nigerian oil and gas industry. For organizations to optimize their knowledge potential, through the continual conversion of tacit knowledge to organizational knowledge, they must put in place enablers that will facilitate the acquisition, transfer, and retention of knowledge resources. This study has brought to fore the contextual barriers, to the conversion of tacit knowledge to organizational knowledge in Nigerian oil and gas engineering companies. Most of these contextual barriers are as a result of inherent cultural, infrastructural, and socioeconomic peculiarities of Nigerian engineering

companies. Understanding and addressing these barriers, and replacing them with enablers, have implications for positive social change at the individual, organizational, and governmental/societal levels.

At the individual level, this study has the potential to contribute to positive social change by sensitizing engineering practitioners on the personal and interpersonal barriers that may hinder knowledge acquisition and transfer. This study could also enlighten engineering practitioners on how to leverage on social media, knowledge socialization, memberships of professional associations, and collaboration to facilitate knowledge acquisition and knowledge transfer. The process of conversion of tacit knowledge to organizational knowledge starts at the individual level, a change in mindset of individual is the first important step.

At the organizational level, this study emphasizes the need for Nigerian organizations to implement knowledge management systems and ensure that knowledge management practices are consistent and in line with global best practices. This study may assist Nigerian companies to understand the systemic, structural, cultural, and leadership barriers that could impeded tacit knowledge conversion, and what in Nigeria do to remove these barriers. With this study, Nigerian organizations may understand and appreciate the criticality of top management commitment, investment in knowledge management infrastructure, investment in human capacity development in the implementation of knowledge management systems and practices. Organizations may begin to see that investment in knowledge management has the potential to change the fortunes their companies for the better.

At the governmental and societal levels, this study will provide insights to stakeholders, especially government regulatory bodies and engineering societies, on the imperatives of knowledge management as a driver of global competitiveness. This could necessitate updating of the policies and regulations, on the part of government and engineering societies, that drive the operations and practices of engineering companies in Nigeria. Government plays a major role in creating enabling environment for the knowledge management implementation and also in the development policies that will address the adverse socioeconomic issues that are detrimental to knowledge management. This study could enlighten and empower regulatory agencies to review and update existing regulations such that it will promote knowledge management. Also, engineering societies such as the Nigerian Society of Engineers (NSE) and the Council for the Regulation of Engineering Practices in Nigeria (COREN) may begin to sensitize their member organizations on the need to optimize their knowledge resources.

Overall, this study has the potential of bringing about a paradigm shift away from the traditional ways by which information and knowledge is being managed in Nigerian oil and gas engineering companies. Stakeholders within the oil and gas engineering companies will begin to understand the importance of applying global best practices in the implementation of knowledge management. This will include creating enabling conditions that will facilitate the acquisition, transfer, and retention of knowledge.

Implication for Methodological and Conceptual Approaches

This study has implications for the methodological and conceptual approaches. The qualitative case study method guided the process of data collection, analysis, and

interpretation. Findings from the study provided insights into the methodological options that are possible in exploring knowledge management in both developed and developing economies. These methodological options cut across quantitative, qualitative, and mixed method perspectives (see Castaneda et al., 2018; Eken et al., 2020; Owusu-Manu et al., 2018; Ramjeawon & Rowley, 2020; Zapata-Cantu, 2020).

The qualitative case study is exploratory and could provide a basis for the deployment of quantitative study that can evaluate the relationship between knowledge management and organizational performance in Nigeria. Results of this study suggest that knowledge management improves organizational reputation, increases revenue and profitability, enhances business continuity, facilitates and sustainable growth. Further quantitative studies may be used to examine the relationship between effective knowledge management and any of the organizational performance indices highlighted in this study.

The integrated SECI and 4I conceptual framework focuses on the cyclic process by which tacit knowledge is converted to organizational knowledge. This cyclic process encapsulates the acquisition, dissemination, utilization, and retention of tacit knowledge to create organizational knowledge (Hubers et al., 2016; Madase & Barasa, 2019; Shahzad et al., 2016). Findings from this study confirmed that knowledge acquisition, knowledge transfer, and internalization of knowledge as the process by which tacit knowledge is converted to organizational knowledge. These processes take place at the intersections between socialization, externalization, combination, and internalization, in the case of SECI framework and intuiting, interpreting, integrating, and

institutionalization, in the case of 4I framework (Mahmood et al., 2019; Torres et al., 2020).

This study identified enablers and barriers to the conversion of tacit knowledge to organizational knowledge at each of these intersections. Future studies could focus on each of socialization, externalization, combination, and internalization and how each of the phases facilitate knowledge management. Similarly, future study can focus on each of intuiting, interpreting, integrating, and institutionalization stages, with a view to examine how each of the phases facilitate knowledge management.

Findings from this study confirmed that knowledge-intensive organizations are complex adaptive systems with attributes such as interrelationships, interdependencies, self-organization, and complexity. These attributes enhance dynamic capabilities and organizational agility (see Heisig et al., 2016). Complex adaptive system framework emphasizes of complexity, self-organization, adaptation, and emergence (Abbott & Hadzikadic, 2017). It is therefore important for engineering companies in Nigeria to provide a working environment and structure that facilitates self-organization, interdependencies, interrelationships, and agility. Further studies could examine how the understanding of complex adaptive system framework can facilitate the implementation of knowledge management systems in Nigerian companies.

Recommendations for Practice

Engineering practitioners, as knowledge workers, need to understand the uniqueness of knowledge work and appreciate the nature of knowledge-intensive organizations. As principal actors and leaders in engineering companies, this

understanding is critical to the effective implementation of knowledge management systems and practices. It is also important for engineering practitioners and leaders to understand the importance of tacit knowledge, and the need to continually acquire, share, disseminate, use, and internalize this knowledge. This understanding will promote the right attitude and environment for tacit knowledge conversion. It will also facilitate the development of infrastructure, processes, systems, and practices for effective knowledge management.

Engineering practitioners need to pay attention to the importance of socializing, mentor-mentee relationships, collaboration, teamwork, self-organization, and membership of professional associations in the acquisition of tacit knowledge. These activities should be encouraged in engineering companies to drive the process of tacit knowledge acquisition. Leaders in engineering companies should provide incentives to engineering practitioners and invest in human capacity development and technology to facilitate the sharing, dissemination, and retention of knowledge. It is also important for engineering practitioners and leaders to fully commit to knowledge management initiatives and practices.

Casualization of labor, job insecurity, and high employee turnover are barriers to the acquisition, sharing, dissemination, and retention of knowledge. A robust knowledge management and employee retention strategy will help to remove these barriers. Engineers are the custodian of tacit knowledge, therefore ensuring that competent and experienced engineers are onboarded into the workforce is critical to improving the knowledge base of engineering companies.

Conclusions

The purpose of this qualitative case study was to understand the enablers and barriers to tacit knowledge conversion in engineering companies as perceived by engineering practitioners working in the Nigerian oil and gas industry. Findings from this study contribute to the existing literature on knowledge management within the context developing economies, especially Nigeria. This study is exploratory and not exhaustive. However, it provides insights into, and foundation for, further studies on knowledge management in Nigeria and other developing economies.

Indigenous engineering companies operating in the Nigeria oil and gas industry are not able to optimize their knowledge resources through the implementation of knowledge management. The reality is that most engineering companies are not implementing management systems, and the few engineering companies that implement knowledge management practices are inconsistent in their approach. Also, there are inherent barriers that hinder the process of converting tacit knowledge to organizational knowledge in engineering companies within the Nigerian oil and gas industry.

Some of these contextual barriers are a function of adverse cultural, infrastructural, and socioeconomic conditions which are counterproductive to knowledge management and organizational learning. For instance, casualization of labor, job insecurity, high employee turnover, bad remuneration, and lack of project opportunities are peculiar barriers within the context of Nigerian oil and gas engineering companies. However, the most significant barriers were nonexistent knowledge management systems and inconsistent knowledge management practices.

It is imperative that Nigerian engineering companies commit to removing these barriers and put in place enablers that will facilitate the acquisition sharing, sharing, dissemination, and retention of knowledge. Good leadership and management commitment is critical in this regard, as a lot of these barriers are linked to lack of commitment on the part of leaders. Good knowledge and employee retention strategies, providing learning opportunities, creating an enabling environment, investment in human capacity development, good remuneration, and provision of incentives, are some of the enablers that could improve knowledge management.

Most engineering companies in the Nigerian oil and gas industry are project-based companies and often operate a matrix organizational structure to meet operational and project requirements. Projects offer unique opportunities for the tacit knowledge acquisition and organizational learning, as they provide an avenue for collaboration of engineering practitioners with different experiences, skillset, background, and knowledge towards the fulfillment of project objectives. Project-based companies place unique demand on engineering practitioners in terms of agility, interrelationships, interdependencies, self-organization, complexity, and dynamic capabilities required to drive knowledge management and organizational learning.

For engineering companies in Nigeria to fully optimize their knowledge resources and remain competitive, they must begin to prioritize within their organization, the implementation of knowledge management systems and practices. The implementation of knowledge management systems and practices should be hinged on the continual acquisition, sharing, dissemination, utilization, and retention of tacit knowledge, geared

towards the creation of organizational knowledge. Organizational knowledge creation is a major driver of innovation and competitive advantage in knowledge-intensive organizations.

The first step towards implementing knowledge management systems and practices is to cultivate an organizational culture that supports knowledge management. Leaders in engineering companies need to have the right mindset, create an enabling environment, and lead the way in this regard. Leaders must also demonstrate genuine commitment to the implementation of knowledge management by onboarding competent engineers; investing in professional development of engineers; investing in technology and knowledge management infrastructure; and deploying effective knowledge and employee retention strategies. Engineering practitioners on their part must show commitment through knowledge socialization, collaboration, mentor-mentee relationships, and membership of professional associations.

References

Abbott, R., & Hadzikadic, Z. (2017). Complex adaptive systems, systems thinking, and agent-based modeling. *Advanced Technologies, Systems, and Applications,* 1-8. https://doi.org/10.1007/978-3-319-47295-9_1

Acharya, A., & Mishra, B. (2017). Exploring the relationship between organizational structure and knowledge retention: a study of the Indian infrastructure consulting sector. *Journal of Knowledge Management,21*(4). 961-985. https://doi.org/10.1108/JKM-11-2016-0506

Adeh, E. (2020, August 31). Nigerian engineers lament low government patronage. *ThisDay Newspaper*. https://www.thisdaylive.com/index.php/2020/08/31/nigerian-engineers-lament-low-govt-patronage/

Agwor. T.C. & Adesina, O. (2017). Ethical issues in conducting research in the behavioral and social sciences. *International Journal of Humanities & Social Studies, 5*(12), 185-188. https://www.researchgate.net/publication/322343086_Ethical_issues_in_conducting_research_in_the_behavioral_and_social_sciences

Akgun, A. E., Keskin, H., Ayar, H., & Okunakol, Z. (2017). Knowledge sharing barriers in software development teams: A multiple case study in Turkey. *Kybernetes*, *46*(4), 603-620. https://doi.org/10.1108/PR-04-2016-008

Akhavan, P., Shahabipour, A., & Hosnavi, R. (2018). A model for assessment of uncertainty in tacit knowledge acquisition. *Journal of Knowledge Management,*

22(2). 413-431. https://doi.org/10.1108/JKM-06-2017-0242

Akinwale, Y. O., Akinbami, J.K., & Akarakiri, J.B. (2018). Factors influencing technology and innovation capability in the Nigerian indigenous oil firms. *International Journal of Business Innovation and Research,15* (2), 247-262. https://doi.org/10.1504/IJBIR.2018.089146

Akinyetun, T. S. (2016). Nigeria and oil production: Lessons for future. *International Journal of Multidisciplinary Research and Development, 3*(5), 19-24. https://www.researchgate.net/publication/318529974_Nigeria_and_Oil_Production_Lessons_for_Future

Alonso, A. D., & Alexander, N. (2017). Importance of acquiring knowledge through feedback in an emerging industry. *Asia Pacific Journal of Marketing and Logistics, 29*(2),265-282. https://doi.org/10.1108/APJML-07-2016-0128

Amar, A. D. & Hlupic, V. (2016) Leadership for knowledge organizations. European *Journal of Innovation Management,19*(2), 239-260. https://doi.org/10.1108/EJIM-12-2014-0120

Andersen, L. (2019). Complexity and rationality: a material-systemic approach. *International Journal of Managing Projects in Business, 12*(2). 444-465. https://doi.org/10.1108/IJMPB-10-2017-0116

Andrews, M., & Smits, S. (2019). Using tacit knowledge exchanges to improve teamwork. *Information Systems Management Journal, 3*(1), 15-23. https://www.researchgate.net/publication/336253482_Using_Tacit_Knowledge_Exchanges_to_Improve_Teamwork

Arrau, G. P. (2016). Knowledge management in the context of developing countries: The case of Chile. *European Conference on Knowledge Management.*1-9. Academia. https://www.academia.edu/25162412/Perez_Arrau_2016_Knowledge_management_in_the_context_of_developing_countries_the_case_of_Chile._16_th_European_Conference_on_Knowledge_Management_-_ECKM_2015_Udine_Italy

Attar, M. M. (2020). Organizational culture, knowledge sharing, and intellectual capital: *Directions for Future Research, 9*(1), 11-20. https://doi.org/10.11648/j.ijber.20200901.12

Audretsch, D. B., Belitski, M., Caiazza, R., & Lehmann, E.E. (2020). Knowledge management and entrepreneurship. *International Entrepreneurship and Management Journal, 16*, 373–385. https://doi.org/10.1007/s11365-020-00648-z.

Awodoyin, A., Osisanwo, T., Adetoro, N., & Adeyemo, I. (2016). Knowledge sharing behavior pattern analysis of academic librarians in Nigeria. *Journal of Balkan Libraries Union, 4*(1). 12-19. http://dx.doi.org/10.16918/bluj.39024

Ayonmike, C. S., & Okeke, B.C. (2016). The Nigerian local content act and its implication on technical and vocational education and training (TVET) and the nation's economy. *International Journal of Education Learning and Development, 3*(1), 26-35. ResearchGate. https://www.researchgate.net/publication/

Babbie, E. (2017). *Basics of social research* (7th ed.). Cengage Learning

Badpa, A., Salim, J., Yahaya, J., Foroozesh, P., & Arbabi, M.S. (2018). The effect of KMS usage on organizational performance in oil and gas industry: An empirical study in the context of developing economy. *International Journal of Trend in*

Research and Development, 5(2), 21-21. http://www.ijtrd.com/papers/IJTRD15819.pdf

Balde, M., Ferreira, A.I., & Maynard, T. (2018). SECI driven creativity: The role of team trust and intrinsic motivation. *Journal of Knowledge Management,22*(8), 1688-1711. https://doi.org/10.1108/JKM-06-2017-0241

Bamgboje-Ayodele, A. & Ellis, L. (2015). Knowledge management and the Nigerian culture: A round peg in a square hole? *African Journal of Information Systems, 7*(1), 1-22. http://digitalcommons.kennesaw.edu/ajis/vol7/iss1/

Birt, L., Scott, S., Cavers, D., Campbell, C., & Walters, F. (2016). Member checking: A tool to enhance trustworthiness or merely a nod to validation? *Qualitative Health Research, 26*(13), 1802–1811. https://doi.org/10.1177/1049732316654870

Awdel ce, L., & Burnett, S. (2016). Barriers to knowledge sharing in third sector social care: a case study. *Journal of Knowledge Management, 20*(1), 125-145. https://doi.org/10.1108/AJIM-12-2019-0362

Bogna, F., Raineri, A., & Dell, G. (2020). Critical realism and constructivism: Merging research paradigms for a deeper qualitative study. *Qualitative Research in Organizations and Management: An International Journal, 5*(4), 461-484. https://doi.org/10.1108/QROM-06-2019-1778.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology 3*(2),77-101. https://doi.org/10.1191/1478088706qp063oa

Burkholder, G. J., & Burbank, P. M. (2016). Philosophical foundations and the role of theory in research. *The scholar-practitioner's guide to research design,* 15-37.

https://mbsdirect.vitalsource.com

Cabrilo, S., & Dahms, S. (2018). How strategic knowledge management drives intellectual capital to superior innovation and market performance. *Journal of Knowledge Management, 22*(3), 621-648. https://doi.org/10.1108/JKM-07-2017-0309

Castaneda, D.I., Manrique, L. F., & Cuellar, S. (2018). Is organizational learning being absorbed by knowledge management? A systematic review. *Journal of Knowledge Management, 22*(2). 299-325. https://doi.org/10.1108/JKM-01-2017-0041

Castillo-Montoya, M. (2016). Preparing for interview research: The interview protocol refinement framework. *Qualitative Report*, *21*(5), 811-831. https://nsuworks.nova.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=2337&context=tqr

Cegarra-Navarro, J., & Martelo-Landroguez, S. (2020). The effect of organizational memory on organizational agility: Testing the role of counter-knowledge and knowledge application. *Journal of Intellectual Capital, 21*(3), 459-479. https://doi.org/10.1108/JIC-03-2019-0048

Chowdhury, I. A. (2016). Issue of quality in a qualitative research: An overview. *Innovative Issues and Approaches in Social Sciences, 8*(1), 2-24. http://dx.doi.org/10.12959/issn.1855-0541.

Chete, L. N., Adeoti, J. O., Adeyinka, F. M., Ogundele, O. (2017). Industrial development and growth in Nigeria: Lessons and challenges. *Learning to*

Compete, 8, 1-38. https://www.brookings.edu/wp-content/uploads/2016/07/L2C_WP8_Chete-et-al-1.pdf

Chipangura, P., Niekerk, D. V., & Waldt, G.V.D. (2016). An exploration of objectivism and social constructivism within the context of disaster risk. *Disaster Prevention and Management, 25*(2), 261-274. https://doi.org/10.1108/DPM-09-2015-0210

Chugh, R. (2017). Barriers and enablers of tacit knowledge transfer in Australian higher education institutions. *International Journal of Education and Learning Systems, 2*. 272-276. http://iaras.org/iaras/journals/ijels

Churchill, S. D. (2018). Explorations in teaching the phenomenological method: Challenging psychology students to "grasp at meaning" in human science research. *Qualitative Psychology*, *5*(2), 207-227. https://psycnet.apa.org/doi/10.1037/qup0000116

Costa, V., & Monteiro, S. (2016). Knowledge processes, absorptive capacity and innovation: A mediation analysis. *Journal of Corporate Transformation, 23*(3), 207-218. https://doi.org/10.1002/kpm.1507

Crawford, L. M., Burkholder, G. J., & Cox, K. A. (2016). Writing the research proposal. *The scholar-practitioner's guide to research design,* 162-187. https://mbsdirect.vitalsource.com

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Sage.

Criado-García, F., Calvo-Mora, A., & Martelo-Landroguez, S. (2020). Knowledge management issues in the EFQM excellence model framework. *International*

Journal of Quality & Reliability Management, 37(5),781-800. https://doi.org/10.1108/IJQRM-11-2018-0317

Crossan, M. M., Lane, H.W., & White, R.E. (1999). An organizational learning framework: From intuition to institution. *Academy of Management Review*, *24*(3), 522-537. https://doi.org/10.5465/amr.1999.2202135

Dabic, M., & Kiessling, T. (2019). The performance implications of knowledge management and strategic alignment of MNC subsidiaries. *Journal of Knowledge Management, 23*(8), 1477-1501. https://doi.org/10.1108/JKM-03-2019-0129

Dalmer, N. K. (2019). Considering the local and the trans-local: Reframing health information practice research using institutional ethnography. *Aslib Journal of Information Management, 71*(6), 703-719. https://doi.org/10.1108/AJIM-02-2019-0046

Dang, C. N., Le-Hoai, L., & Kim, S. Y. (2018). Impact of knowledge enabling factors on organizational effectiveness in construction companies. *Journal of Knowledge Management, 22*(4), 759-780. https://doi.org/10.1108/JKM-08-2016-035

Dang, C. N. & Le-Hoai, L. (2019). Relating knowledge creation factors to construction organizations' effectiveness: Empirical study. *Journal of Engineering, Design and Technology,17*(3),515-536. https://doi.org/10.1108/JEDT-01-2018-0002

Dalkir, K. (2011). *Knowledge management in theory and practice* (2nd ed). The MIT Press.

Dahou, K., Hacini, I., & Burgoyne, J. (2018). Knowledge management as a critical success factor in developing international companies' organizational learning

capability. *Journal of Workplace Learning*, 31(3). 112-123. https://doi.org/10.1108/JWL-12-2017-0118

Dayan, R., Heisig, P., & Matos, F. (2017). Knowledge management as a factor for the formulation and implementation of organization strategy. Journal of Knowledge Management, 21(2),308-329. https://doi.org/10.1108/JKM-02-2016-0068.

Del Giudice, M., & Della Peruta, M. R. (2016). The impact of IT-based knowledge management systems on internal venturing and innovation: a structural equation modeling approach to corporate performance. *Journal of Knowledge Management, 20*(3), 484-498. https://doi.org/10.1108/JKM-07-2015-0257

Edwards, J. S. (2008). Knowledge management in the energy sector: Review and future directions. *International Journal of Energy Sector Management, 2*(2), 197-217.https://doi.org/10.1108/1750622081088321

Dikko, M. (2016). Establishing construct validity and reliability: Pilot testing of a qualitative interview for research in Takaful (Islamic insurance). *The Qualitative Report*, *21*(3), 521-528. https://nsuworks.nova.edu/cgi/viewcontent.cgi?referer=https://scholar.google.com/&httpsredir=1&article=2243&context=tqr

Duan, Y., Huang, L., Cheng, H., Yang, L., & Ren, T. (2020). The moderating effect of cultural distance on the cross-border knowledge management and innovation quality of multinational corporations. *Journal of Knowledge Management,* 1-32. https://doi.org/10.1108/JKM-11-2019-0656

Durmusoglu, S. S., Nayir, D.Z., Chaudhuri, M., Chen, J., Joens, I., Scheuer, S. (2018).

Barriers to firm service innovativeness in emerging economies. *Journal of Services Marketing,32*(7), 925–944. https://doi.org/10.1108/JSM-11-2016-0411

Ejeh, P., & Hall, A. (2018). Applying a knowledge evaluation framework in the Nigerian public sector, *European Conference on Knowledge Management*, *117*, 198-207. https://sure.sunderland.ac.uk/id/eprint/9686/1/Ejeh-Hall%20European%20KM%20conference

Eken, G., Bilgin, G., Dikmen, I., & Birgonu, M. T. (2020). A lessons-learned tool for organizational learning in construction. *Automation in Construction, 110*, 1-19. https://doi.org/10.1016/j.autcon.2019.102977

El-Awad, Z., Gabrielsson, J., & Politis, D. (2017). Entrepreneurial learning and innovation. *International Journal of Entrepreneurial Behavior & Research, 23*(3),381-405. https://doi.org/10.1108/IJEBR-06-2016-0177

Faulkner, S. L. & Trotter, S.P. (2017). Data Saturation. *Wiley Online Library*, 1-15. https://doi.org/10.1002/9781118901731.iecrm0060

Feili, H., Besharat, R., Chitsaz, M., & Abbasi, S. (2018). The impact of different leadership styles in successful implementation of knowledge management in organizations by structural equation modeling. *Journal of Industrial and Systems Engineering, 11*(3), 1-22. https://doi.org/10.13140/rg.2.2.33545.34405

Fusch, P. I. & Ness, L. R. (2015). Are we there yet? Data saturation in qualitative research. *The Qualitative Report*, *20*(9), 1408-1416. http://www.nova.edu/ssss/QR/QR20/9/fusch1

Gaizauskiene, L., & Tuncikiene, Z. (2016). The concept and role of knowledge worker

and workplace fit in learning organization. *International Journal of Learning and Change, 8*, 1-10. https://doi.org/10.1504/IJLC.2016.081650

Gallifa, J. (2018). Research traditions in social sciences and their methodological rationales. *Aloma, 36*(2), 9-20. https://orcid.org/0000-0002-8272-3688

Ganguly, A., Talukdar, A., & Chatterjee, D. (2019). Evaluating the role of social capital, tacit knowledge sharing, knowledge quality and reciprocity in determining innovation capability of an organization. *Journal of Knowledge Management, 23*(6), 1105-1153. https://doi.org/10.1108/JKM-03-2018-0190

Ghasemi, B., & Valmohammadi, C. (2018). Developing a measurement instrument of knowledge management implementation in the Iranian oil industry. *Kybernetes, 47*(10). 1874-1905. https://doi.org/10.1108/K-01-2018-0006

Ghosh, P., Goel, G., Dutta, T., & Singh, R. (2019). Turnover intention among liquid knowledge workers: a study of Indian insurance professionals. *Journal of Global Operations and Strategic Sourcing, 12*(2), 288-309. https://doi.org/10.1108/JGOSS-10-2017-0040

Goswami, A. K. & Agrawal, R. K. (2020). Explicating the influence of shared goals and hope on knowledge sharing and knowledge creation in an emerging economic context. *Journal of Knowledge Management, 24*(2), 172-195. https://doi.org/10.1108/JKM-09-2018-0561

Grah, B., Dimovski, V., Snow, C. C., & Peterlin, J. (2016). Expanding the model of organizational learning: scope, contingencies, and dynamics. *Economic and Business Review, 18*(2), 183-212. https://doi.org/10.15458/85451.21

Greener, S. (2008). *Business Research Methods*. http://www.bookboon.com.

Grimsdotti, E. & Edvardsson, I. R. (2018). Knowledge management, knowledge creation, and open innovation in Icelandic SMEs. *Original Research,* 1-13. https://doi.org/10.1177/2158244018807320

Gunawan, J. (2016). Ensuring trustworthiness in qualitative research. *Nursing Journal, 1*(1),10-11. https://doi.org/. 10.33546/bnj.4

Guo, W. (2019). Collaborative knowledge management for corporate ecological responsibility. *Data Technologies and Applications, 53*(3). 304-317. https://doi.org/10.1108/DTA-01-2019-0003

Hancock, D., & Algozzine, B. (2017). *Doing case study research: A practical guide for beginning researchers* (3rd ed.). New York: Teachers College Press.

Heisig, P., Suraj, O. A., Kianto, A., Kemboi, C., Arrau, G.P., & Easa, N.F. (2016). Knowledge management and business performance: global experts' views on future research needs. *Journal of Knowledge Management, 20* (6). 1169-1198. http://dx.doi.org/10.1108/JKM-12-2015-0521

Herbst, A. S. (2017). Capturing knowledge from lessons learned at the work package level in project engineering teams. *Journal of Knowledge Management*, *21*(4), 765-778. doi: http://dx.doi.org/10.1108/JKM-07-2016-0273

Hubers, M. D., Poortman, C.L., Schildkamp, K., Pieters, J.M., & Handelzalts, A. (2016). Opening the black box: Knowledge creation in data teams. *Journal of Professional Capital and Community, 1*(1), 41-68. https://doi.org/10.1108/JPCC-07-2015-0003

Iazzolino, G., & Laise, D., (2018). Knowledge worker productivity: Is it really impossible to measure it? *Measuring Business Excellence, 22*(4), 346-361. http://dx.doi.org/10.1108/MBE-06-2018-0035

Ibidunni, A. S. (2020). Exploring knowledge dimensions for improving performance in organizations. *Journal of Workplace Learning, 32*(1), 76-93. https://doi.org/10.1108/JWL-01-2019-0013

Inkinen, R. (2016). Review of empirical research on knowledge management practices and firm performance. *Journal of Knowledge Management, 20*(2), 230-257.http://dx.doi.org/10.1108/JKM-09-2015-0336

International Organization for Standardization. (2015). Quality management systems - Requirements (ISO/DIS Standard No. 9001). 1-40. http://wqc-portal.pwa.co.th/attachment/topic/88/ISO_9001_2015.pdf

Irum, A., & Pandey, A. (2020). Social media: Changing the face of knowledge management. *Development and Learning in Organizations: An International Journal, 34* (1). https://doi.org/10.1108/DLO-02-2019-00510

Iyamah, F.A. & Ohiorenoya, J.O. (2015). Knowledge Sharing and Performance in the Nigerian Oil and Gas Industry. *Information and Knowledge Management, 5*(3), 82-90. https://www.researchgate.net/publication/274457282_knowledge_sharing_and_performance_in_the_oil_and_gas_industry

Ju, B. & Li, J. (2019) Exploring the impact of training, job tenure, and education-job and skills-job matches on employee turnover intention. *European Journal of Training*

and Development, 43(3/4), 214-231. https://doi.org/10.1108/EJTD-05-2018-0045

Jorge E.P. (2021). Knowledge management (KM) & complex adaptive systems (CAS): A literature review. *Leadership in Health Services 25*(1), 1-12. https://doi.org/10.1108/17511871211198061

Jugder, N. (2016). *The thematic analysis of interview data: an approach used to examine the influence of the market on curricular provision in Mongolian higher education institutions (3rd edition).* Hillary Place Papers.

Kane, G. C. (2017). The evolutionary implications of social media for organizational knowledge management. *Information and Organization, 27* (1).37-46. https://doi.org/10.1016/j.infoandorg.2017.01.001

Kianto, A., Shujahat, M., Hussain, S., Nawaz, F., & Ali, M. (2019). The impact of knowledge management on knowledge worker productivity. *Baltic Journal of Management, 14*(2). 178-197. https://doi.org/10.1108/BJM-12-2017-0404.

Klepic, Z., & Madzar, D. (2018). The impact of organizational culture on knowledge management in small and medium enterprises. *Tourism in Southern and Eastern Europe, 4*, 259-266. https://doi.org/10.20867/tosee.04.48

Korstjens, I., & Moser, A. (2018). Practical guidance to qualitative research. Part 4: Trustworthiness and publishing. *European Journal of General Practice, 24*(1), 120–124. https://doi.org/10.1080/13814788.2017.1375092

Laihonen, H., & Mantyla, S. (2018). Strategic knowledge management and evolving local government. *Journal of Knowledge Management, 22*(1), 219-234. https://doi.org/10.1108/JKM-06-2017-0232.

Lawal, F. M., Oriogu, C. D., & Ogbuiyi, S. U. (2017). Influence of demographic factors on knowledge sharing among researchers in selected research institutes in Ibadan, Nigeria. *Journal of Information and Knowledge Management, 8*(2). 63 – 76. https://dx.doi.org/10.4314/iijikm.v8i2.6

Leonardi, P. M. (2017). The social media revolution: Sharing and learning in the age of leaky knowledge. *Information and Organization, 27*(1). 47-59. https://doi.org/10.1016/j.infoandorg.2017.01.004

Leedy, P. D., & Ormrod, J. E. (2013). *Practical research: Planning and design* (10th ed.). Boston, MA: Pearson.

Leuven, K. U. (2011). Social Change. *OBO Social Change*. 1-58. https://www.researchgate.net/publication/274193404

Levallet, N., & Chan, Y.E. (2019). Organizational knowledge retention and knowledge loss. *Journal of Knowledge Management, 23*(1),176-199. https://doi.org/10.1108/JKM-08-2017-0358

Lievre, P., & Tang, J. (2016). SECI and inter-organizational and intercultural knowledge transfer: A case-study of controversies around a project of co-operation between France and China in the health sector. *Journal of Knowledge Management*, *19*(5), 1069-1086. https://doi.org/10.1108/JKM-02-2015-0054

Limba, R. S., Hutahayan, B., Fernandes, S., & Fernandes, A. (2019). Sustaining innovation and change in government sector organizations: Examining the nature and significance of politics of organizational learning. *Journal of Strategy and Management, 12*(1),103-115. https://doi.org/10.1108/JSMA-10-2017-0075

Lindgren, J., Emmitt, S., & Widen, K. (2018). Construction projects as mechanisms for knowledge integration: Mechanisms and effects when diffusing a systemic innovation. *Engineering, Construction and Architectural Management, 25*(11), 1516-1533. https://doi.org/10.1108/ECAM-02-2017-0022

Lizier, A. L. (2017). Investigating work and learning through complex adaptive organizations. *Journal of Workplace Learning, 29*(7/8), 554-565. https://doi.org/10.1108/JWL-05-2016-0033

Lysaght, R., Roy, M. J., Rendall, J. S., Krupa, T., Ball, L., & Davis, J. (2018). Unpacking the foundational dimensions of work integration social enterprise: The development of an assessment tool. *Social Enterprise Journal, 14* (1), 60-70. https://doi.org/10.1108/SEJ-11-2017-0061

Madase, K., & Barasa, L. (2019). Absorptive capacity, marketing capabilities, and innovation commercialization in Nigeria. *European Journal of Innovation Management, 22*(5),790-820. https://doi.org/10.1108/EJIM-09-2018-0194

Mahmood, N., Ali Qureshi, M., & Ul-Hadi, N. (2019). Industry cluster resources impacting dual innovations in Pakistan's IT sector: Mediating effect of knowledge & learning processes. *City University Research Journal, 9*(1), 144-163. https://ezp.waldenulibrary.org/login?qurl=https%3A%2F%2Fwww.proquest.com%2Fdocview%2F2190969108%3Faccountid%3D14872

Mamedio, D. F., & Meyer, V. (2020). Managing project complexity: how to cope with multiple dimensions of complex systems. *International Journal of Managing Projects in Business, 13*(4), 727-744. https://doi.org/10.1108/IJMPB-06-2019-

0147

Manning, J. (2017). *In vivo coding.* The international encyclopedia of communication research methods. New York, NY: Wiley-Blackwell. https://doi.org/10.1002/9781118901731.iecrm0270

Masadeh, R., Almajali, D. A., Alrowwad, A. & Obeidat, B.Y. (2019). The role of knowledge management infrastructure in enhancing job satisfaction: A developing country perspective. *Interdisciplinary Journal of Information, Knowledge, and Management, 14,* 1-25. https://doi.org/10.28945/4169

Mathews, R. L., MacCarthy, B. L., & Braziotis, C. (2017). Organizational learning in SMEs: a process improvement perspective. *International Journal of Operations & Production Management, 37*(7), 970-1006. https://doi.org/10.1108/IJOPM-09-2015-0580

McQueen, R. J., & Janson, A. (2016). Accelerating tacit knowledge building of client-facing consultants Can organizations better support these learning processes? *The Learning Organization, 23*(4), 202-217. https://doi.org/10.1108/TLO-07-2015-0035

Medina, R., & Medina A. (2017). Managing competence and learning in knowledge-intensive, project-intensive organizations: A case study of a public organization. International Journal of Managing Projects in Business, 10(3),505-526. https://doi.org/10.1108/IJMPB-04-2016-0032

Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation* (4th ed.). San Francisco, CA: Jossey-Bass.

Michell, V., & McKenzie, J. (2017). Lessons learned: Structuring knowledge codification and abstraction to provide meaningful information for learning. *VINE Journal of Information and Knowledge Management Systems, 47*(3), 411-428. https://doi.org/10.1108/VJIKMS-11-2016-0061

Millar, C.C.J.M., Lockett, M., & Mahon, J.F (2016). Knowledge intensive organizations: on the frontiers of knowledge management. Journal of Knowledge Management, 20(5). 845-857. https://doi.org/10.1108/JKM-07-2016-0296

Mordor Intelligence, (2018). Nigeria oil & gas market: Growth, trends & forecast (2020 - 2025). https://www.mordorintelligence.com/industry-reports/nigeria-oil-and-gas-market

Najmi, K., Kadir, A. R., & Kadir, M.I.A. (2018). Mediation effect of dynamic capability in the relationship between knowledge management and strategic leadership on organizational performance accountability. *International Journal of Law and Management, 60*(2), 517-529. https://doi.org/10.1108/IJLMA-01-2017-0004

Navidi, F., Hassanzadeh, M., & Shojai, A. Z. (2019). Organizational knowledge documentation in project-based institutes: A case study at the satellite research institute. *The Electronic Library, 35*(5), https://doi.org/10.1108/EL-10-2015-0196

Nonaka, I. (1990). Management of Knowledge Creation. Nihon Keizai Shinbun-sha.

Nonaka, I. (1994). A Dynamic Theory of Organizational Knowledge Creation. *Organization Science, 5*(1), 14-37. http://www.jstor.org/stable/2635068

Nonaka, I., & Takeuchi, H. (1995). *The knowledge creating company*. Oxford University Press.

Nonaka, I., Krogh, G., & Voelpel, S. (2006). Organizational Knowledge Creation Theory: Evolutionary paths and future advances. *Organization Studies 27*(8), 1179 - 1208. https://doi.org/10.1177/0170840606066312

Nowell, L. S., Norris, J. M., White, D. E., & Moules N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods, 16*, 1-13. https://doi.org/10.1177/1609406917733847

Ochieng, E. G., Price, A. D. F., Zuofa, T., Egbu, C. and Ruan, X. (2016). Revitalizing energy capital project development and execution strategies: lessons from the energy sector. Production Planning and Control, 27(4),237-248. https://doi.org/10.1080/09537287.2015.1094583

Ochieng, E. G., Ovbagbedia, O.O., Zuofa, T., Abdulai, R., Matipa, W., Ruan, X., & Oledinma, A. (2018). Utilizing a systematic knowledge management-based system to optimize project management operations in oil and gas organizations. *Information Technology & People, 31*(2), 527-556. https://doi.org/10.1108/ITP-08-2016-0198

Odor, H. O. (2018). A literature review on organizational learning and learning organizations. *International Journal of Economics &Management Sciences*. *7*(1), 1-6. https://doi.org/10.4172/2162-6359.1000494

Olatokun, W., & Njideaka, T. M. (2020). Knowledge sharing practices among cataloguers in Nigeria's academic libraries. *Library Management,* 1-15. https://doi.org/10.1108/LM-12-2019-0090

Oliva, F.L., & Kotabe, M. (2019). Barriers, practices, methods and knowledge

management tools in startups. *Journal of Knowledge Management, 23*(9) 1838-1856. https://doi.org/10.1108/JKM-06-2018-0361

Oliva, F. L., Couto, M. H. G., Santos, R. F., & Bresciani, S. (2019). The integration between knowledge management and dynamic capabilities in agile organizations. *Management Decision, 57*(8). 1960-1979. https://doi.org/10.1108/MD-06-2018-0670

Oluikpe, P. I. (2015). Knowledge creation and utilization in project teams. *Journal of Knowledge Management*, *19*(2), 351-371. https://doi.org/10.1108/JKM-06-2014-0214

Omotayo, F. O., & Babalola, S. O. (2016). Factors influencing knowledge sharing among information and communication technology artisans in Nigeria. *Journal of Systems and Information Technology*, *18*(2), 148-169. https://doi.org/10.1108/JSIT-02-2016-0009

Osagie, E. (2018). An overview of the Nigerian oil and gas industry local content initiative. *Energy Mix Report*. https://www.energymixreport.com/an-overview-of-the-nigerian-oil-and-gas-industry-local-content-initiative

Ovbagbedia, O. O. & Ochieng, E. G. (2016). Impact of organizational culture on knowledge transfer in Nigerian heavy engineering projects. *Management, Procurement and Law, 168*(5), 241-247. http://dx.doi.org/10.1680/mpal/.1400030

Owusu-Manu, D., Edwards, D. J., Parn, E.A., Antwi-Afari, M. F., & Aigbavboa, C. (2018). The knowledge enablers of knowledge transfer: a study in the

construction industries in Ghana. *Journal of Engineering, Design and Technology,16*(2). 194-210. https://doi.org/10.1108/JEDT-02-2017-0015

Palaganas, E., Sanchez, M. C., Molintas, M.V.P. & Caricativo, R. D. (2018). Reflexivity in qualitative research: A journey of learning. *The Qualitative Report, 22*(2), 426-438. https://nsuworks.nova.edu/tqr/vol22/iss2/5

Papa, A., Santoro, G., Tirabeni, L., & Monge, F. (2018). Social media as tool for facilitating knowledge creation and innovation in small and medium enterprises. *Baltic Journal of Management, 13*(3),329-344. https://doi.org/10.1108/BJM-04-2017-0125

Pezalla, A. (2016). *Critiquing and synthesizing the literature. The scholar-practitioner's guide to research design*. MBS Direct Bookshelf. https://mbsdirect.vitalsource.com

Phillippi, J., & Lauderdale, J. (2017), A Guide to Field Notes for Qualitative Research: Context and Conversation. *Qualitative Health Research, 28*(3) 381–388. https://doi.org/10.1177/1049732317697102

Poutanen, P., Soliman, W., & Stahle, P. (2016). The complexity of innovation: an assessment and review of the complexity perspective. *European Journal of Innovation Management, 19*(2), 189-213. https://doi.org/10.1108/EJIM-03-2014-0036

Pyrko, I., & Dorfler, V. (2013). Trans-organizational knowledge: The 4I framework revisited. *British Academy of Management,* 1-20. https://www.bam.ac.uk/

Purushothaman, A. (2016). Organizational learning: A road map to evaluate learning

outcomes in knowledge intensive firms. *Development and Learning in Organization, 29*(3), 11-14. https://doi.org/10.1108/DLO-07-2014-0053

Qin, H., Wang, H., & Johnson, A. (2020). Understanding the information needs and information-seeking behaviors of new-generation engineering designers for effective knowledge management. *Aslib Journal of Information Management*, 1-16. https://doi.org/10.1108/ajim-04-2020-0097

Ramanigopal, C. (2013). Knowledge management for the oil and gas industry: opportunities and challenges. *Advances in Management,6*(8). 3-8. http://www.managein.net/bk_issue/abst_6_8.htm

Ramjeawon, P.V., & Rowley, J. (2020). Enablers and barriers to knowledge management in universities: perspectives from South Africa and Mauritius. *Aslib Journal of Information Management,* 2050-3806. https://doi.org/10.1108/AJIM-12-2019-0362

Ravitch, S. M., & Carl, N. M. (2016). *Qualitative research: Bridging the conceptual, theoretical, and methodological (2nd ed.)*. Sage

Ravitch, S., & Riggan, M. (2017). Reason & rigor: *How conceptual frameworks guide research. (2nd ed.)*. Sage.

Razzaq, S., Shujahat, M., Hussain, S., Nawaz, F., Wang, M., Ali, M., & Tehseen, S. (2019). Knowledge management, organizational commitment and knowledge-worker performance: The neglected role of knowledge management in the public sector. *Business Process Management Journal, 25*(5), 923-947. http://dx.doi.org/10.1108/BPMJ-03-2018-0079

Reinmoeller, P., & van Baardwijk, N. (2005). The link between diversity and resilience. *MIT Sloan Management Review,46*(4),61-65. https://www.academia.edu/6146588/The_Link_Between_Diversity_and_Resilience.

Rovik, K. A. (2016). Knowledge transfer as translation: review and elements of an instrumental theory. *International Journal of Management Reviews,3*.1-21 https://doi.org/10.1111/ijmr.12097

Roy, S., & Mitra, J. (2018). Tacit and explicit knowledge management and assessment of quality performance of public R&D in emerging economies: An Indian perspective. *Journal of Organizational Change Management, 31*(1), 188-214. https://doi.org/10.1108/JOCM-06-2017-0236

Saldana, J. (2016). *The coding manual for qualitative researchers* (3rd ed.). Sage Publications.

Statsenko, L., Gorod, A., & Ireland, V. (2018). A complex adaptive systems governance framework for regional supply networks. *Supply Chain Management: An International Journal, 23*(4), 293–312. https://doi.org/10.1108/SCM-08-2017-0279

Stojanovic-Aleksic, V., Nielsen, J. E., & Boskovic, A. (2019). Organizational prerequisites for knowledge creation and sharing: empirical evidence from Serbia. *Journal of Knowledge Management, 23*(8), 1543-1565. https://doi.org/10.1108/JKM-05-2018-0286

Saini, M., Arif, M., & Kulonda, D. J. (2018). Critical factors for transferring and sharing

tacit knowledge within lean and agile construction processes. *Construction Innovation,18*(1). 64-89. https://doi.org/10.1108/CI-06-2016-0036

Schilling, J., & Kluge, A. (2009) Barriers to organizational learning: An integration of theory and research. *International Journal of Management Reviews, 11*(3). 337–360. https://doi.org/10.1111/j.1468-2370.2008.00242.x

Secundo, G., Schiuma, G., & Passiante, G. (2017). Entrepreneurial learning dynamics in knowledge-intensive enterprises. *International Journal of Entrepreneurial Behavior & Research, 23*(3), 366-380. https://doi.org/10.1108/IJEBR-01-2017-0020

Shahzad, K., Bajwa, S. U., Siddiqi, A.F.I., Ahmed, F., & Sultani, A.R. (2016). Integrating knowledge management (KM) strategies and processes to enhance organizational creativity and performance: An empirical investigation. *Journal of Modelling in Management, 11*(1), 154-179. https://doi.org/10.1108/JM2-07-2014-0061

Spanos-Dunfey, T. (2019). What is social change and why should we care? Southern New Hampshire University. https://www.snhu.edu/about-us/news-and-events/2017/11/what-is-social-change

Spraggon, M., & Bodolica, V. (2017). Collective tacit knowledge generation through play: Integrating socially distributed cognition and transactive memory systems. *Management Decision, 55*(1),119-135. https://doi.org/10.1108/MD-05-2015-0173

Stephan, U., Patterson, M., Kelly, C., & Mair, J. (2016). Organizations driving positive social change: A review and an integrative framework of change processes. *Journal of Management, 42*(5). 1250-1281.

https://doi.org/10.1177/0149206316633268

Sumbal, S. M., Tsui, E., & See-to, E.W. K. (2017). Interrelationship between big data and knowledge management: an exploratory study in the oil and gas sector. *Journal of Knowledge Management, 21*(1), 180-196. https://doi.org/10.1108/JKM-07-2016-0262

Sun, Y., Zhou, X., Jeyaraj, A., Shang R., & HI, F. (2019). The impact of enterprise social media platforms on knowledge sharing: An affordance lens perspective. *Journal of Enterprise Information Management, 32*(2). 233-250. https://doi-org.ezp.waldenulibrary.org/10.1108/JEIM-10-2018-0232

Sweetman, R., & Conboy. K (2018). Portfolios of Agile Projects: A complex adaptive systems' agent perspective. *Project Management Journal, 49*(6). 18-38. https://doi.org/10.1177/8756972818802712

Terhorst, A., Lusher, D., Bolton, D., Elsum, I., & Wang, P. (2018). Tacit knowledge sharing in open innovation projects. *Project Management Journal, 49*(4) 5–19. https://doi.org/10.1177/8756972818781628

Theofanidis, D., & Fountouki, A. (2018). Limitations and delimitations in the research process. *Perioperative Nursing, 7*(3), 155–162. https://doi.org/10.5281/zenodo.2552022

Thompson, S.P. & Valentinov, V. (2017), The neglect of society in the theory of the firm: a systems theory perspective, *Cambridge Journal of Economics, (41)*4, 1061-1085. https://doi.org/10.1093/cje/bew072

Torabi, F., & El-Den, J. (2017). The impact of knowledge management on organizational

productivity: A case study on Koosar Bank of Iran. *Procedia Computer Science*, *124*(1), 300–310. https://doi.org/10.1016/j.procs.2017.12.159

Torres, C. L. F., Olvera-Vargas, L. A., Gomez, J. S., & Contreras-Medina, D. I. (2020). Discovering innovation opportunities based on SECI model: reconfiguring knowledge dynamics of the agricultural artisan production of agave-mezcal, using emerging technologies. *Journal of Knowledge Management,* 1-24. https://doi.org/10.1108/JKM-01-2020-0078

Turner, J. R. & Baker, R. M. (2019). Complexity theory: An overview with potential applications for social sciences. *Systems,*1-23. https://doi.org/10.3390/systems7010004

Ugochukwu, S. T., & Onyekwena, T. (2016). Participation of indigenous contractors in Nigerian public sector construction projects and their challenges in managing working capital. *International Journal of Civil Engineering, Construction and Estate Management, 1*(1), 1-21. http://www.eajournals.org/wp-content/uploads/Participation-Of-Indigenous-Contractors-In-Nigerian-Public-Sector-Construction-Projects.

Ugwu, C. I. & Ekere, J. N. (2018). The role of knowledge management in providing innovative services in university libraries in Nigeria A structural equation modeling approach. *Global Knowledge, Memory, and Communication, 67*(6/7),350-376. https://doi.org/10.1108/GKMC-10-2017-0086

Vajiheh S., & Zeynab, S. (2016) Organizational learning as a key role of organizational success. *Social and Behavioral Sciences,* 230, 219 – 225.

https://core.ac.uk/download/pdf/82163156.

Vendrell-Herrero, F., Darko, C. K., & Ghauri, P. (2020). Knowledge management competences, exporting and productivity: Uncovering African paradoxes. *Journal of Knowledge Management, 24*(1), 81-104. https://doi.org/10.1108/JKM-07-2018-0433

Vourvachis, P., & Woodward, T. (2016). Content analysis in social and environmental reporting research: trends and challenges. *Journal of Applied Accounting Research, 16(*2), 166-195. https://doi.org/10.1108/JAAR-04-2013-0027

Wahda, (2017). Mediating effect of knowledge management on organizational learning culture in the context of organizational performance. *Journal of Management Development*, *36*(7), 846-858. https://doi.org/10.1108/JMD-11-2016-0252

Wahyono, (2020). The mediating effects of product innovation in relation between knowledge management and competitive advantage. *Journal of Management Development, 39*(1), 18-30. https://doi.org/10.1108/JMD-11-2018-0331.

Walden Social Change Report, (2017). *Walden 2020: A vision for social change.* https://www.waldenu.edu/-/media/walden/files/about-walden/walden-university-2017-social-change-report-final-v-2

West, P.W. (2016). Simple random sampling of individual items in the absence of a sampling frame that lists the individuals. *New Zealand Journal of Forestry Science, 46*(15), 1-7. https://doi.org/10.1186/s40490-016-0071-1

Wilson, J.P. & Campbell, L. (2016). Developing a knowledge management policy for ISO 9001: 2015. *Journal of Knowledge Management, 20*(4),829-844.

https://doi.org/10.1108/JKM-11-2015-0472

Xu R., Xiaofang D., & Lihua L. (2018). Knowledge transfer between projects within project-based organizations: the project nature perspective. *Journal of Knowledge Management*, *22*(5), 1082-1103. https://doi.org/10.1108/JKM-05-2017-0184 .

Yadav, D. K., Pant, M., & Seth, N. (2020). Analyzing enablers of knowledge management in improving logistics capabilities of Indian organizations: A TISM approach. Journal of Knowledge Management, 24(7),1559-1584. https://doi.org/10.1108/JKM-10-2019-0535

Yao, J. Crupi, A., Minin, A. D., & Zhang, X. (2020). Knowledge sharing and technological innovation capabilities of Chinese software SMEs. *Journal of Knowledge Management, 24*(3), 607-634. https://doi.org/10.1108/JKM-08-2019-0445

Yee, M. Y., Tan, C. L., & Thurasamy, R. (2019). Back to basics: building a knowledge management system. *Strategic Direction, 35* (2). 1-3. https://doi-org.ezp.waldenulibrary.org/10.1108/SD-07-2018-0163

Yin, R. K. (2016). *Qualitative research from start to finish (2nd ed.)*. New York, NY: Guilford.

Yin, R. K. (2018). *Case study research and applications: Designs and methods (6th ed.)*. Sage

Youssef, M., Haak-Saheem, W., & Youssef, E. M. (2017). A structural equation model for knowledge sharing behavior in an emerging economy. *Journal of Knowledge Management, 21*(4), 925-945. https://doi.org/10.1108/JKM-10-2016-0470

Zapata-Cantu, L. (2020). Boosting innovation in emerging markets: the moderating role of human capital. *International Journal of Emerging Markets,* 1-21. https://doi.org/10.1108/IJOEM-01-2019-0015

Zappa, P., & Robins, G. (2016). Organizational learning across multi-level networks. Social Networks, 44, 295-306. https://doi.org/10.1016/j.socnet.2015.03.003

Zhou, S., Battaglia, M., & Frey, M. (2018). Organizational learning through disasters: a multi-utility company's experience. *Disaster Prevention and Management, 27*(2),243-254. https://doi.org/10.1108/DPM-11-2017-0290

Appendix A: Interview Questions

1. Tell me about your role as an engineering practitioner in your organization.
2. Tell me about the interrelationships and interdependencies among the functional roles in your organization.
3. How would you describe the notion of tacit knowledge conversion to organizational knowledge?
4. How would you describe the knowledge management systems and practices in your organization?
5. What is the role your organizational culture play in implementing effective knowledge management systems and practices?
6. What is the role your organizational structure play in implementing effective knowledge management systems and practices?
7. What are the barriers you believe hinder the acquisition of knowledge in your organization?
8. What are the barriers you believe hinder transfer of knowledge in your organization?
9. What are the barriers you believe hinder the retention of knowledge in your organization?
10. What are the enablers you believe could facilitate the acquisition of knowledge in your organization?
11. What are the enablers you believe could facilitate transfer of knowledge in your organization?
12. What are the enablers you believe could facilitate the retention of knowledge in your organization?

13. How would you describe the lessons learned process on projects in your organization?

14. How would you describe the role knowledge sharing plays in your organization's performance?

15. What more can you describe to me about what organizations can do to effectively convert tacit knowledge to organizational knowledge?

Appendix B: Interview Protocol

Date:
Time:
Interviewee Code #:
Sex:
Academic Qualification:
Designation:
Number of Projects worked on:
Number of cognate years of experience as an Engineering Practitioner:
Number of years worked in current company:

Parts of the Interview	**Interview Questions**
Introduction	Hello. My name is Babajide Ojuola. Thank you for volunteering to take part in this interview. Please make yourself comfortable. Your insights will be vital to this study. This interview is going to be recorded, and I would take down notes as we go along. I estimate the interviewing would last for between 60 to 90 minutes Let me again reiterate that if at any point you feel uncomfortable and would like to withdraw your consent for participation feel free to do so. Also, if there are questions you do not understand, interject, and let me know so I could clarify. Also, by default, I will not identify you or your organization during publication of the results. Before we begin, do you have any questions, clarifications or concerns?
Question 1:	1. Tell me about your role as an engineering practitioner in your organization. a. Can you describe your job activities? b. What are the various functional roles that interface within your department? c. What are the modalities for exchange of information and knowledge between the different functions?

	d. How does your role in your unit play out within the framework of the overall organizational structure? Prompt- Follow-up on any interesting ideas for more details.
Question 2:	2. Tell me about the interrelationships and interdependencies among the functional roles in your organization. a. Could you give me some examples? b. How do these interrelationships and interdependencies impact the flow of knowledge and information? Prompt- Follow-up on any interesting ideas for more details.
Question 3:	3. How would you describe the notion of tacit knowledge conversion to organizational knowledge? a. Could you give me some examples? Prompt- Follow-up on any interesting ideas for more details.
Question 4:	4. How would you describe the knowledge management systems and practices in your organization? a. How effective are these knowledge management systems and practices? b. How can these knowledge management systems and practices be improved? Prompt- Follow-up on any interesting ideas for more details-
Question 5:	5. What is the role your organizational culture plays in implementing effective knowledge management systems and practices? a. Can you give examples? b. What is the role of top management? c. What is the role of middle-level management? d. What is the role of other workers?

	Prompt- Follow-up on any interesting ideas for more details
Question 6:	6. What is the role your organizational structure plays in implementing effective knowledge management systems and practices? a. Can you give examples? b. What is the role of top management within this structure? c. What is the role of middle-level management within this structure? d. What is the role of other workers within this structure? Prompt- Follow-up on any interesting ideas for more details
Question 7:	7. What are the barriers you believe hinder the acquisition of knowledge in your organization? a. Can you give examples? Prompt- Follow-up on any interesting ideas for more details
Question 8:	8. What are the barriers you believe hinder transfer of knowledge in your organization? a. Can you give examples? Prompt- Follow-up on any interesting ideas for more details
Question 9:	9. What are the barriers you believe hinder the retention of knowledge in your organization? a. Can you give examples? Prompt- Follow-up on any interesting ideas for more details
Question 10:	10. What are the enablers you believe could facilitate the acquisition of knowledge in your organization? a. Can you give examples? Prompt- Follow-up on any interesting ideas for more details
Question 11:	11. What are the enablers you believe could facilitate transfer of knowledge in your organization? a. Can you give examples?

	Prompt- Follow-up on any interesting ideas for more details
Question 12:	12. What are the enablers you believe could facilitate the retention of knowledge in your organization? a. Can you give examples? Prompt- Follow-up on any interesting ideas for more details
Question 13:	13. How would you describe the process by which lessons learned are captured on projects in your organization? a. Can you give examples? b. What is your opinion of projects as gateways for the acquisition of new knowledge? Prompt- Follow-up on any interesting ideas for more details
Question 14:	14. How would you describe the role knowledge sharing plays in your organization's performance? a. Can you give examples? Prompt- Follow-up on any interesting ideas for more details
Question 15:	15. What more can you describe to me about what organizations can do to effectively to convert tacit knowledge to organizational knowledge?
Closing statement	1. We have come to the end of this interview session. Thank you for your time. You have shared valuable insights that will be very useful for this study. 2. If you have any questions about anything, please feel free to ask now. 3. I will contact you if I need to clarify any statement and would share the transcripts and analysis of the data with you at the end of the process. You will have seven days to respond, otherwise I would assume you agree with my analysis. 4. Many thanks once again.

Appendix C: Approvals to Reprint Figures

4I Organizational Learning Framework: Depicting Organizational Learning as a Dynamic Process
(Crossan et al.,1999)
Academy of Management Review

RE: Permission to Reproduce 4I Organizational Learning Framework in an article published by the Academy of Management Review
Irina Burns < >
Wed 2/24/2021 10:48 PM
To: Babajide Ojuola
Dear Babajide Ojuola,

We grant you permission to use the framework in your dissertation. Please include the full source of the original publication and indicate that it is being reprinted with the permission from the Academy of Management.

Thank you,

Irina

Irina Burns
Senior Managing Editor and Licensing Services Manager
Academy of Management

From: Babajide Ojuola <bu>
Sent: Thursday, February 18, 2021 12:13 PM
To: AOM Admin < >; John Pescatore < >; Joe Colella < >; Steve Whalen <sg>
Subject: Permission to Reproduce 4I Organizational Learning Framework in an article published by the Academy of Management Review

Dear Academy of Management Review,

Please refer to the email trail below.

My name is Babajide Ojuola, I am a Doctoral candidate of Walden University, USA. I am currently working on my Doctoral Dissertation titled Knowledge Management in Engineering Companies in the Nigeria Oil and Gas Industry.
The 4I Organizational Learning Framework is one of the frameworks that I intend to use in my research and your article "An organizational learning framework: From intuition to

institution" is one of the articles I am using for my study. I have already gotten Professor Crossan's permission to reproduce the framework however she asked me to also get permission from your esteemed organization to reproduce the 4I Organizational Learning Framework: Depicting Organizational Learning as a Dynamic Process, on page 532 of the article in the Academy of Management Review journal for use in my Doctoral Dissertation.

I have attached a copy of a Letter from Walden University confirming my status as Doctoral Candidate for your reference.

I hope to receive your kind permission to reproduce this framework for use in my Doctoral Dissertation as I look forward to your kind feedback.

Best Regards,

Babajide Ojuola
Doctoral Candidate (Walden University)

From: Crossan, Mary < >
Sent: Tuesday, January 26, 2021 6:45 PM
To: Babajide Ojuola < >
Cc: <k>
Subject: Re: Permission to Reproduce 4I Organizational Learning Framework

Although it is fine with me you will need to check with Academy of Management Review.

Regards

Mary

On Jan 26, 2021, at 12:30 PM, Babajide Ojuola < > wrote:

ICAS knowledge management model
(Dalkir, 2011)
The MIT Press

Re: Permission to Reproduce the "ICAS knowledge management model" and "The known and unknown matrix"

Babajide Ojuola
Sun 2/21/2021 9:07 PM
To:Aya Satoh <

Hello Aya,

Thank you for the kind permission to reprint figure 3.11, "ICAS knowledge management model," from Knowledge Management in Theory and Practice by Kimis Dalkir in my dissertation. I will surely credit the MIT Press source in my dissertation.

With regards to Figure 4.2, "Known-unknown matrix," you are right reproduced from another source—Knowledge Management by Carl Frappaolo (Capstone Publishing, 2006). I will try to reach out to the copyright holders of the original image for permission. Otherwise i will remove it from my study altogether.

Many thanks again for your help.

Best Regards,

Babajide Ojuola
Doctoral Candidate (Walden University)

From: Aya Satoh < >
Sent: Friday, February 19, 2021 6:38 PM
To: Babajide Ojuola < >
Subject: Re: Permission to Reproduce the "ICAS knowledge management model" and "The known and unknown matrix"

Dear Babajide,

Thank you for your request.

I'm happy to grant nonexclusive permission to reprint figure 3.11, "ICAS knowledge management model," from *Knowledge Management in Theory and Practice* by Kimis Dalkir in your dissertation, for academic non-commercial use only. Please credit the MIT Press source in your dissertation.

Figure 4.2, "Known-unknown matrix," seems to be reproduced from another source—*Knowledge Management* by Carl Frappaolo (Capstone Publishing, 2006). I've attached a screenshot of the figure from the Dalkir book here for reference. If this is the case, you would need to reach out to the copyright holders of the original image for permission. Unfortunately, I don't have access to the Frappaolo book, but if you know this not to be the case, please let me know and I can grant permission to use the image from the Dalkir book.

Please let me know if you have any questions or if there's anything else I can do for you.

With best wishes,
Aya

><><><><><><
Aya Satoh
Subsidiary Rights Associate
she/her/hers
The MIT Press

Complexity Theory Framework
(Turner & Baker, 2019)
Professor John R. Turner

Re: Permission to Reproduce Complexity Theory Framework

John Turner < >
Tue 1/26/2021 6:17 PM

To: Babajide Ojuola
Babajide,

Thanks for reaching out. Yes, feel free to use any part of the article for your dissertation. If willing, send a copy of your dissertation after you have defended. I would be interested in seeing your work.

Best of luck.

Thanks,
John R. Turner, PhD

On Jan 26, 2021, at 11:07 AM, Babajide Ojuola < > wrote:

Dear Professor Turner,
My name is Babajide Ojuola, I am a Doctoral candidate of Walden University, USA. I am currently working on my Doctoral Dissertation titled Knowledge Management in Engineering Companies in the Nigeria Oil and Gas Industry.
Complexity Theory is one of the key theories that underpin my research and your article "Complexity Theory: An Overview with Potential: Applications for the Social Sciences" is one of the articles I am using for my study and I will like to use this medium to seek your permission to reproduce the complexity theory framework on page 13 of the article for use in my Doctoral Dissertation.
I have attached a copy of a Letter from Walden University confirming my status as Doctoral Candidate for your reference.
I hope to receive your kind permission to reproduce this framework for use in my Doctoral Dissertation as I look forward to your kind feedback.
Best Regards,
Babajide Ojuola
Doctoral Candidate (Walden University)

Appendix D: Nondisclosure Agreement

1717 W. 6th St. Suite 310, Austin, TX 78703
finance@rev.com | www.rev.com

CLIENT NON-DISCLOSURE AGREEMENT

This CLIENT NON-DISCLOSURE AGREEMENT, effective as of Jan 1, 2021 (this "Agreement") is entered into by Rev.com, Inc. ("**Rev**") and Customer identified below ("Customer", "Client") is made to set forth Rev's agreement with respect to certain proprietary information being provided to Rev.com and/or Temi.com by the undersigned Client for the purpose of performing transcription, captioning and other document related services (the "Rev.com Services"). In consideration for the mutual agreements contained herein and the other provisions of this Agreement, the parties hereto agree as follows:

1. Scope of Confidential Information

1.1. "Confidential Information" means, subject to the exceptions set forth in Section 1.2 hereof, any documents, text or other files supplied by Client to Rev for the purpose of performing the Rev Services.

1.2. Confidential Information does not include information that: (i) was available to Rev prior to disclosure of such information by Client and free of any confidentiality obligation in favor of Client known to Rev at the time of disclosure; (ii) is made available to Rev from a third party not known by Rev at the time of such availability to be subject to a confidentiality obligation in favor of Client; (iii) is made available to third parties by Client without restriction on the disclosure of such information; (iv) is or becomes available to the public other than as a result of disclosure by Rev prohibited by this Agreement; or (v) is developed independently by Rev or Rev's directors, officers, members, partners, employees, consultants, contractors, agents, representatives or affiliated entities (collectively, "Associated Persons").

2. Use and Disclosure of Confidential Information

2.1. Rev will keep secret and will not disclose to anyone any of the Confidential Information, other than furnishing the Confidential Information to Associated Persons; provided that such Associated Persons are bound by agreements respecting confidential information. Rev will use reasonable care and adequate measures to protect the security of the Confidential Information and to attempt to prevent any Confidential Information from being disclosed or otherwise made available to unauthorized persons or used in violation of the foregoing.

2.2. Notwithstanding anything to the contrary herein, Rev is free to make, and this Agreement does not restrict, disclosure of any Confidential Information in a judicial, legislative or administrative investigation or proceeding or to a government or other regulatory agency;

provided that, if permitted by law, Rev provides to Client prior notice of the intended disclosure and permits Client to intervene therein to protect its interests in the Confidential Information, and cooperate and assist Client in seeking to obtain such protection.

3. Certain Rights and Limitations

3.1. All Confidential Information will remain the property of Client.

3.2. This Agreement imposes no obligations on either party to purchase, sell, license, transfer or otherwise transact in any products, services or technology.

3.3. This Agreement is subject to the limitations of liability agreed to in Rev's Terms of Service, found at https://www.rev.com/about/terms ("Terms of Service").

4. Termination

4.1. Upon Client's written request, Rev agrees to use good faith efforts to destroy and, if requested, to certify the destruction of all Confidential Information; provided that Rev may retain a summary description of Confidential Information for archival purposes.

4.2. The rights and obligations of the parties hereto contained in Sections 2 (Use and Disclosure of Confidential Information) (subject to Section 2.1), 3 (Certain Rights and Limitations), 4 (Termination), and 5 (Miscellaneous) will survive the return of any tangible embodiments of Confidential Information and any termination of this Agreement.

5. Miscellaneous

5.1. This Agreement will be governed by and construed in accordance with the laws of the State of Texas governing such agreements, without regard to conflicts-of-law principles. The sole and exclusive jurisdiction and venue for any litigation arising out of this Agreement shall be an appropriate federal or state court located in Travis County, Texas and the parties agree not to raise, and waive, any objections or defenses based upon venue or forum non conveniens.

This Agreement (together with the Terms of Use and any other agreement for the Rev Services) contains the complete and exclusive agreement of the parties with respect to the subject matter hereof and supersedes all prior agreements and understandings with respect thereto, whether written or oral, express or implied. If any provision of this Agreement is held invalid, illegal or unenforceable by a court of competent jurisdiction, such will not affect any other provision of this Agreement, which will remain in full force and effect. No amendment or alteration of the terms of this Agreement will be effective unless made in writing and executed by both parties hereto. A failure or delay in exercising any right in respect to this Agreement will not be presumed to operate as a waiver, and a single or partial exercise of any right will not be presumed to preclude any subsequent or further exercise of that right or the exercise of any other right. Any modification or waiver of any provision of this Agreement will not be effective

unless made in writing. Any such waiver will be effective only in the specific instance and for the purpose given.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed below by their duly authorized signatories:

CLIENT:

Company Name:

Name: Babajide Ojuola

Title: Doctoral Student (Walden University)

Date: July 14, 2021

Address for notices to Client: 94 Awolowo Road Ikoyi Lagos Nigeria

REV.COM, INC.

Shannon Catalano

Shannon Catalano

VP, Corporate Controller

January 1, 2021