KNOWLEDGE CREATION ENHANCEMENT IN THE ROYAL MALAYSIAN NAVY (RMN) FLEET

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KUALA LUMPUR

2020

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DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE OF DOCTOR OF MANAGEMENT

FACULTY OF BUSINESS AND ACCOUNTANCY
UNIVERSITY OF MALAYA
KUALA LUMPUR

2020

UNIVERSITY OF MALAYA

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Matric No: 17014096/1 (CXA 160006)

Name of Degree: Doctor of Management (DMgt)

Title of Project Paper/Research Report/Dissertation/Thesis:

Knowledge Creation Enhancement in the Royal Malaysian Navy (RMN) Fleet

Field of Study: Business Management

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KNOWLEDGE CREATION ENHANCEMENT IN THE ROYAL MALAYSIAN NAVY (RMN) FLEET

ABSTRACT

This study aims to gauge the extent of knowledge creation processes in the Royal Malaysian Navy (RMN) fleet with the use of the SECI (socialization, externalization, combination, internalization) knowledge creation process model proposed by Nonaka and Takeuchi (1995). This is in order for the researcher to propose a knowledge creation enhancement framework to the organization. Case study method was utilized in this study and both descriptive and interpretive analyses were employed to achieve the research aims. The descriptive data were used to triangulate the interpretive data and documentation reviewed by dividing the findings in accordance to the SECI conversion process. 234 self-administered questionnaires were used to investigate to what extent the RMN fleet performs the SECI and 15 semi-structured face-to-face interviews provided insights about how the RMN fleet perform these activities. The survey data were analyzed by using Statistical Package for Social Sciences (SPSS) Version 24 software to get descriptive statistics and transcriptions from the interviews were analyzed manually by content analysis method for interpretive data, to get the themes and sub-themes of the study. NVivo 12 software were also used to managed all the data from the interviews by identifying at the noticeable patterns to be connected to the study. The findings indicate that the SECI processes were used for knowledge creation in the RMN fleet. However, some limitations minimized the benefits in all creation of knowledge modes in SECI processes within the RMN. The externalization and internalization processes in creating knowledge were seen to be slightly prominent when compared to socialization and combination, revealing that in the RMN fleet all four modes of knowledge creation have almost equal importance. However, the use of each process is mostly subjected to the higher management support and some cultural

contexts. The findings also suggest that the SECI processes, regardless it is a single or as a whole process, influence the creation of knowledge by increasing the generation of ideas, documentation of knowledge, updating the knowledge and sharing of knowledge for the benefit of the organization.

Keywords: knowledge creation, knowledge management, SECI, tacit knowledge, explicit knowledge.

PENINGKATAN PENCIPTAAN ILMU PENGETAHUAN DI ARMADA TENTERA LAUT DIRAJA MALAYSIA (TLDM)

ABSTRAK

Kajian ini bertujuan untuk mengukur tahap proses penciptaan ilmu pengetahuan di dalam Armada Tentera Laut Diraja Malaysia (TLDM) dengan menggunakan model proses penciptaan pengetahuan SECI (*socialization, externalization, combination, internalization*) yang dicadangkan oleh Nonaka dan Takeuchi (1995). Ini adalah untuk membolehkan penyelidik mencadangkan rangka kerja peningkatan penciptaan pengetahuan kepada organisasi. Kaedah kajian kes telah digunakan dalam kajian ini dan kedua-dua analisis deskriptif dan interpretatif digunakan untuk mencapai matlamat penyelidikan. Data deskriptif digunakan untuk mengesahkan dokumentasi data tafsiran yang ditinjau dengan membahagikan penemuan, sesuai dengan proses penciptaan pengetahuan SECI. Soal selidik yang dikendalikan sendiri terhadap 234 responden telah digunakan untuk menyiasat sejauh mana Armada TLDM melaksanakan proses SECI dan 15 wawancara secara semi-struktur memberikan pandangan tentang bagaimana Armada TLDM melaksanakan aktiviti ini. Data tinjauan dianalisis dengan menggunakan perisian *Statistical Package for Social Sciences* (SPSS) Versi 24 untuk mendapatkan statistik dan transkrip deskriptif dan wawancara dianalisis secara manual dengan kaedah analisis kandungan untuk data tafsiran bagi memperolehi tema dan sub-tema kajian. Perisian NVivo 12 juga diguna untuk menguruskan semua data daripada temubual dengan mengenal pasti corak yang ketara untuk dikaji dengan lebih lanjut. Penemuan menunjukkan bahawa proses SECI digunakan untuk penciptaan pengetahuan di dalam Armada TLDM. Walau bagaimanapun, beberapa batasan meminimumkan faedah dalam semua penciptaan mod pengetahuan dalam proses SECI di dalam Armada TLDM. Proses *externalization* dan *internalization* dalam mencipta pengetahuan dilihat sedikit menonjol apabila dibandingkan dengan *sosialization* dan *combination*,

mendedahkan bahawa di dalam Armada TLDM, kesemua empat mod penciptaan pengetahuan mempunyai kepentingan yang hampir sama. Walau bagaimanapun, penggunaan setiap proses kebanyakannya tertakluk kepada sokongan pengurusan yang lebih tinggi dan beberapa konteks budaya. Penemuan ini juga mencadangkan bahawa proses SECI, tidak kira satu atau keseluruhan proses, mempengaruhi penciptaan pengetahuan dengan meningkatkan generasi idea, dokumentasi pengetahuan, mengemaskini pengetahuan dan berkongsi pengetahuan untuk kepentingan organisasi.

Kata kunci: penciptaan pengetahuan, pengurusan pengetahuan, SECI, pengetahuan tersirat, pengetahuan eksplisit.

ACKNOWLEDGEMENT

Alhamdullillah, I am very humble and grateful on the completion of this study and would like to thank Allah, the Almighty, the Most Gracious and the Most Merciful, who has empowered and enabled me to complete this dissertation successfully. To you my love and other half, YAM Tunku Muna Najiah binti Almarhum Sultan Iskandar Al-Haj, this dissertation is dedicated especially for you. Words alone cannot describe how grateful, thankful and blessed I am to have your love, patience, understanding and support. To my lovely children who have kept me cheerful all the time, I love you all dearly and hope everybody will be successful in your future undertakings. My love and appreciation also go to my father and other family members for their constant and untiring support. Very deep warm thanks and prayers go to my late mother, late father- and mother-in-law, who had given me so much support during their life. They are always in my memory and I will miss them forever. Al Fatihah.

I am indebted also to my supervisor, Associate Professor Dr Noor Ismawati binti Jaafar, who has given me of her time to provide valuable feedback. The constructive criticism has meant a lot to my work and I want to express my deep thanks for her guidance, patience, time and enthusiasm throughout all the stages of my doctoral study. Without her continuous assistance, support and encouragement, this dissertation could not have been completed. I thoroughly enjoyed the process of sharing knowledge with her and appreciate her great effort. Appreciation to my sponsors, the Malaysian Armed Forces (MAF) and the Royal Malaysian Navy (RMN), for giving the support throughout my doctoral study and last but not least, thanks also to my doctoral colleagues and the departmental offices of Institut Pegawai Kanan Tentera Darat (INSPEKA) and Graduate School of Business (GSB), Faculty of Business and Accountancy, University of Malaya, for their continuous support in making my dream a reality.

"Real life isn't always going to be perfect or go our way, but the recurring acknowledgement of what is working in our lives can help us not only to survive but surmount our difficulties".

Sarah Ban Breathnach

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LIST OF ABBREVIATIONS

AAW	:	Anti Air Warfare
ACT	:	Adoptive Control of Thought
ANOVA	:	Analysis of Variance
ASW	:	Anti Submarine Warfare
ASuW	:	Anti Surface Warfare
BOI	:	Board of Inquiry
BRL	:	*Buku Rujukan Laut*
CBT	:	Computer-Based Trainer
CD	:	Compact Disc
CO	:	Commanding Officer
DVD	:	Digital Video Disc
EEZ	:	Exclusive Economic Zone
EW	:	Electronic Warfare
FCE	:	Fleet Commander East
FCW	:	Fleet Commander West
HOD	:	Head of Department
HQ	:	Headquarters
ICT	:	Information and Communication Technology
ISI	:	Institute for Scientific Information
IT	:	Information Technology
JTB	:	Justified True Belief
KBV	:	Knowledge-Based View
KM	:	Knowledge Management
LCS	:	Littoral Combat Ship

LMS	:	Littoral Mission Ship
MAF	:	Malaysian Armed Forces
MMEA	:	Malaysian Maritime Enforcement Agency
MPCSS	:	Multi-Purpose Command Support Ship
MRSS	:	Multi-Role Support Ship
NGPV	:	New Generation Patrol Vessel
OEM	:	Original Equipment Manufacturer
OJT	:	On Job Training
PUSTAKMAR	:	*Pusat Taktis Maritim*
RMAF	:	Royal Malaysian Air Force
RMN	:	Royal Malaysian Navy
RMP	:	Royal Malaysian Police
SECI	:	Socialization Externalization Combination Internalization
SOP	:	Standard Operating Procedure
SPSS	:	Statistical Package for Social Sciences
UiTM	:	Universiti Teknologi MARA
UM	:	University of Malaya
UMREC	:	University of Malaya Research Ethic Committee
UNIRAZAK	:	Universiti Tun Abdul Razak
UNITAR	:	Universiti Tun Abdul Razak
US	:	United States
UTM	:	Universiti Teknologi Malaysia

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CHAPTER 1: INTRODUCTION

1.1 Background of Study

Survivability and development of organizations depend on knowledge (Memon, 2015). Shih, Chang, and Lin (2010) posited that in a knowledge economy, the main input for organizations is knowledge, and personnel within organizations deal with information that is transformed into knowledge. Tsai and Li (2007) added that the productivity of any organization would be tripled if the organization knew what it was supposed to know. Memon (2015) posited that regardless of whether an organization is public or private, it is imperative that its personnel are creative and knowledgeable. He further added that the roles played by these personnel are important in that they involve the current dynamic and rapid exchange of complex knowledge crucial to the organization.

Knowledge management (KM) is deemed to be suitable for military organizations, especially in managing contemporary military operations. The management of knowledge needs to be systematically done. Military organizations all around the world agree that the personnel within their organizations are actually their main and most vital assets and the sources of their organizational knowledge (Manuri, 2012). Military organizations, in particular the Royal Malaysian Navy (RMN), emphasize knowledge creation and knowledge sharing, which are KM processes (Kianto, Vanhala, & Heilman, 2016), in scenarios such as forums, seminars, meetings, and war gaming conducted within the organizations. It is through KM processes, new knowledge is constantly created by organizations and it is merged utilizing a strategic and systematic method, starting with the discovery of knowledge and eventually, new and additional knowledge creation (Mahdi, Nassar & Almsafir, 2018).

This study's focus on creation of knowledge processes is based on the SECI model by Nonaka and Takeuchi (1995a, 1995b). This is to provide insight into the extent to which knowledge creation processes are utilised in the RMN fleet in order to ensure every individual in the fleet shares knowledge created in the form of expertise, ideas, and suggestions that can be used by all personnel in order to remain an effective and efficient organization.

According to Razmerita, Kirchner, and Nielsen (2016), knowledge is viewed as residing within personnel. They further posited that this knowledge is embedded and tacit and thus not simply created, captured and codified, making its management problematic. The problem is with regard to the process of creating and capturing individual and organizational knowledge, systematically, in order to make knowledge accessible to more than one individual. In accordance to Li, Liu and Zhou (2018), obtaining tacit knowledge is a very difficult process for most of the personnel. Often knowledge is acquires through certain sequence or process of interactions, for examples, tacit knowledge is acquired through observation and experience, and explicit knowledge is acquired through books, manuals, minutes, etc. (recorded knowledge). Li et al. (2018) further quoted a saying of "the master teaches the trade, but the apprentice's skill is self-made", because they insisted that traits or attributes like personnel's knowledge background, their learning ability and will, their communication frequency and its complexity and their coding ability, will influence the absorption of knowledge.

When personnel are transferred or retired from an organization, they leave with lots of knowledge that they have accumulated over their working years. This knowledge base must then to be re-created, re-built or reconstructed by new personnel who take up

the posts. Thus, Nielsen and Razmerita (2014) emphasized the need for managers and management to get actively involved in motivating and encouraging knowledge creation and knowledge sharing among personnel. Kianto et al. (2016) also suggested that, management of knowledge can indeed nurture job satisfaction and, in so doing, foster high organizational performance.

On the other hand, Mafabi, Nasiima, Muhimbise, Kaekande, and Nakiyonga (2017) posited that it is important to share created knowledge among personnel because sharing will assist personal mastery through knowledge retention and action learning, such as in cases where knowledgeable personnel quit the job. Knowledge creation processes within the KM could also affect the utilization of adopted or adapted state-of-the-art equipment and technologies in military inventories which are used to achieve advantages in knowledge, thus increasing the sustainable competitive advantage of the organization (Manuri, 2012) or in other words, for the RMN fleet to remain relevant in safeguarding the sovereignty of the nation and its maritime interests.

Hence, in the RMN, saving this created knowledge from dissipating due to personnel transfer or retirement is crucial. The safe operations of the fleet might also be jeopardized without this valuable knowledge. The results would be devastating both for the nation and its people, who are the main stakeholders of the organization. This can be witnessed in the few mishaps or tragedies that have happened within the fleet, even though they were isolated cases (Board of Inquiry (BOI) findings: MTL(N1-2).500-2/15/29 - (5) dated 14 Nov 2017; MTL/NTAD(SEK-UND)/4418/5 - (12) dated 12 Sep 2014). The idea is to get an accident-free or zero-incident fleet since safety is paramount in all operations, training or exercises involving the RMN fleet. Furthermore, the damage done to the economy of the nation would also be severe as currently it is

unclear how the RMN fleet can create and retain the knowledge held by its experienced personnel when they leave the organization.

Meanwhile, the SECI knowledge creation model by Nonaka and Takeuchi (1995a, 1995b) has provided a platform and framework which vastly covers sharing of knowledge and creation of knowledge processes in the field of management and organization (Earl, 2001; von Krogh, Ichijo, & Nonaka, 2000). Thus, the qualitative method of this study utilizes the SECI model to probe the core issues related to the policy framework and knowledge creation strategy perspective of the RMN fleet by conducting a survey and interviewing relevant personnel. Further elaboration on the SECI knowledge creation process model is provided in Chapter 2.

The introduction of the study was covered in the first section of this chapter. Next, Section 1.2 covers the research problem and the problem statement for this study, and Section 1.3 describes the knowledge creation needs of the organization. Section 1.4 explains the significance of the study, Section 1.5 and 1.6 are on the research questions and research objectives before the summary of key definitions in Section 1.7. Finally, Section 1.8 provides an overview of the dissertation structure.

1.2 Research Problem

The RMN fleet has been experiencing some complications with regards to knowledge retention in ships' operations, especially during the changeover of crew. As per the organizational requirement for rotating personnel (*BRL 1066 Jil.I & II, Edisi 3, Bab 4,* 2013), personnel will have fair and equal chances of serving at sea during their service for career progression and rank promotion. According to Maruta (2014), personnel being transferred to another post or retired will leave with substantial

organizational knowledge. This definitely has a negative impact on the operation of the RMN fleet. Knowledge workers are exceptionally crucial and valuable because their value in an organization is essentially intangible and difficult to replicate (Stovel & Bontis, 2002). Each time personnel leave an organization, productivity is affected because of the learning curve involved in job and organizational understanding. RMN personnel, regardless of rank, must serve three to four times over a period of one to three years on board a ship as an essential part of their career progress to equip and qualify themselves for promotion (*BRL 1066 Jil.I & II, Edisi 3, Bab 6,* 2013). This period seems to be too short for knowledge creation processes to take place. In order to prevent further losses of this intellectual capital, senior management of the RMN must find ways and means to codify these intellectual assets in strategical-designed KM (Stovel & Bontis, 2002), which includes knowledge creation processes.

The transformation plan for the RMN will witness more newly built vessels to come into the RMN inventory. The Littoral Combat Ship (LCS) under construction in Lumut (Contract No. KP/PERO/2A/04-0002/RT022-08/DE between Government of Malaysia and Boustead Naval Shipyard Sdn. Bhd., 2008), the Littoral Mission Ship (LMS) being built in China (Contract No. KP/PERO/2E/RT260/2016/DE between Government of Malaysia and Boustead Naval Shipyard Sdn. Bhd., 2016) and the recently announced vessel in the RMN transformation, the Multi Role Support Ship (MRSS), will be added to the inventory list. These assets, fitted with state-of-the-art equipment, are estimated to be worth approximately RM15 billion. Without proper management of the knowledge gained from the Original Equipment Manufacturer (OEM) on how to operate and to maintain those vessels, dissipation or loss of knowledge will occur. Again, to ensure that the RMN does not lose the knowledge, all the four main practices of KM (i.e.,

capturing, storing, sharing and utilization of knowledge) need to be inculcated immediately (Stovel & Bontis, 2002).

Unwanted incidences in the RMN, for instance, collision at sea or fire on board, have been associated with lack of competencies. This is shown in letters by the RMN Chief of Navy addressing Board of Inquiry (BOI) findings (MTL(N1-2).500-2/15/29 - (5) dated 14 Nov 2017; MTL/NTAD(SEK-UND)/4418/5 - (12) dated 12 Sep 2014). Competencies can be defined as the combination of skills, knowledge, attitudes and behaviours of personnel required for performing effectively (Salleh & Sulaiman, 2016). Mishaps are avoidable if every seaman serving on board a vessel has adequate knowledge necessary for competent responses to situations. Liu, Fu, Wang and Fang (2014) further explained that competency is the knowledge owned by the personnel or their skills demonstrated by behaviours at the workplace. Hence, these sets of skills, knowledge and attitudes are related to allow personnel to conduct various tasks (Salleh & Sulaiman, 2016).

Thus, this research focuses on determining the level of knowledge creation processing in the RMN fleet and how a knowledge creation processes enhancement framework can be developed to improve fleet operations.

1.3 Knowledge Creation Importance in the RMN Fleet

In the military context, the inadequacy of KM has been mainly due to low awareness and lack of understanding (Manuri, 2012), thus making the awareness and understanding of knowledge creation processes, especially in the RMN fleet, at an unsatisfactory level. Manuri (2012) observed limitations in his study about the low awareness of the importance of KM and lack of exposure to KM in military

organizational contexts, and these deficiencies definitely influence the awareness and understanding of personnel on knowledge creation processes, as well.

It has been observed that in military organizations, and specifically those of the RMN fleet, most of the data and information are mainly managed manually, and this has affected how personnel manage data and information during operations (Manuri, 2012). There is no specific and dedicated system to create and capture knowledge from the organization and which would later allow all personnel in the fleet to have access, share, disseminate and utilize the knowledge. To make things worse, Memon (2015) insisted that personalized resources of knowledge are very difficult to mimic, and this is actually what happened in the RMN fleet. Hence, the theory used in this study is the SECI knowledge creation process model promulgated by Nonaka and Takeuchi (1995a, 1995b), which forms the foundation for determining the extent of knowledge creation processes used and the needs for knowledge creation particularly within the RMN fleet.

In the RMN fleet scenario, most personnel have attended lots of career courses both in-country or overseas. This knowledgeable human capital comprises high-level personnel who use systematic or non-systematic knowledge from the courses attended to develop new ideas (Drucker, 1998). With regard to the RMN transformation plan, developing human capital is one item of the agenda. In developing human capital, knowledge is an important element in addition to skill, attitude, behaviour and discipline needed to produce competent personnel. Knowledge is part of the competency, as posited by Salleh and Sulaiman (2016), necessary for performing effectively. So, knowledge creation within the fleet is crucially needed to ensure the organization is performing effectively and efficiently. On top of that, this knowledgeable human capital add value in order for the organization to achieve

sustainable competitive advantage. A few researchers, including Memon (2015) and Icihijo (2006), have also noted that knowledge deployment is not new as an aspect of competitive advantage. Peter Drucker (1988) also introduced the term 'Knowledge Worker', and this term changed the concept of conservative arrays of economic growth due to the value of human capital.

According to Memon (2015), the abilities of personnel are all knowledge dependent in that knowledge enkindles personnel in creating new ideas, concepts, etc. This personnel knowledge, generally referred to as organizational knowledge, is crucial in the acquisition and growth of an organization's sustainable competitive advantage. Pfeffer and Sutton (2000) also posited that internal resources such as personnel or human capital knowledge are the sources of an organization's sustainable competitive advantage.

Utilization of knowledge is a very complicated phenomenon (Memon, 2015). Most knowledgeable personnel do not retain or manage their knowledge effectively due to the perception that these intangible resources have resided in their minds all the while. Hence, it is very difficult and challenging to impart the application of knowledge management within an organization (Alavi & Leidner, 2001). Bartczak (2002) found that managerial, resource, and environmental influences are the stumbling blocks in managing knowledge within the United States (US) military, apart from funding, confusion, commitment and leadership education. Although it will be difficult to materialize, somebody needs to highlight and bring this matter up for the sake of the organization's betterment. Continuous research needs to be conducted after this study as knowledge creation is a dynamic process as explained by the SECI model's knowledge creation spiral (Nonaka & Takeuchi, 1995a, 1995b).

Meanwhile, Rai (2011) posited that management of knowledge has become a prerequisite for both public and private organizations in order for them to gain competitive advantage. Organizations like the RMN fleet need to adopt a proper and systematic management of knowledge to become competitive in the contemporary environment. Therefore, effective and efficient means and ways should be appreciated by managers so that they can leverage the existing knowledge within the fleet for the betterment of the organization (Swart & Harvey, 2011).

1.4 Significance of the Study

This case study attempts to understand the knowledge creation process phenomenon in a given scenario (Myers, 2013) within the RMN fleet context, which will be useful to ensure that knowledge will be easily captured and made available for active-duty RMN personnel. The assumption is that the RMN fleet has knowledge within its human capital and there is a need for creating, capturing or extracting this knowledge so that it improves the organization's performance.

This study will be of benefit to the RMN fleet through the proposed knowledge creation framework, which can assist in capturing knowledge in order to improve fleet operations. According to Yin (2015), case studies focus on the social construction of reality; therefore, the study will contribute to the RMN through proposed systematic knowledge creation techniques to prevent the dissipation of knowledge when personnel transfer or retire.

The management of knowledge involves identifying, keeping, designing, distributing, and sharing knowledge (Nonaka & van Krogh, 2009), thus proposing a framework to

create and capture knowledge within the RMN for effective and efficient operations of the fleet is of significant importance. The research contributes to managing organizations' knowledge, especially that of the Malaysian Armed Forces. The study will thus contribute within the RMN if the framework can be generalized to other arms of the RMN such as base units, for example.

Furthermore, Holland (2010) found that core learning errors and less concentration on the development of intellectual capital, especially from intangible resources, were the common causes of organizations' failures because organizational learning and growth are directly proportional. Revans (2011) insisted that continuous learning from experience is vital and could be one of the keys to achieving competitive advantage.

Most organizations, including the RMN fleet, have faced common unintended problems. One of the problems is misplaced focus of knowledge, where the fleet has difficulties in creating and storing intangible knowledge or resources so that they will not be dissipated. To make things worse, top management's lack of regard for learning, creation and sharing of knowledge and utilization of knowledge, have added to the unwanted issues. Knowledge creation especially requires a dynamic learning system which plays a decisive role in reviving knowledge through new experiences and cognitive skills (Holland, 2010) and is thus a concept all managers within the fleet need to familiarize themselves with.

Ali and Ahmad (2006) posited that implementation of the management of knowledge in the military, such as in the RMN fleet context, is still a dilemma. According to them, the intricacy or complexity of the military environment makes it impracticable to exercise it in military operations. This is more specifically with regard to dealing with

lots of data and information at one time. Whatever the circumstances, such as difficulties and complexity encountered in managing knowledge, most world-class militaries are adopting proper and systematic ways of managing knowledge in order to achieve sustainable competitive advantages (Blesio & Molignani, 2000).

The vast flow of data and information arriving simultaneously in military operations are difficult to manage, can create confusion, and may lead to misinterpretation or misconceptions regarding the information if the user is not careful. This can be seen during complex warfare operations with various warfare directors giving all the input to the commanding officer (CO) of a warship. Duffy (2001) stated that the process of managing knowledge drives innovation by exploiting the best use of organizational human capital and their experiences. In this event, proper and systematic management will facilitate the use of knowledge, and this will allow proper planning of any operation according to standard operating procedures (SOPs), policies and doctrines. On top of that, Ali and Ahmad (2006) further posited that managing knowledge is intended to inspire and support new knowledge creation and sharing tools as crucial elements in military operations' success.

RMN fleet operations are principally procedural driven. In this scenario, vast volumes of data and information are manually processed, and the lack or scarcity of integration leads to 'working in silos' or 'knowledge silos', which will make managing knowledge an arduous task (Cole-Gomolski, 1997). Therefore, this study is intended to disclose whether knowledge creation is an important factor within the RMN fleet by determining the current extent of the process and proposing a knowledge creation framework to create/capture knowledge within the fleet. This study stresses the importance of knowledge, not only in capitalizing on the development of resources but

also with regard to encouraging and motivating knowledge creation and sharing (Arner & Schou-Zibell, 2011), to build the fleet's readiness as a knowledge-based organization while keeping in mind the associated safety aspects throughout RMN fleet operations.

Nonaka and Takeuchi (1995) came out with one of the most influential theory of knowledge creation, which argued that interaction between tacit and explicit knowledge via socialization, externalization, combination and internalization, leads to new knowledge creation (Grimsdottir et al., 2019; Nonaka and Konno, 1998; Nonaka and Takeuchi, 1995; Nonaka et al., 2000). By leveraging on the knowledge creation process SECI model, the researcher could gauge the extent of the processes within the model in the fleet's scenario. However, by knowing the extent will not help much in rationalizing the issue of safety at sea. Therefore, with the data derived, the researcher need to obtain insights so that the data can be use in a useful manner. In a recent study by Li, Liu and Zhou (2018), they proposed new knowledge creation model, Grey SECI (G-SECI), the enhancement of SECI model in the complex product systems (CoPS) development. It was a study in a different context and studied on the relationship between knowledge creation models and innovation performance during CoPS development. Where as, the aim of this study is to obtain the extent of knowledge creation processes within the fleet from survey conducted and to figure out on the optimum utilization of the data for the benefit of the fleet. Then the study by Liu et al. (2018), was modeled so that the data obtained could be used to propose a new knowledge creation enhancement framework to benefit the RMN fleet. Recent studies are scarce and almost none on exploring knowledge creation in the military context, especially on the navy fleet. This new framework that is going to be proposed is visualized as the mechanism for the RMN fleet in order to improvise her operation especially in mitigating the problem of safety and security at sea, so that mishaps could be avoided and managed effectively and

efficiently.

1.5 Research Questions

Based on the problem statement, the following research questions are posed to specify the research topic:

1. What is the level of knowledge creation process in the RMN fleet?
2. How can a knowledge creation framework be developed to improve RMN fleet operations?

1.6 Research Objectives

The overall objective of this study is to explore a model that would assist the RMN fleet to implement management of knowledge that facilitates the process of extracting knowledge from experienced personnel and making that knowledge explicit in order to sustain organizational capacity. The utilization of SECI model in this study assisted in achieving objectives stipulated. The model that emphasizes on tacit or explicit knowledge creation process established knowledge networks within the organization by leveraging this process (Warkentin, Sugumaran, & Bapna, 2001) thus allowed certain extent of the processes identified and measured

This model identified as universal because it was utilized in a number of context of studies (Allal-Cherif & Makhlouf, 2018; Bandera, Keshtkar, Bartolacci, Neerudu & Passerini, 2017) and because of this uniqueness, the model deemed to be suitable and can be generalized in military context especially in the RMN fleet environment to evaluate the extent of knowledge creation processes. It is considered as the main

model of knowledge creation because most of the KM elements are embedded in the processes within the model (Easa, 2012). The model representing a convergence or triangulation of personnel, processes and technology and this occurs at the individual, group, organizational and inter-organizational levels (Easa, 2012; Smith, 2001; Alhawary & Alnajjar, 2008; Nonaka & Konno, 1998; Bose, 2002). Hence, in this study, the researcher feels that by determining the extent of knowledge creation processes within the RMN fleet, a proposal of promulgating a new knowledge creation enhancement framework can be made in assisting the organization.

Therefore, the sub-objectives are to:

1. Identify the current extent of knowledge creation processing in the RMN fleet.
2. Propose a knowledge creation enhancement framework to create/capture knowledge and improve fleet operations.

1.7 Dissertation Structure and Outline

This dissertation contains five chapters. The chapters are divided as indicated below, and brief synopses of the content of the chapters are provided:

Chapter One summarizes the background and discusses the needs of the organization for knowledge creation, in general. The significance of the study is described and explained within the context of RMN fleet operations. The chapter also covers the research questions and research objectives.

Chapter Two explicates the reviewed literature. The empirical and theoretical literature in the scope of knowledge management and knowledge creation are categorically reviewed. The concentration is more on the empirical and theoretical

aspects of knowledge creation processes within organizations. This chapter also examines numerous key definitions from previous researchers and the concepts of knowledge creation processes within the knowledge management and operations of the RMN fleet.

Chapter Three briefly explains the research design, population, sampling, instruments and the procedures for data collection and data analysis. The chapter also provides a discussion of the theoretical lens used in this study as well as the research methodology and study setting based on the knowledge creation processes in socialization, externalization, combination and internalization modes. Sampling of the study is discussed with regard to which data collection methods and tools are applied. Research validity and reliability are also addressed, accordingly.

Chapter Four covers the results from analyses of the survey and interview data, including those from which the findings of the study are derived. The findings are divided into two parts. The first part is on the survey questionnaires used to measure the levels of knowledge creation processing within the RMN fleet and awareness of the knowledge creation processes among the RMN fleet personnel. The second part is on the interviews conducted with the selected RMN personnel.

Chapter Five presents the researcher's discussion of results of analyses which led to the findings of this study and a summary of this study, which is followed by conclusions and recommendations. The answers for research questions are summarized in this chapter, and it also includes discussion of the limitations of the study and about possibilities for further research needed to compliment this study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Our current society is classified as a knowledge society, one which focuses on the importance of knowledge creation. Drucker (1988) mentioned the importance of a knowledge society in his study. Nonaka (1994) posited that contemporary society realizes the importance of knowledge that may include strategic or organizational innovation. The RMN, as a sophisticated organization, is currently managed as a knowledge society. This can be observed in the RMN always motivating and sending its officers and personnel for courses and studies, making it easier for personnel who intend to further progress in their academic qualifications, and promoting those who have good paper qualifications and also valuable knowledge as these are the main elements in achieving its objectives and goals. This, however, raises some questions as to how the RMN, and specifically the RMN fleet, creates and retains knowledge. Therefore, this research studied the enhancement of the RMN fleet's knowledge creation process in order to fulfil its obligation in safeguarding the nation's maritime interests.

Nonaka (1994) posited that a dynamic organization should not only efficiently process the information received or gathered but also needs to create information and knowledge. He added that the basic concept and model of organizational creation of knowledge is based on explicit and tacit knowledge and the continuous dialogue between them that drives the creation of new ideas and concepts. He further added that this basic concept will create the 'communities of interaction' that will lead to contributions that develop and amplify new knowledge.

This chapter provide a general overview of knowledge and few specific types of knowledge associated with the study, concepts related to knowledge management (KM) and knowledge creation, theories used in knowledge creation, creation of knowledge processes in the SECI model, and an overview of the role of information and communication technology (ICT). The researcher used a variety of academic sources and databases to review relevant articles in journals retrieved from Scopus, Emerald, ScienceDirect, ResearchGate, Web of Science and Institute for Scientific Information (ISI) Web of Knowledge.

2.2 The Knowledge Concept

Easa (2012) stated in his study that knowledge involves personnel's experience that enables them through available data and information so that they will know how to do things, be aware of things or to cause things to happen. However, Memon (2015) posited that there is no single approved definition of knowledge. According to Dalkir (2011), there are many overlapping categories of knowledge types. There have also been many definitions of knowledge offered by previous researchers. For instance, Nonaka and Takeuchi (1995a, 1995b) came up with the 'Justified True Belief' (JTB) concept of knowledge, which stated that one must not only believe a given true proposition but must be aware of the justification behind it. Gunnlaugsdottir (2003) in his study mentioned that the utilization of knowledge is the prime impetus of an organization's competitive advantage and that of the global economy. Knowledge can be defined as being linked with information. This is particularly noticed when information is subjected to logic in being understood, where one relies on verification or recollections from one's own experiences (Dixon, 2000; Gunnlaugsdottir, 2003). However, Davenport and Marchand (1999) argued that this knowledge will remain as information until it is retained in the personnel's minds. When personnel can deduce

meaning from the information with their mental (cognitive) capacity and have the ability to interpret it, this will lead to knowledge creation (Nonaka, 1995).

Knowledge is seen to be rooted in personnel's minds and is actually a mix of experiences, values and beliefs (Polanyi, 1966; Davenport & Prusak, 1998). Earl (2001) and Wiig (1997) posited that knowledge can be viewed from a few perspectives. In this study, the researcher seeks to determine the levels and types of knowledge that personnel in the RMN fleet have, whether their knowledge is conceptual in that it evokes meaning, contextual knowledge normally evoked by situations and events, or operational knowledge, which is the set of procedures or norms used (articulation of operationalization used) in defining the terms of a process that usually needed to determine the nature of a phenomenon or an item, and which of these knowledge types are deemed to mostly reside within the RMN fleet personnel. Knowledge also can be viewed as information that is meaningful in cognitive forms, acquired by experimentation, experience, information consumption and also thinking processes like critical thinking and imagination. In this sense, knowledge possessed by the RMN fleet personnel is more likely to be 'routine' knowledge acquired through their daily common work on board ships, 'experience' knowledge acquired throughout their service, and 'technical' knowledge, which is the understanding of modern technology, state-of-the-art armaments, sensors and gadgets fitted on board the RMN warships.

Apart from this 'formal' creation of knowledge, knowledge is also created 'informally' when personnel within the organization share and exchange common work interests and share common work problems (Easa, 2012). According to Davenport and Prusak (2000), sharing and exchanging knowledge takes place mainly through personal conversations. They added that places like smoking corners or water dispensers, and

events like seminars or open forums, are important places for sharing informal and formal knowledge.

Nevertheless, in this study within the RMN fleet, knowledge is observed as primarily coming from the organizational perspective with the aim of amplifying personnel knowledge as part of organizational knowledge (Nonaka & Takeuchi, 1995a, 1995b). On this score, knowledge is normally found in the documentation or databases of ships and contained in the fleet's procedures and practices (Wallace, 2007; Gherardi, 2006) such as SOPs, practice guides and manuals, for example. However, knowledge is considered highly variable and sometimes ambiguous (Earl, 2001; Nonaka & Konno, 1998; Tsoukas & Vladimirou, 2001). This will lead to difficulties in extracting, transferring, storing, combining and utilizing knowledge due to these constraints and complex processes (Easa, 2012). Different organizational structures and cultures might pose challenges to the willingness to share knowledge (Petrescu, Popescu, & Sirbu, 2010). Petrescu et al. (2010) added that initiatives and efforts from management and specific knowledge strategies should be in place to overcome those challenges. For the purpose of the study, some definitions of knowledge are listed in Table 2.1.

Table 2.1: Definitions of Knowledge

AUTHOR	YEAR	DEFINITION
Nonaka and Takeuchi	1994	Justified true belief that increases an entity's capacity for effective action.
Davenport and Prusak	2000	Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information.
Dixon and Gunnlaugsdottir	2000 and 2003	Knowledge can be defined as the link between information; in particular, when information is put into logic and being understood, where one can verify or recall from their own experiences.
Konstantinou	2008	Knowledge in general can be perceived as the product of the dynamic and continual relationship between "human agency,"

AUTHOR	YEAR	DEFINITION
		practices of knowing and the organizational context.
Manuri	2012	Knowledge is the result of learning; the internalization of information, data and experience.
Easa	2012	Knowledge is a set of beliefs about causal relationships in an organization.
Barao at el.	2017	Knowledge is the critical source in today's economy and is raw material i.e. the knowledge-based intangibles (or less tangible knowledge assets).
Mahdi, Nassar and Almsafir	2018	Knowledge has been considered as a strategic resource and as such, it needs to be managed to promote the competitive performance of the organization.

2.2.1 Types of Knowledge

Knowledge is considered as a high-value form of information because of its added context, experience, reflection and interpretation (Davenport 2013). There are a few types of knowledge, and for this study, the researcher took the most common ones, which are tacit and explicit knowledge. Polanyi (1966) was among the first researchers to classify tacit and explicit knowledge. Nonaka (1995) also posited that knowledge can be divided into two types, which are tacit knowledge and explicit knowledge. In knowing processes holistically, both tacit knowledge and explicit knowledge are profound, indispensable and indivisible (Choi & Lee, 2003; Brown & Duguid, 2001; Easterby-Smith & Lyles, 2003; Earl, 2001; Hansen, Nohria, & Tierney, 1999; Nonaka & Takeuchi, 1995a, 1995b). Tacit knowledge is the knowledge that resides in people's mind and explicit knowledge is the knowledge captured and written down (Gourlay, 2006). The main difference between the two is that the former cannot be easily accessed like the latter. Even though explicit knowledge is more accessible, it is more vulnerable/insecure to unlawful exploitation (Jasimuddin, Klein, & Connell, 2005). Jasimuddin et al. (2005) further added that tacit knowledge found to be less vulnerable but it is less accessible to personnel.

On the other hand, Dulipovici and Baskerville (2007) posited that knowledge can also be regarded as organizational or personal. Tsoukas and Vladimirou (2001) explained that organizational knowledge is "the capacity members of an organization have developed to draw distinctions in the process of carrying out their work, in particular concrete contexts, by enacting sets of generalizations whose application depends on historically evolved collective understandings." He added that personal knowledge is "the individual capacity to draw distinctions, within a domain of action, based on an appreciation of context or theory, or both."

Within an organization like the RMN fleet, knowledge can also be either external knowledge or internal knowledge (Frenz & Ietto-Gillies, 2009; Earl, 2001; Menon & Pfeffer, 2003). External knowledge is normally obtained from external bodies like the headquarters (HQ) with their subject matter experts and other organizations or institutions, like other military services, foreign navies and higher education learning institutes (Frenz & Ietto-Gillies, 2009; López-Sáez, José, Martín-de-Castro, & Cruz-González, 2010), where as internal knowledge can be obtained from internal sources, for instance, from personnel and every department in the fleet organization. Therefore, the researcher can conclude, as supported by Easa (2012), that an organization's knowledge base is not only formal knowledge in the context of documentations, like SOPs, training programmes or formal information, but as Garvey and Williamson (2002) and Tsoukas and Vladimirou (2001) argued, it is also informal and tacit knowledge that is taken for granted. Easa (2012) posited that informal knowledge is something personal, and it reflects personnel's experiences, education levels and most importantly, the tacit understanding of individuals. This informal knowledge covers personnel's attitudes towards their work and willingness to work for and with the organization, in general, and specifically, with and for one another (Tsoukas & Vladimirou, 2001). Garvey and

Williamson (2002) added that elements of trust, respect, loyalty and commitment, assist in developing and sharing informal knowledge between personnel. Hence, management and the organization need to emphasize and support the building of these traits (Tsoukas & Vladimirou, 2001) among the RMN fleet personnel.

2.2.1.1 Tacit Knowledge

Tacit knowledge is intangible and personal knowledge that is very hard to enunciate with the use of formal language (Polanyi, 1967). Nonaka and Takeuchi (1995a, 1995b) defined tacit knowledge as context-specific and personal knowledge that is hard to communicate and formalize. Wilson (2002) added that tacit knowledge is the personal knowledge that is impossible to be communicated in formal and systematic language. Nonaka and Konno (1998) posited that tacit knowledge is intangible and related to personnel's experiences and actions, for instance, the expertise, ideas, emotions and values, that a person embraces. Hence, transferring this knowledge is best done in informal or non-structured ways and by utilizing interpersonal means (Pham, 2008). Nonaka (1995) mentioned that the awareness and importance of tacit knowledge has been generally accepted in the literature of KM as a powerful element. Collins (2010) posited that tacit knowledge is context specific, highly personal, and also deeply rooted in an individual's emotions, values, ideas and experiences, and there is no doubt that in the sophisticated RMN fleet, there is a lot of tacit knowledge that is required to be transferred despite all the available documentation. Memon (2015) posited that tacit knowledge is a kind of personal knowledge, and it is deep-seated in intangible aspects, for example in our personal behaviours, our values and beliefs, our stories and even our rituals and symbols. However, this tacit knowledge cannot be easily transferred by only using speech or writing, but may be done by the means of mentoring and shadowing processes (Rutten, Blaas-Franken, & Martin, 2016) since this knowledge is contained

within personnel's minds. Furthermore, due to the unique epistemology of individuals, it cannot be detached easily and very difficult to access (Cook & Brown, 1999).

According to Memon (2015), tacit knowledge can be divided into two types, which are technical, i.e., tacit knowledge, which is more subjective and includes the know-how element based on years of experience covering perceptions, insights, hunches or stimulations, and the cognitive type of tacit knowledge, which includes, for example, beliefs, values, mental models and emotions. Tacit knowledge is the source of inspiration (Wang, 2006), and this knowledge can only be contextualized through intuitive cognition and systematic processes. In short, tacit knowledge is informal internal knowledge residing in the individual minds of personnel and has not been documented in a structured or systematic form.

2.2.1.2 Explicit Knowledge

Explicit knowledge is the knowledge that can be codified, expressed, stored, transferred, managed and shared by KM tools (Nonaka, 1994). Nonaka and Takeuchi (1995a, 1995b) further defined explicit knowledge as the knowledge that is transmittable in formal and systematic language. According to Nonaka and Konno (1998), explicit knowledge is tangible, can be documented and shared or distributed to others, for example, in the form of reports, minutes, guidelines and procedures. Wilson (2002) added that explicit knowledge is the knowledge that can be communicated in formal and systematic language. Explicit knowledge is internal knowledge that is structured, such as meeting minutes/reports, procedures or manuals, and this knowledge is articulated and can be stored in certain media (Greiner, Böhmann, & Krcmar, 2007). Explicit knowledge is more objective, expressive, and rational, and this knowledge can be easily transmitted or distributed (Suppiah & Sandhu, 2011). A few researchers, such

as Polanyi (1967), Nonaka and Takeuchi (1995a, 1995b), and Suppiah and Sandhu (2011), posited that explicit knowledge is knowledge that is easily codified, written down or documented to be transmitted either manually or electronically. From the definitions above, the researcher could conclude that explicit knowledge can be distributed or transferred through more structured processes utilizing technology-driven mechanisms, like using ICT systems, which agrees with research by Mårtensson (2000).

Meanwhile, Rutten et al. (2016) added that explicit knowledge is the knowledge that can be easily transferred by using words or writing, and Park, Vertinsky, and Becerra (2014) posited that explicit knowledge is the knowledge that has been codified, articulated and stored. In the RMN fleet context, all this knowledge can be learned from written materials which are readily available in the form of doctrines, SOPs, manuals, standing orders, minutes, etc.

Easa (2012), in his study, regarded tacit knowledge and explicit knowledge as separated and well-defined. However, Polanyi (1966) argued that "a sharp division between tacit and explicit knowledge does not exist … all knowledge is either tacit or rooted in tacit knowledge" (p. 7). He pointed out that "we can know more than we can tell and we can tell nothing without relying upon our awareness of things we may be able to tell" (p. 16). Meanwhile, Brown and Duguid (2001) posited that tacit knowledge and explicit knowledge reflect the dimensions of knowledge, not the types of knowledge, pointing out that there is hardly any practical differentiation between them. Tsoukas (2003) also argued that both tacit knowledge and explicit knowledge are grounded to one another. From these arguments, the researcher concluded that both tacit knowledge and explicit knowledge complement each other, and this is supported by Johnson, Lorenz, and Lundvall (2002).

2.3 Knowledge Management (KM)

The increased awareness on the importance of knowledge, for organizations' survival and prosperity and the fast evolving and pervasive advancement of technology, such as the increased ICT capabilities to store, manage and distribute knowledge, have led to awareness of the importance of managing knowledge (Easa, 2012). Manuri (2012) posited that management of knowledge is becoming more crucial because economic and social perspectives are now becoming knowledge driven. Choi, Poon, and Davis (2006) posited that managers should pay more attention to managing knowledge effectively. Development of KM in all sectors, both private and public, is spreading, and in this contemporary scenario, the existence of KM and the recognition given to any industry implementing KM is immense (Manuri, 2012).

According to King (2009), KM is the organizing, planning, controlling and motivating of processes, people and systems within the organization to ensure that its knowledge-related assets are effectively employed and improved. The cyclical model of KM processes as suggested by Bose (2004) are knowledge creation, capturing of knowledge, refinement of knowledge, knowledge storing/codifying, updating available knowledge and knowledge dissemination. Davenport and Prusak (2000) argued that if organizations want to excel in management of knowledge, they need to practice generation, codification and transfer of knowledge within their organizations. This study will focus on the current extent of knowledge creation in the RMN fleet, investigating current practices in KM activities, which are to capture knowledge, to store, to share and utilize knowledge among personnel. As mentioned by Liao and Wu (2010), KM consists of a collection of techniques, methods and tools that facilitates four activities: capturing knowledge, storing knowledge, sharing knowledge and using

knowledge (see also Sher & Lee, 2004), thus making lots of room for knowledge being created within the organization.

Easterby-Smith and Prieto (2008) and Buono and Poulfelt (2005) posited that research on management of knowledge has taken human and technology perspectives in consideration. Easa (2012) explained that from the human perspective, focus is more on social relations, cultural background and sense making when dealing with organizational knowledge, while from the technology perspective, focus is more toward information systems and information processing designed and dedicated for management of knowledge.

Darroch and McNaughton (2002) posited that "knowledge management is the management function that creates or locates knowledge, manages the flow of knowledge within the organization and ensures that the knowledge is used effectively and efficiently for the long-term benefit of the organization" (p. 211). Organizations have to smartly manage their own knowledge to increase effectiveness and efficiency that will lead to competitive advantage (Holt, Armenakis, Feild, & Harris, 2007; Singh, Shakar, Narain & Kumar, 2006). Drucker (1993) mentioned that knowledge has become such a dominant and key economic resource that it could be the only source needed for achieving competitive advantage. Knowledge is available in the RMN fleet, especially among experienced personnel who will not be permanently attached on board vessels due to the policy mandating a rotational basis of working in the RMN. Kianto et al. (2016) suggested that KM is all about crafting, stimulating, supporting and providing suitable knowledge atmospheres in an organization, to enable and motivate personnel with knowledge to share, use and create new knowledge. Nevertheless, the creation of a good environment and atmosphere by the organization and personnel's willingness to

share knowledge are the key factors for the success of KM initiatives (Easa, 2012). Manuri (2012) posited that KM is now being treated as the natural solution to increase operations where the added value will be sustainable competitive advantage. Therefore, in the RMN fleet context, identifying the knowledge creation mechanisms that are required to extract knowledge is crucial in order to retain all the knowledge and to create new knowledge within the fleet before knowledgeable human capital leave the organization.

It is posited that KM as a whole and knowledge creation in specific will facilitate improved organizational performance (Nafei, 2014), improved decision making and the creation of core competences. KM also seems to be applicable in all areas of management, and it is a vital activity in strategic operations (Manuri, 2012). Nafei (2014) further mentioned that KM is also an enabler of organizational learning. KM facilitates the exchange of knowledge and continuous sharing that perpetuates the learning process within the organization. Hence, this study proposes a knowledge creation framework to the RMN fleet in order to systematically create and capture knowledge to improve fleet operations in a safe, efficient and effective manner.

Wiig (1993) identified a few factors pertaining to the importance of KM. He stated that in managing knowledge, creating and acquiring knowledge must be performed effortlessly before the knowledge can be exploited to the fullest extent in order to achieve aims and objectives. He further elaborated that daily management of this knowledge needs to be constantly and continuously done so that the organization will be intelligently and smartly operated. Further pursuit of innovation may help in building knowledge, apart from learning from personnel or organizational experiences and innovation practices, which is now becoming a trend in military organizations,

especially in the RMN. The management of knowledge is a never-ending process often operating in response to dynamic external environmental factors. Therefore, organizations such as the RMN fleet need to re-strategize, re-focus and look into new technologies and management approaches to mitigate the effects of these factors on knowledge management (Kruger, 2008). This will further assist in building the organizational capability to acquire new opportunities (Wiig, 1993) in order to stay ahead of adversaries and achieve sustainable competitive advantages.

On the other hand, the definitions of KM can be viewed from a few different perspectives, which include the economic perspective, IT perspective and organizational perspective. Davenport et al. (1998) defined management of knowledge from the economic perspective as an intellectual asset. Zack (1999), from the IT perspective, described management of knowledge as "a managerial activity to develop new applications of information technology to support the digital capture, storage, retrieval and distribution of an organization's explicitly documented knowledge" (p. 46). Lastly, Davenport and Prusak (1998), from the organizational perspective, defined management of knowledge as a method which simplifies the processes of creating, capturing, sharing, understanding and distributing an organization's knowledge. Hence, taking the organizational approach as the main focus, this study defines the management of knowledge so as to provide a description of the processes concerned with generating/creating, capturing, codifying, storing, sharing, disseminating, utilizing, and understanding the knowledge (Easa, 2012). Easa (2012) further added that management of knowledge occurs at the individual, team, organizational and inter-organizational levels, bringing together personnel, technology, culture and processes, to fulfil the purpose of contributing to the organizations.

The above discussion and arguments clearly show that knowledge is complex and comes along with uncertain concepts (Easa, 2012). Easa (2012) further added that knowledge management is problematic and difficult to achieve because knowledge is related to individual personnel's actions and experiences, and they are normally different and do not occur with the same 'frequency'. As Dougherty (2004) posited in his study, transferring or codifying knowledge is not easily done, hence capturing knowledge through action is important and valuable. Mehralian, Nazari and Ghasemzadeh (2018) opined that in whatever ways KM is defined in previous studies, knowledge creation process is seen to be the most vital and important in KM activities. The main reason why KM seems to triggered the great interest of many managers was largely due to knowledge creation potential that is very important in providing the means of innovative culture within the organizations (Mehralian et al., 2018).

2.4 Knowledge Creation

In KM, four common activities have been found (Bose, 2004; Davenport & Prusak, 1998; Easa, 2012; Kianto et al., 2016; King, 2009; Liao & Wu, 2010), which are knowledge creation, knowledge storing, knowledge sharing and knowledge utilization. Knowledge creation is seen to be the initiating component or element in KM (Mehralian et al., 2018). Mehralian at el. (2018) further added that knowledge creation is so critical that most of the organizations are trying their best to be competitive by creating knowledge that will assist them to achieve their objectives. Creation of knowledge is arguably a highly integrative KM activity, holistically bringing together knowledge by generating/capturing before codifying, transferring and utilizing it (Aurum, Daneshgar, & Ward, 2008). Mikic et al. (2009) posited that Polanyi's ideas of personal knowledge, and Nonaka's SECI knowledge creation process model may be affiliated with the emergence of KM. Thus, organizational knowledge can be created by amplifying

personnel's personal knowledge, i.e., converting tacit knowledge into explicit knowledge, and then circulating or cascading this knowledge from personnel to the group, organization and inter-organization levels, as proposed in the SECI model (Nonaka & Takeuchi, 1995a, 1995b). Memon (2015) posited that researchers cannot ignore the influences of people, place and structure on the creation of knowledge process during empirical investigation. He further added that the influence of the higher echelon during creation of knowledge processes might also affect the processes with regard to policies and decisions.

According to Nonaka (1994), knowledge creation first came into KM in the mid 1990s, and most successful organizations constantly create new knowledge and extensively distribute this knowledge throughout their organizations. He further quoted "that knowledge creation refers to a continuous process where one overcomes individual limitations and restrictions imposed by prevailing information and past experiences by attaining a new perspective, a new observation of the new environment and new knowledge". Jogulu and Pansiri (2011) posited that "knowledge creation refers to different findings created through multiple data collection and analysis techniques providing insightfulness and extensiveness in overall results, from which researchers can make more accurate inferences with increased credibility". Kao, Wu, and Su (2011) added that knowledge creation is basically "a process that produces new knowledge by accumulating and integrated existing knowledge" (p. 1037), and Nonaka and Takeuchi (1995a, p. 56) concluded that therefore, mobilization and conversion of tacit knowledge of individual personnel is the key to knowledge creation.

The basis of organizational creation of knowledge is the conversion of tacit knowledge to explicit knowledge and back again from explicit knowledge to tacit

knowledge (Nonaka & Takeuchi, 1995a, 1995b). Nonaka and Takeuchi (1995a, 1995b) added that this knowledge created by the interaction of tacit knowledge and explicit knowledge at the individual level, group or team level, organizational level and inter-organizational level forms the core of the SECI model. Nonaka, von Krogh, and Voepel (2006, p. 1180) defined organizational creation of knowledge, as the process of making knowledge available and amplifying knowledge created by individuals and then connecting this knowledge to the organization's explicit knowledge system. On the other hand, Nonaka and Konno (1998) stated that the creation of knowledge process, is a context specific process, where time, space and the relationship with others, needs to be taken into consideration. Hence, the knowledge creation process is dependent on the environment to stimulate the process and not only dependent on personnel characteristics (Easa, 2012). Nonaka, Toyama, and Konno (2000), Nonaka, Toyama, and Byosiere (2003) and von Krogh, Nonaka, and Rechsteiner (2012) posited that platforms or areas for creating knowledge, knowledge assets existing in the organization and leadership or management that support creation of knowledge have been identified in providing support for dynamic organizational knowledge creation utilizing the SECI model. According to von Krogh et al. (2012) and Nonaka et al. (2000), leadership will assist in providing direction of dynamic and emergent processes of knowledge creation, and it is the top management's duty to articulate an organization's knowledge vision and communicate it within or outside the organization (see also Easa, 2012). Based on this, high-level management should encourage, promote and develop knowledge asset sharing, and leaders have to carefully choose the right mix of personnel for participation and promotion of their interaction (Nonaka et al., 2000) in order to create new knowledge.

2.5 Theories Used in Knowledge Creation

A rigorous theoretical foundation is needed for a KM initiative to be successful (Dalkir, 2011), thus making the knowledge creation which is part of the initiative affected by this theoretical basis, as well. Dalkir (2011) further added that realization of the KM activities in the KM cycle require the promulgation of a conceptual framework in order for managers to have guidelines within which to operate. This is to ensure that the implementation will be a fruitful one since the process will be coordinated properly and hopefully will produce the expected benefits that the organization anticipates. Previous studies have shown that only few managers really understand how to manage knowledge creation in knowledge creation organizations (Dalkir, 2011), and this is worrying if this case is to be brought into the RMN fleet environment because the fleet deals with state-of-the-art equipment worth billions of Malaysian Ringgit in its inventory (paid for by tax payers, who are thus the stakeholders) to protect the maritime sovereignty of the nation (i.e., safety and security issues). For the sake of comparison in the context of this study, some related theories are discussed below.

2.5.1 Adoptive Control of Thought (ACT)

The Adoptive Control of Thought (ACT) Model (Anderson, 1983) divided knowledge into two categories, which are declarative knowledge and procedural knowledge. Declarative knowledge can be described as the actual knowledge that is expressed in the form of propositions, and this knowledge can be related to explicit knowledge (Nonaka, 1994). Procedural knowledge is methodological knowledge, for instance, the knowledge of how we remember ourselves playing guitar or riding a bicycle. This knowledge is more towards tacit knowledge, the knowledge that is always embedded in people's minds (Nonaka, 1994).

According to the ACT Model (Anderson, 1983), the continuous transformation of declarative or actual knowledge to procedural or methodological knowledge leads to the cognitive/mental development of skills. This finding is consistent with previous research done by Ryle (1949), and Anderson's ACT is the improved and upgraded version of Ryle's theory. However, Nonaka (1994) argued that transformation of knowledge from declarative to procedural knowledge as explained by the ACT Model (Anderson, 1983) showed that the transformation is only unidirectional instead of the transformation supposedly being bidirectional. So, in order to prove this, Nonaka (1994) came out with four modes of knowledge conversion, which showed the relationship between both tacit knowledge and explicit knowledge in the form of his Spiral Model. The four modes of the conversion of knowledge are from tacit knowledge to tacit knowledge, tacit knowledge to explicit knowledge, explicit knowledge to explicit knowledge and explicit knowledge to tacit knowledge, which will be discussed as this discussion progresses.

2.5.2 Knowledge-Based View (KBV)

The Knowledge-Based View (KBV) of the Firm Theory (Grant, 1996) looks into conceptualizations of organizational models that anticipate their structures and behaviours. According to Shahzad, Siddiqi, Ahmid, Bajwa, and Sultani (2016), KBV explains all the knowledge processes and their significant relationships with creativity and performance within the organization. Based on the knowledge requirements and characteristics of knowledge, an organization is conceptualized as a body for integrating knowledge. Thus, for example, the RMN fleet, as an organization, is responsible for integrating all of its strategic and significant knowledge (Grant, 1996; Kogut & Zander, 1996; Nonaka & Takeuchi, 1995a, 1995b) in accordance with the KBV's theory that knowledge is the most strategic and significant resource for ensuring an organization

has a sustainable competitive advantage and superior performance (Easterby, Thorpe, & Jackson, 2008).

2.5.3 SECI Model

In 1995, Nonaka and Takeuchi proposed a model of knowledge conversion describing the process of interactions between explicit knowledge and tacit knowledge, which is known as the socialization, externalization, combination, and internalization (SECI) model. This model was the outcome of their study exploring how middle managers in a few companies in Japan created knowledge and to learn on how this knowledge could be converted. The conversion process of tacit knowledge to tacit knowledge is identified as a socialization process, tacit knowledge to explicit knowledge as an externalization process, explicit knowledge to explicit knowledge as a combination process and explicit knowledge to tacit knowledge as an internalization process (Nonaka, 1994). He added that transformation of tacit knowledge to explicit knowledge created new knowledge, and Nonaka and Takeuchi (1995a, 1995b) considered their SECI model as the "engine" of knowledge creation.

On the other hand, Sikombe and Phiri (2019) and Chugh (2017) differentiate the knowledge into two, which are tacit and explicit knowledge that are intangible and tangible from the KM perspective. They added that it is vital to identify this knowledge so that organization can exploit it for organizational success. Thus, by utilizing the SECI model in the RMN fleet, the organization can identify both knowledge existence and the level of creation of knowledge processes extent within the all four modes stipulated.

Sikombe and Phiri (2019) further added that tacit knowledge is the knowledge that is

more contextual-specific and individualistic, whereas, explicit knowledge is the knowledge that can be communicated and codified easily through policies, doctrines or manuals. Both knowledge have their own advantages that can contribute greatly to the organization. Both knowledge complement each other as per SECI model (Nonaka & Takeuchi, 1995a, 1995b) explained that knowledge creation process is a dynamic process where tacit to tacit, tacit to explicit, explicit to explicit and explicit to tacit knowledge conversion are taking place continuously. The complementation of both knowledge will assist in creating new knowledge, updating and upgrading existing knowledge and improve tacit-based knowledge within the RMN fleet's personnel for the betterment of the organization.

This model, as mentioned above, is divided into four sub-processes, which are socialization, externalization, combination and internalization. KM involves activities such as knowledge acquisition/creation, knowledge storing, knowledge sharing and the utilization of knowledge, where the whole idea is to make this available knowledge accessible so that it can be used and re-used by members within the loop (Bhosale & Kant, 2016). Nonaka and Takeuchi (1995a, 1995b) introduced the SECI Model as a guideline for the creation of knowledge process, which is part of KM. The model also emphasized on the tacit knowledge or explicit knowledge creation process, and leveraging this process to establish knowledge networks within organizations (Warkentin, Sugumaran, & Bapna, 2001).

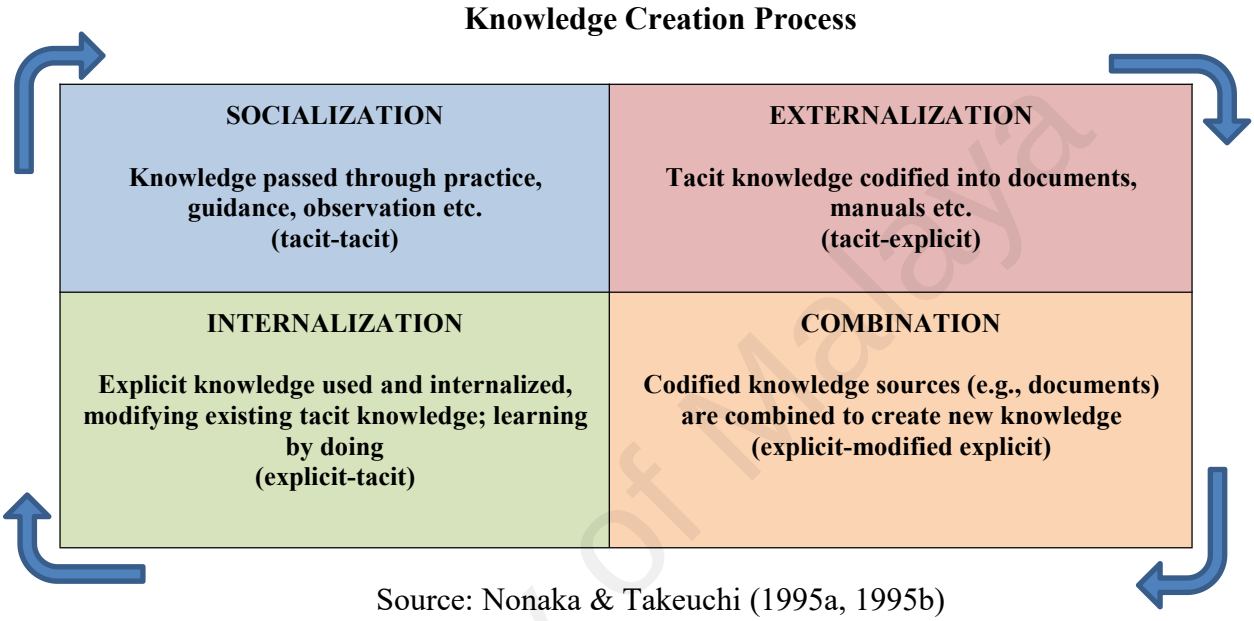
The SECI model has been widely used in KM studies. It is a creation of knowledge process model, which is also known as a wheel of tacit knowledge and explicit knowledge transformation (Nonaka & Takeuchi, 1995a, 1995b). This model is regarded by researchers as the best model that embraces the nature of KM and creation of

knowledge processes. This model contains most of the KM perspectives, and according to Easa (2012), it can be considered as the central model of organizational creation of knowledge. He further added that the conversion processes within this model occurs at the individual, group, organizational, and inter-organizational levels, utilizing personnel, processes and technology. This is in concurrence with Smith (2001), Alhawary and Alnajjar (2008), Nonaka and Konno (1998) and Bose (2002), who recognize that the SECI model represents a convergence of personnel, processes and technology.

The researcher cannot deny the role of human capital in relation to the SECI model, and this study attempted to provide a clearer understanding of the aspects of each process contained in the SECI model found among the personnel in the RMN fleet. In this study, these knowledge workers are further divided into senior management, middle management and operational management to obtain comprehensive insights at all levels of management as per Huang, Basu, and Hsu (2010), who stated that the application of the SECI model will enrich the insights of the organization into their creation of knowledge and the processes involved.

The SECI model is also known as the "spiral" model due to the movement of four processes that expand horizontally and vertically across the organization (Nonaka & Toyama, 2003; Nonaka et al., 2000) (see Figure 2.1). The spiral movement starts from the socialization phase, where tacit knowledge is exchanged among personnel (tacit to tacit knowledge), followed by the externalization phase, where new tacit knowledge is documented as explicit knowledge (tacit to explicit knowledge). This is followed by the combination phase, where new explicit knowledge is pooled or used to upgrade existing explicit knowledge (explicit to explicit knowledge), and finally, the internalization phase, where new explicit knowledge is used by personnel to upgrade their existing tacit

knowledge (explicit to tacit knowledge). Then this tacit knowledge is exchanged again, and the processes discussed above continue along the spiral (Andreeva & Ikhilchik, 2011). Hence, Nonaka et al. (2002) concluded that "organizational knowledge creation is a never-ending process that upgrades itself continuously" (p. 12).



Source: Nonaka & Takeuchi (1995a, 1995b)

Figure 2.1: SECI Model

Grant and Grant (2008) stated that:

> … the importance of Nonaka's work is evidenced by its dominance as, by far, the most referenced material in the KM field and by the number of practitioner projects implementing elements of the model. While a variety of other knowledge classification systems have been proposed, variations on Nonaka's interpretation of Polanyi's original tacit/explicit knowledge concept dominate in the literature — both academic and practitioner. (p. 577)

There are many other management theories and models that have been used in knowledge creation research, for example, models developed by Bose (2004), Davenport and Prusak (2000), and Hansen, Nohria, and Tierney (1999). However, all these models do not encompass all of the creation of knowledge modes found in the SECI model. Hence, the comprehensiveness of the SECI model is the main reason why

the researcher chose the model for this study. The researcher used the SECI model by Nonaka and Takeuchi (1995a, 1995b) because the creation of knowledge process in the RMN fleet is an ongoing and dynamic process, which is happening currently, but only the officers and personnel involved need to be educated and make themselves aware of the importance of these knowledge creation concepts in order to obtain systematic KM processes within the fleet. Most of the researchers regard Nonaka and Takeuchi's (1995a, 1995b) SECI model as the most suitable and the best framework, even though there are other frameworks and models available with regards to KM. The SECI model incorporates all the KM activities (capturing, sharing, storing and using knowledge) studied in the RMN fleet context to show the links between these activities. Therefore, in this study, the researcher used this model to develop a research framework that will be explained further in Chapter 3.

2.5.3.1 Socialization

The process of creating personnel's knowledge when interactions happen is identified as a socialization process by Muina, Martin, and Lopez Saez (2002). This process often takes place during informal social meetings, not in the personnel's workplace, where tacit knowledge is created and shared (Nonaka et al., 2000). This process converts existing tacit into new tacit knowledge, through shared experiences or ideas, which often take place in daily social interactions (Martín-de-Castro, López-Sáez, & Navas-López, 2008). Mehralian (2018) concurred by adding that in socialization mode, tacit knowledge is shared by the personnel through experience, observations and informal conversations, that can be said as hands-on experience.

The socialization mode of the SECI model is about sharing experiences through social interaction, where the element of tacit knowledge is shared and created, such as

technical skills and mental models (Nonaka & Takeuchi, 1996). Kase, Paauwe, and Zupan (2009) added that socialization activities are supported by job descriptions or specifications, job contents and job methods. Theories of organizational culture are always related and associated with the socialization mode (Nonaka, 1994). In this mode, the interaction between personnel within the organization will result in tacit knowledge being created through shared experience, or it can be said that the knowledge is passed through guidance, practice, observation, etc. According to Nonaka (1994), this tacit knowledge can be acquired without utilizing language but just by practice, imitation and observation, similar to the concept of the RMN personnel carrying out their on-job-training (OJT) implemented within the RMN fleet. However, to acquire this tacit knowledge, we must remember that it is a daunting task or extremely difficult to share each other's thinking processes (Nonaka, 1994). Hence, the socialization process, which is an ongoing process in the RMN fleet, and the new knowledge created in terms of tacit knowledge which is available, need to be systematically managed.

2.5.3.2 Externalization

The externalization process is tacit knowledge to explicit knowledge conversion. Nonaka and Takeuchi (1995a) posited, "Externalization holds the key to knowledge creation, because it creates new, explicit concepts from tacit knowledge" (p. 66). Tacit knowledge is "articulated and crystallized" into explicit knowledge and shared among personnel to become the basis or foundation of new knowledge (Mehralian et al., 2018). Muina et al. (2002) added that externalization develops group knowledge from individual and created organizational knowledge by documenting this tacit individual and group knowledge. According to Nonaka (1994), the externalization mode in the SECI model relates to tacit knowledge and explicit knowledge conversion as both tacit knowledge and explicit knowledge complement each other. He further added that the

mutual interaction between personnel or individuals in the organization is the gist. Although in previous studies, the externalization mode was not well developed, it can be said that the information creation process takes place in this mode (Nonaka, 1994). Memon (2015) posited that in externalization mode, the conversion of tacit knowledge, which is subjective, intangible and inexpressible, to explicit knowledge, which is objective, tangible and expressible, takes place. He further added that this knowledge can be obtained from professional language and technical terminologies in routine communications between individuals at the workplace, and conversion mode is activated when this interaction is taking place, while personnel are performing their work or tasks. In externalization mode, tacit knowledge will be codified into documents, manuals, etc., and this is the process of concept creation and is triggered by collective reflection or normal dialogue (Nonaka & Takeuchi, 1996).

According to Nonaka and Toyama (2003), when tacit is converted into explicit knowledge, knowledge is shared with others. They further added that this shared knowledge becomes the basis of new knowledge, for example, in concept forms, written documents or images. Documenting and reporting the outcomes of dialogue or discussions are effective methods to articulate personnel's tacit knowledge and convert the knowledge into explicit knowledge (Easa, 2012). By documenting and reporting, one can be assured that minimal or no dissipation of important knowledge will be faced by organizations.

2.5.3.3 Combination

In the combination mode, creation of knowledge process includes existing explicit knowledge converted into more systematic sets of explicit knowledge (Easa, 2012). It is the process of integrating explicit knowledge from various sources, in order to generates

more systematic explicit knowledge, that can be disseminated or cascaded throughout the organization (Mehralian et al., 2018). Muina et al. (2002) posited that in combination mode, organizations constitute a body of knowledge, from the knowledge owned by different groups and also inter-organizational knowledge. This mode in the SECI model involves combining the different bodies of explicit knowledge (Nonaka & Takeuchi, 1996). In combination mode, information processing can be said to take place (Nonaka, 1994), and according to Nonaka and Takeuchi (1996) and Nonaka et al. (2000), in this mode, the existing explicit knowledge (from repositories or databases) will be converted into modified, remodelled and reconfigured explicit knowledge. Memon (2015) posited that the combining and exchanging of knowledge in intangible or tangible forms, take place in combination mode, by collecting new information, through making connections between existing and new or old knowledge, in order to work out new concepts, or to organize it, so that they are more systematic or structured. This mode explains the creation of explicit knowledge from existing explicit knowledge, and the conversion of knowledge involves social processes, that is to combine different bodies of explicit knowledge held by individuals (Nonaka, 1994). In other words, in combination mode, we can obtain codified knowledge sources, for example, by combining documents to create new knowledge. According to Nonaka (1994), this exchange and combination of knowledge is done through exchange mechanisms, such as meetings, forums, conferences and even through telephone conversations. He added that the existing information will go through reconfiguration processes of sorting out, adding on, re-categorizing and re-contextualizing, that will lead to discovery of new knowledge.

Through combination mode, explicit knowledge is collected from either outside or inside of the organization. The knowledge is then combined and edited to become new

explicit knowledge. This new knowledge is then circulated among the personnel utilizing ICT databases and networks that facilitate this mode of conversion of knowledge. In brief, the "reconfiguration of existing information through sorting, adding, combining and categorizing of explicit knowledge (as conducted in computer databases) can lead to new knowledge" (Nonaka & Takeuchi, 1995a, p. 67).

2.5.3.4 Internalization

In internalization mode, Nonaka et al. (2000) posited that the process occurs where knowledge becomes valuable, when it is internalized in personnel, and this process is actually closely related to the learning-by-doing process (Nonaka & Takeuchi, 1996). Internalization is the process where organizational knowledge is converted back into individual personnel knowledge (Muina et al., 2002). Mehralian et al. (2018) opined that it can be mentioned as the experiential learning process, where explicit knowledge becomes part of personnel's knowledge and subsequently or eventually becomes the important organizational asset. Haag, Duan, and Mathews (2010) added that personnel's confidence and knowledge are strengthened by this learning-by-doing process, and their skills become embedded in their minds, and this will then be translated into their daily routine or specific context in which the knowledge is used. Comparing and contrasting new and existing knowledge, ideas or concepts with experience in internalization mode, are done to facilitate the understanding of meanings (Memon, 2015). This mode also helps by rectifying personal understanding, concepts and mistakes, thus making knowledge more expressive and apprehensible (Huang & Wang, 2002). Explicit knowledge is shared within the organization and converted into tacit knowledge by individuals in internalization mode (Easa, 2012), and this process is closely related to "learning by doing," also known as organizational learning (Nonaka & Takeuchi, 1995a, 1995b). Personnel can internalize explicit knowledge to enrich their tacit knowledge

base by reading documentation about the organization and their jobs (Easa, 2012). In brief:

> … for explicit knowledge to become tacit, it helps if knowledge is verbalized or diagrammed into documents or manuals. Documentation helps individuals internalize what they experienced, thus enriching their tacit knowledge. In addition, documents or manuals facilitate the transfer of explicit knowledge to other people, thereby helping them experience the experiences of others indirectly. (Nonaka & Takeuchi, 1995a, p. 69)

To this extent, we know that every mode in the SECI model, namely, socialization, externalization, combination and internalization, can create knowledge independently. However, the most important thing here is the dynamic interaction between all modes of knowledge creation investigated in this study within the RMN fleet.

2.6 Role of Information and Communication Technology (ICT)

Pan and Scarborough (1999) posited that both technology and human perspectives are seen to be complementary. This suggests that both of them are interacting elements although they can be described as independent, as well (Easterby-Smith & Prieto, 2008). The rise of the knowledge economy has increased knowledge needed among personnel, thus Memon (2015) posited that digitization and ICT infrastructure development used to capture and share knowledge are basic to KM. The importance of knowledge in economic development has been triggered by the fast and vast development of ICT and networks (Beijerse, 2000; Carrión, González, & Leal, 2004; Tseng, 2009). Memon (2015) posited that the use of social interaction and technology can promote knowledge creation by individuals. This measure will provide common access to information (Becerra-Fernandez, Gonzalez, & Sabherwal, 2004), and Memon (2015) further added that the accessibility and flow of knowledge in any organization are crucial elements necessary for the creation of knowledge process to take place. In other words, utilizing ICT will allow free access to the information.

ICT is identified as a mechanism that can store knowledge, and it provides access to data, information or knowledge created by personnel in multiple locations (Easa, 2012). Easa (2012) further added that networks and telecommunications technology, for example, emails, internet and intranet, provide the means for personnel to gather, store, organize and access explicit knowledge and provide a platform to enable personnel to share their tacit knowledge without having to be physically present with each other in face-to-face communications or discussions. This will increase the accessibility of knowledge because it will reduce the effort and time spent by personnel in knowledge sharing.

Manuri (2012) stated that there has been a lot of debate on the role of ICT as an enabler to KM. He added that KM is basically comprised of people, organizations and technology. Egbu and Botterill (2001) stated that KM is the process of knowledge being acquired, created, shared, communicated, utilized, managed and applied to meet organizational needs. For all these processes to happen, Marwick (2001) posited that knowledge transformation, whether tacit knowledge to explicit knowledge or explicit knowledge to tacit knowledge, can be supported by utilizing ICT, although this is especially true for explicit knowledge.

Kimmerle, Cress, and Held (2010) stated that, as many regard ICT as an enabler, it is actually the integration of both human and technology that facilitates individual knowledge creation. Fresneda and Goncalves (2008) mentioned that ICT brought new ways of creating, collecting, storing, combining and using knowledge. Marwick (2001) posited that for effective KM to take place, the combination of organizational, managerial and social initiatives is the essence, plus technology. Okunoye and Karsten

(2002) further added that the need of ICT in implementing KM as an enabler depends on IT infrastructure availability and on how it is going to be understood, accepted and properly used.

Nonaka and Takeuchi (1996) and Davenport and Prusak (2000) stated that ICT systems will allow personnel to create personal or job-related networking among people in the same surroundings for creating, sharing and dissemination of information. Regardless in public or private sectors, the role of ICT is very crucial in the vast development of technology in the contemporary world. According to Becerra-Fernandez et al. (2004), ICT infrastructure can be utilized to capture and share explicit knowledge by providing share common access to information.

Knowledge creation process studies have discussed the role of ICT in managing organizational knowledge. According to Cham, Yet, Boon, and Teck (2016), to facilitate KM and knowledge creation processes, ICT has been deployed to form a system of managing organizational knowledge and has contributed significantly to knowledge that can be accessed and processed. There are many studies that have evaluated suitable KM and knowledge creation technologies, including the studies conducted by Liao and Wu (2010) and Wu, Bin, and Yongjiang (2013), which identify several KM and knowledge creation process technologies and knowledge-based systems. The role that ICT could play would be to connect personnel across the RMN fleet organization with knowledge (Bjørnson & Dingsøyr, 2008). However, Beccera-Fernandez et al. (2004) posited that KM infrastructure or mechanisms may or may not include technology. For instance, on-job-training (OJT), face-to-face discussion, learning by doing or learning by observation might not use ICT. However, Manuri (2012) argued that with the present availability of advanced and superb technology,

organizations should take full advantage of the existence of technology in order to gain competitive advantage because it will have an overwhelming impact on organizational readiness.

Computer technology, such as software like Microsoft Office or CD/DVD based systems can be used to codify and transfer knowledge, explicitly, i.e., in written or recorded forms (Easa, 2012). This technology is useful in managing knowledge in the RMN fleet. Apart from that, Easa (2012) claimed that electronic communication like video conferencing is also useful for transferring knowledge besides face-to-face communication. Management of knowledge deals with merging data and information in creating new knowledge. ICT enables KM by promoting and facilitating the processes of discovery, capturing, sharing and application of knowledge (Beccera-Fernandez et al., 2004). On the other hand, there is an argument that if organizations focus too much on technology to create network structure, it may limit knowledge sharing among personnel (Swan, Scarbrough, & Preston, 1999). According to Easa (2012), face-to-face communication is important for personnel to share their tacit knowledge, even though ICT is very useful to provide a platform for encouraging knowledge sharing. Hence, organization like the RMN fleet should also focus on social interaction because Swan, Newell, Scarbrough and Hislop (1999) posited that "IT-based tools and systems of KM create the structural networks but do not necessarily encourage the social networking processes…" (p.264). In other words, technology can provide the network of links between geographically dispersed groups and individuals, that enables effective knowledge sharing. However, knowledge is constructed from and through social relationships and interactions.

2.7 Summary

The sophisticated RMN fleet has to evolve as a dynamic organization with communities of interaction to generate more knowledge to remain relevant as a maritime defence component of the country. Because knowledge can be divided into several types, it has been proven that it will become a management problem if not systematically managed. The most popular types of knowledge are tacit knowledge and explicit knowledge. In this study, the researcher chose those types of knowledge to measure the extent of knowledge creation practices as the researcher felt that more knowledge should be extracted from experienced personnel in consideration of the rotation policy that the RMN fleet has. The extracted knowledge needs to be documented and all the valuable knowledge kept intact and not dissipated or lost with the outgoing personnel when the time comes for them to be appointed somewhere else within the RMN. This knowledge also needs to be updated from time to time with advanced, up-to-date technology, and the dynamic environment with changing scenarios and personnel coming in and out from the fleet must be taken into consideration. With this 'new' explicit knowledge, the tacit knowledge base of the RMN fleet personnel can be upgraded and updated through application of the learning by doing concept, and this will be an ongoing or never ending processes as described by the 'spiral' concept of the SECI model developed by Nonaka and Takeuchi (1995a, 1995b) involving the adoption of Polanyi's concepts of tacit knowledge and explicit knowledge (Grant & Grant, 2008; Gourlay, 2006; Tong & Mitra, 2009; Rice & Rice, 2005) and Polanyi's ideas of personal knowledge being organizational and practical. Nonaka and Takeuchi (1995a) stated that "the key to knowledge creation lies in the mobilization and conversion of tacit knowledge" (p. 56), and tacit knowledge is generated by personnel in converting explicit into tacit knowledge through internalization processes (Gourlay, 2006).

Creation of knowledge will amplify personnel's personal knowledge. Utilization of the SECI model to gauge the extent of knowledge creation practices within the fleet has served to guide the researcher in obtaining some means or solutions that can be introduced to the organization in terms of a proposed framework for knowledge creation enhancement. However, points to be considered, besides personnel and this model, are the associated places and structure of knowledge creation. The influence of leaders or higher management will also determine the success of the processes. On the other hand, Easa (2012) claimed that the SECI model is also technologically oriented, and ICT as the enabler of KM, will assist in capturing, codifying, storing, disseminating and using knowledge by allowing easy access to it. However, a few scholars, as discussed in this chapter, have argued that face-to-face interactions are also important for generation of new knowledge.

To sum up, the argument and discussion above recommends that awareness of the creation of knowledge processes and their impacts, the application of the SECI model within the RMN fleet and things associated with knowledge creation, such as technologies and places, will enrich insights into creation of knowledge and the processes involved within the organization (Bryceson, 2007; Haag et al., 2010). Nevertheless, this 'culture' is complicated to implement in a complex organization like the RMN fleet because it has several dimensions, and people are sceptical about changes (Groschl & Doherty, 2006). Easa (2012) posited that culture may refer to occupational cultures, organizational structures and managerial practices, and Denton (2004) added that the management of knowledge in organizations may face problems since all of those mentioned can be interdependent, interrelated or perhaps, contradictory. The reviewed literature suggests that the RMN fleet take prompt actions in determining its level of knowledge creation since knowledge has become paramount

for dynamic and influential organizations to sustain their competitive advantage and remain relevant in their business. The SECI model, which will act as the mechanism for obtaining insights on these challenges, will assist in highlighting issues or loopholes within the organization that can be remedied by proposing a framework for a knowledge creation enhancement model.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

Methodology can be defined as a means or method of doing something (Mouton, 2011), and according to Kaplan and Duchon (1988), there is no research method that is superior from another. Crotty (2003) stated that research design is determined by the nature of research problems and how the researcher is going to seek for the answer. Burrell and Morgan (1979) posited that in choosing a research methodology, philosophical perceptions and interpretations of the researcher need to be considered because it is not just explaining about the nature of society but it also unwraps the nature of science where new knowledge can and will be produced. According to Holden and Lynch (2004), the nature of science is concerned with the subjective and objective approach to the study, as it is explained by several core assumptions of the researcher with regards to epistemology (knowledge), ontology (reality) and human nature in order to select a research methodology. This was further supported by Gill and Johnson (2002) who also stated the researchers' philosophical assumptions (epistemology, ontology and human nature) are the important elements and roles considered prior to selecting a methodology. Meanwhile, Collis and Hussey (2014) said that research methodology is a very comprehensive strategy in the research process comprising the theoretical assumptions, data collection, and data analysis resulting in the findings.

The research method chosen for this study formed the basis for evaluating and philosophically supporting the research questions and research objectives, was widely used in previous relevant research, and was suitable and relevant to the research questions and research objectives.

This chapter will describe the research design, population, sampling, instruments and procedures for data collection and data analysis. It will explain the selected research methodology's analytical framework including process of the research design used in relation to the research aim and objectives. Criteria for establishing trustworthiness and ethical considerations will also be discussed in this chapter.

Memon (2015) posited that in most of the developing countries, the argument has been that the researcher will face difficulties in getting respondents or participants due to not knowing anybody in the organization or the researcher not having any reference of contact with any related officers or personnel. However, since the researcher is part of the organization, the process was easily conducted with the blessings from higher echelons. In this study, arranging distribution of the survey questionnaire and conducting interviews with respondents and participants was not problematic since the results or findings of this study were to be contributed back to the organization. Getting the management level involved in both circumstances was straightforward since the processes were conducted on board the selected warships while they were secured alongside their respective jetties in various naval bases. The researcher had also liaised regarding relevant activities and ship movements with authorities in the Fleet Commander HQ so that the study would not impede the operations of the selected warships. Furthermore, this study had already got the approval from both the Fleet Commander West and East in carrying out the surveys.

Tavallaei and Abu Talib (2010) explained that there is a clear link between methodology and theory. This research employed a qualitative method with the SECI model by Nonaka and Takeuchi (1995a, 1995b) as the theoretical component. The theoretical lens was used as guidance so that the study would focus only on the

framework. Tavallaei and Abu Talib (2010) also elaborated that researchers in conducting qualitative research, are actually approaching the real world with ideas and theories that are going to answer specific questions that researchers are studying in specific ways or using certain methodologies. In the RMN fleet context, the study concentrated on the maritime scenario (on board selected ships), which is the core business of the RMN in safeguarding the sovereignty of the nation's maritime interests comprising over 600,000 square km of area and 4,675 km length of coastlines. The study excluded other units in the RMN, and only concentrated on outcomes from the fleet because the fleet forms the backbone of the RMN.

In this study, the selected respondents, or participants, answered the survey questionnaire, and interviews were based on the justification of their roles at the senior, intermediate (middle) and operational (lower) management levels in relation to knowledge creation processes based on the SECI model. There was no previous study to investigate knowledge creation processes from the military perspective in Malaysia, specifically in the RMN fleet.

3.2 Case Background – RMN

The RMN is the naval arm of the Malaysian Armed Forces, and the main role of the RMN is to safeguard the nation's sovereignty, which includes Malaysia's maritime strategic interests, Exclusive Economic Zone (EEZ) and territorial waters and to defend Malaysia against all seaborne threats (*Perintah Operasi Armada*, 2000). The RMN fleet is considered one of the most sophisticated armadas with technologically advanced and state-of-the-art armaments, sensors and equipment fitted on most of its warships (Saunders, 2015). At the time the study was conducted, the then current transformation plan was taking place, and the RMN was expected to soon receive more advanced

warships. This process of modernization requires personnel that excel in the latest, rapidly changing technology, and this can be achieved only with a well-planned training programme with the right personnel selected to acquire the knowledge.

Therefore, training for knowledge is one of the important factors that makes the RMN a credible and formidable force. The ultimate aim of the training and acquiring knowledge is to prepare RMN personnel to perform their tasks efficiently on board ship and to safeguard the nation's sovereignty under any operational conditions (*Doktrin Pertahanan Maritim*, 2001).

The strength of the RMN personnel based on statistics from May 2019, was 16,755, comprising 2,276 officers and 14,479 other ranks. The challenge of conducting sampling arises from the need to know the specific units to be selected and why they are being selected, and the number of units that the researcher wants in the study (Yin, 2015). In this study, focus was on the RMN fleet and adequately narrowed down to squadron leaders or representatives of the rest of the same class of vessels in the RMN inventory. The research population for the study was comprised of officers and enlisted personnel (other than officers) from the fleet selected from those on board ships located in operational base of the RMN, namely, Lumut Naval Base, Kuantan Naval Base and Kota Kinabalu Naval Base.

The participants were selected for obtaining the information necessary to address the objectives of the research, and for this study purpose, the research participants were selected on the basis of their roles in the ship's organization, which included those from the senior, middle and operations or lower management personnel. This management

level also differentiated the ranks in accordance with the levels of their management roles.

3.3 Qualitative Research

Yin (2009) mentioned that qualitative data can be garnered utilizing several methods, namely, from documents, records, interviews and observations. The purpose of a qualitative study is to get results in more depth and to seek honest opinions and perceptions from the target population, and interviews are important and familiar tools for data collection on participant perceptions, beliefs and behaviour (Creswell & Poth, 2017). Corbin and Strauss (2015) insisted that "qualitative information is valuable to investigate social, organizational and cultural upbringing of underlying phenomenon and unfolding people to accept wisdom towards any issue or problem." Qualitative research is mainly concerned with answering 'why' and 'how' questions within the context, so in this study, a questionnaire survey (preliminary study) and interviews were conducted to examine in detail the extent of knowledge creation processes used within the RMN fleet.

Denzin and Lincoln (2005) posited that in qualitative studies, researchers carry out research in its natural settings. Making sense and sensible interpretation are the aims for qualitative research to ensure that it will be meaningful to people. In other words, the research is situated activity that locates the researcher in the world being studied, and it consists of a set of interpreted and material practices that will make the world being studied visible. Pansiri (2005) further added that qualitative approach allows researchers to choose participants who are deemed to deliver good feedback. Jogulu and Pansiri (2011) also posited that qualitative research offers subjective interpretations of

experiences that give conceivable answers with regards to individual experiences and social phenomena.

Therefore, the extent of knowledge creation processes used in the RMN fleet and the level of knowledge and awareness on knowledge creation processes of the RMN fleet personnel was measured qualitatively. This was accomplished by interviewing every existing level of management in the organization to get their interpretations and perceptions about the policy framework for knowledge creation processes, or KM framework, within the RMN fleet, coupled with a survey done earlier in preliminary study and some documentation reviewed.

3.3.1 Case Study

This research used a case study methodology to investigate the application of KM in the RMN fleet. The methodology included tools, such as an interview guide, for the researcher to study the complex phenomena (Myers, 2013; Yin, 2015). Benbasat, Goldstein, and Mead (1987) explained that case studies examine phenomena in their normal settings, and a researcher may employ multiple methods of data collection to gather the information from multiple entities, for instance, people, groups or organizations. This study was conducted within the RMN fleet complex scenario, and the selected methodology was used to acquire insights allowing the researcher to further understand how personnel coped in their working environments (Yin, 2015) and assisting the researcher to understand people regarding what they said and did (Myers, 2013).

Apart from collecting data using interviews, this study also utilized a survey and review of documentation in order to obtain data from multiple sources. By using all

these resources, the researcher could understand the thinking (Yin, 2015) of the RMN fleet personnel on creation of knowledge processes from the findings of survey, face-to-face meetings during interview sessions and reviewing all the findings from available related documentation.

3.4 Research Design

Research design comprises the complete procedure with regard to collecting, analysing, interpreting and reporting data in a study (Creswell & Plano Clark, 2007). According to Yin (2009), research design is a 'logical illustration' that relates data to be collected and conclusions to be drawn to questions and objectives of the study. In this study, to choose a research method was an arduous task and was not a matter of choosing randomly from available sets of different methods, for instance, interviews, questionnaires, observations or focus groups, and it was not done by conveniently choosing based on either quantitative or qualitative approaches. In researcher's opinion, no research paradigm is better than another because the researcher believes that every research methodology has its strengths and weaknesses to suit the context and purpose of a particular study.

According to Denzin and Lincoln (2005), research design can be divided into two aspects, which are based on the research aim and objectives and the researcher's experiences, perceptions or assumptions, beliefs and philosophical understanding. Gill and Johnson (2002) indicated that the selection of research methodology can be based on the nature and content of the research phenomenon and also availability of resources. In the case of this study, the research methodology used was suitable for addressing the research questions and research objectives in order to achieve the aim and objectives of the study.

The instruments developed for this research were questionnaires and an interview protocol adapted from Easa (2012), which were devised to provide results and to interpret the findings of this study regarding knowledge creation processes in the RMN fleet. The survey and interview questions were based on the SECI model (Nonaka & Takeuchi, 1995a, 1995b). The survey questionnaire covers all four modes of knowledge creation processes that used to gauge the extent of the processes within the RMN fleet as stipulated in the first objective of this study. Similarly, the interview protocol was designed to get the insights from all modes of knowledge creation processes within SECI model to answer the research questions and to achieve the research objectives. It was also to confirmed with the findings from the survey in order to answer and meet the first question and objective. On top of that, the interviews were to obtain the themes from thematic analysis in order to come up with the recommendations in proposing a new knowledge creation enhancement framework as per second research objective. Hence, this case study on the RMN fleet started with the preliminary study utilizing survey questionnaires to gauge the extent of knowledge creation processes within the fleet. This was in order to gather descriptive statistics based on item analysis that provided mean values and standard deviations. One-way analysis of variance (ANOVA) was also conducted on the demographic data to get some explanation about the relationship with SECI model. The study was conducted on board various types of warship belonging to the RMN fleet, namely, frigates, corvettes, new generation patrol vessels (NGPV) and multi-purpose command support ships (MPCSS) located in various RMN naval bases.

The sampling procedures were carried out from the fleet's personnel serving on board the squadron leaders of each type of ship mentioned or from ships that

represented the type of ship selected, especially when the squadron leaders were away for any operations or exercises. For preliminary study, the researcher used stratified random sampling to highlight a specific subgroup within the population. It was the most efficient technique where all groups were adequately sampled and comparisons among them were possible (Sekaran & Bougie, 2016). This sampling also provided more precision and required smaller sample. Proportionate allocation was used in this study to infer the results that represented the whole RMN fleet. Hence, the fleet personnel were stratified into senior (20%), middle (30%) and lower management level (50%) based on approved ship's personnel appointments on board. The senior level of management comprised officers with the rank of Lieutenant Commander and above. The middle level was from Petty Officer to Lieutenant, and the lower level was from Leading Rate and below. This sampling design deemed to be more efficient because the fleet's personnel was better represented and differentiated information obtained from the respective groups (Sekaran, 2013).

For qualitative study, the sampling was concentrating into the desired insights that can be provided by the participants and the interviewees met the criteria set by the researcher (Sekaran, 2013). Purposive sampling from different management level were conducted according to their roles and functions as senior management, middle management and lower management. The personnel were also from different type of ships as per mentioned above and they were divided according to their department of seamen, technicians and logisticians. Quota sampling of 33.3% for each management level, type of ships and respective departments was set, as this sub-criteria in purposive sampling can be considered also as proportionate stratified sampling, where participants' proportions were predetermined on a convenience basis (Sekaran, 2013). They were also divided according to the type of ships, which are combatant class that

comprised of frigate and corvette (33.3%), NGPV (33.3%) and MPCSS (33.3%) and the department that they served respectively i.e. operations department (33.3%), technical department (33.3%) and logistics/others (33.3%). 'Others' in the department representing the OJTs and other personnel on attachment. The other demographic data such as education background, length of service, and number of training, were the extra inputs to know about respondents background in answering survey questionnaires, to ensured that the fleet is providing personnel with sufficient training and to know the length of stay on board for each personnel that might be influencing the survey answers.

The survey was conducted by collective administrative survey utilizing five-point Likert scale questionnaires. For the survey, 250 questionnaires (Sekaran, 2013) were distributed and collected back. However, only 234 questionnaires were used since 16 of them were deemed inappropriate to be used in the study. To obtain further insight for this study, 15 participants (Yin, 2015) divided equally from various management levels were interviewed. Semi structured interviews with open ended questions were conducted, and some probing techniques were used to obtain insights regarding the whole study. The point of saturation of the data were obtained after 12 interviewees, but the researcher continued with another 3 interviewees to ensured. Furthermore, the operational requirement of the ships limit the researcher of getting more participants and according to Yin (2015), 15 interviewees were adequate for the purpose of this study.

Both questionnaires and the interview protocol were adapted from Easa (2012) and were constructed accordingly to answer the research questions and to meet the research objectives. The researcher utilized simple language and words that were easy to understand by the respondents and participants. The analyses of data were made using

SPSS version 24 software for descriptive analysis and ANOVA, and Nvivo12 software was used as well as manual interpretive analysis. Triangulation was made between the stakeholders, methods and materials, which comprised survey data, interview transcriptions and documentation reviewed by the researcher.

3.4.1 Research Ethics Approval

The participation in the questionnaire survey or interviews in this study was on a voluntary basis, and respondents or participants answered the questions on behalf of themselves. Information was given to the respondents and participants with regard to ethical approval by means of consent forms, and the respondents or participants were free to withdraw at any time if they wished to do so. A minimum age of 18 was set for the respondents or participants since that is the minimum age requirement to enter the organization. Apart from that, prior to conducting the data collection, authorization was obtained from the University Malaya Research Ethic Committee (UMREC) as per Appendix A. This was in order for the researcher to assure the respondents and participants with regard to compliance with certain ethical standards set by the university deemed to be mandatory in the data collection process.

Creswell and Poth (2017) posited that many ethical obligations may arise during data collection, data analysis and during the interpretation of those collected data. Sieber (1973) stated that researchers must ensure the physical, psychological, social, economic or legal protection of the participants. Berg (2004) added that researchers must provide accurate information and avoid any factual overstatement or exaggeration, and according to Guthrie, Ricceri, and Dumay (2012), researchers must ensure the confidentiality and privacy of all the participants or respondents and not reveal any information that might be used to identify and jeopardize the participants or respondents.

In other words, the researcher needs to be fully responsible to protect participants' privacy, confidentiality, interests, emotions, morals, culture, etc.

3.4.1.1 Informed Consent

Prior to carrying out the study in the RMN fleet, an approval letter was sent to the Fleet Commander West (FCW) located in the Lumut Naval Base and Fleet Commander East (FCE) in Kota Kinabalu Naval Base to get their blessings for the study to be conducted in their fleets (see Appendices B and C). Gratefully, they gave their verbal consents to conduct the research on board several warships selected on the basis of squadrons moored alongside operational jetties at several RMN naval bases in different locations in Malaysia. Apart from the consent form to be signed by the respondents or participants, verbal consents were also obtained from the Commanding Officers of all ships selected. The participants were informed that they could stop participating at any time if they wanted to or if they felt uncomfortable about continuing during the data collection process.

3.4.1.2 Protection of Participants/Respondents

Researchers as per codes of professional conduct should always adhere to ethical obligations (Punch, 2005). Collis and Hussey (2014) added that researchers must be responsible for ethical conduct and protection of all participants or respondents even though social sciences have less ethical obligation compared to natural sciences. Hence, confidentiality and anonymity needed to be assured and guaranteed in all processes, phases or levels of this research.

3.4.1.3 Anonymity and Confidentiality

For privacy compliance, the researcher followed the proper consent procedures as mentioned above and to maintain confidentiality, the researcher collected anonymous data, which were not linked to the respondents or participants. Respondents or participants were assured that their personal details and all data or information given would neither be made public nor lead to disclosure of identities.

Good data collection and good storage practices ensured data security. The researcher was not allowed to discuss about the respondents or participants outside of the research context. The access to information about individual respondents or participants was restricted to only the researcher, the supervisor or research assistants on a need-to-know basis. Extreme care was taken to avoid breaches of security in which the information might be disclosed to anyone else. This not only meant to protect against psychological, social and legal harm to the participants but is essential to the conduct of any research on sensitive topics. Apart from that, the obtained data were safely kept, locked and secured in the researcher's study room at home, and nobody had unauthorized access to any of that information.

3.5 Research Framework

In order to answer the research questions and to achieve the research objectives of this study, a research framework, as shown in Figure 3.1, was used. This framework is based on the SECI Model, and in this study, the researcher used it to examine the knowledge creation processes found in this study from the socialization, externalization, combination and internalization perspectives.

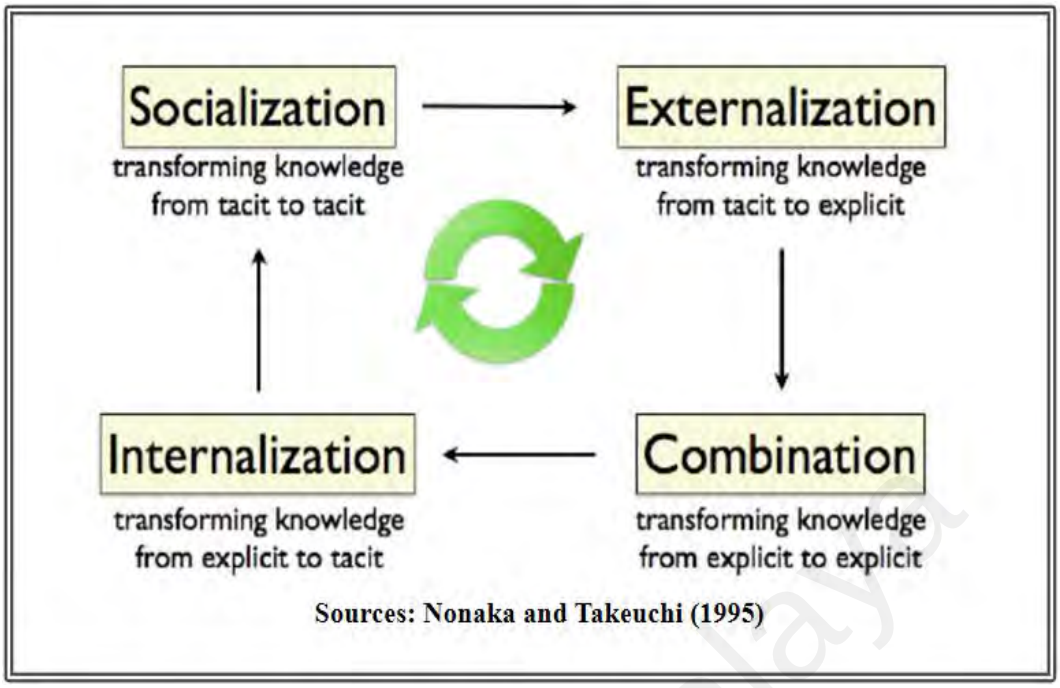


Figure 3.1: Research Framework

In knowledge creation processes, all four activities of KM, i.e., capturing, storing, sharing and utilization of knowledge, also take place. Data from multiple resources are captured through processes of knowledge creation and stored before becoming outcomes (outputs) to be shared and used by the organization. For instance, in socialization mode i.e. tacit to tacit knowledge conversion, face-to-face communications or video conferencing enable the involved parties to capture, store, share and use the transmitted knowledge. Similarly, in the externalization process where tacit knowledge is captured and codified into explicit knowledge, stored, shared and utilized. These four main KM activities are also parts of the combination and internalization of knowledge creation process. Hence, the researcher feels that the model is the most appropriate model to become the theoretical lens in this study.

3.6 Data Collection

Zikmund, Babin, Carr, and Griffin (2013) posited that, in any study, the data collection process is the most critical part, where different resources and types of expertise could be required in order to get sufficient data or information to ensure high response rates from the respondents or participants. Sometimes, lack of self-interest, lack of organizational-interest and poor research culture within the organization will inhibit the process from proceeding smoothly and as required by the researcher.

In this study, the process of data collection (survey questionnaires and interviews) was initiated with the sending of formal letters of request to the RMN Fleet Commander West and East situated in Lumut and Kota Kinabalu, respectively. Targeted ships for this study were scattered among these mentioned bases and were considered to adequately represent the population of the whole RMN fleet. Fleet Commander West and East realized the importance of this study and gave their blessings to coordinate and facilitate this research. Verbal communications with the CO of the selected ships were established in order to coordinate the survey and interviews. Further explanation on the sample population was explained to give a better picture of what was going to happen during the process of data collection for this study and to get the appropriate respondents or participants based on the ranks and job functions of these knowledge workers in relation to the SECI knowledge creation process model by Nonaka and Takeuchi (1995a, 1995b). Respondents or participants were stratified into senior management, middle management and operational (lower) management groups, which were determined to represent the whole population of the RMN fleet organization. In terms of organizational level, sampling was carried out on board selected warships and from selected squadrons within the RMN fleet. Bear in mind that a squadron comprises a few warships of the same class. Therefore, the squadron leader, the senior most ship,

or in the absence of the squadron leader, any warship of the same class was taken to represent the whole squadron as respondents or participants. Thus, these samples should be adequate to represent the whole of the RMN fleet population for the purpose of this study.

The data collection was categorized into primary data collection, which were interviews and surveys, and secondary data collection, including reports, books and articles that contained information generated for other purposes other than the original one (Cohen, Manion, & Morrison, 2011). Data were collected using questionnaires and interviews following an interview protocol adapted from Easa (2012) with some added questions that suited the military context and environment to get insights about knowledge creation processes in the RMN fleet. As such, this study collected primary data through surveys and interviews and secondary data from reviewing available and related documentation.

Researcher feels that it is necessary to use questionnaires in this study, since it is almost impossible to interview every single personnel in the RMN fleet, in order to obtain relevant data and information (McClure & Faraj, 2000). It is the nature of the fleet, where ships are involve in so many kind of operations and exercises, and will not be long alongside the jetty. So, a survey using questionnaires was conducted first to get the gist of the research, which was to know the extent of knowledge creation processes, level of awareness and thinking of the RMN personnel in the fleet about knowledge creation processes, and this was then followed by interviews. The researcher analyzed survey data using SPSS and transcribed collected interview data using Microsoft Word. After transcription, thematic analysis of the transcribed data was conducted either

manually or using Nvivo12 software. In addition, related available documentation was reviewed accordingly such as SOPs, BOI reports, meeting minutes, etc.

3.6.1 Survey of Knowledge Creation Awareness

In this study, a questionnaire survey was used to get a clearer and better understanding of the participants' levels of awareness and thinking in relation to creation of knowledge processes in the RMN fleet. The nature of operations for personnel on board RMN warships is normally such that they have high mobility and very tight schedules during their tenure to safeguard the nation's maritime sovereignty. The questionnaires included closed-ended questions, to get the relevant data or information pertaining to the study. According to McClure and Faraj (2000), closed-ended questions force quick responses, facilitate getting scores quickly, and are easy to evaluate later. As mentioned above, the questionnaires were adapted from the instrument used by Easa (2012) with some modifications based on the RMN fleet context. The following items were used to measure the knowledge creation levels:

Table 3.1: Instrument Items

Process	Items		Source
Socialization	S1	During discussions, I try to find out others' opinions, concepts, thoughts or ideas.	Easa (2012)
	S2	During discussions, I often encourage others to express their concepts, thoughts or ideas.	Easa (2012)
	S3	My colleagues and I will actively share life or work experience with each other.	Easa (2012)
	S4	I gather information from other departments.	Easa (2012)
	S5	Before discussion, I will collect necessary information and show it to my colleagues.	Easa (2012)
	S6	I like to get to know the people whom I will work with before working together.	Easa (2012)
	S7	I collect work-related information and ideas in formal/informal relationships with other people.	Easa (2012)
	S8	The RMN fleet follows a systematic plan to rotate its staff in all departments.	Easa (2012)
	S9	Detailed face-to-face discussions of work issues are encouraged in the RMN fleet.	Easa (2012)

Process	Items		Source
	S10	Involving the RMN fleet in joint operations/exercises supports staff's knowledge through face-to-face interaction with others.	Easa (2012)
	S11	The RMN fleet conducts meetings, seminars, workshops to discuss the updating of work issues.	Easa (2012)
	S12	The RMN fleet invites its qualified members and external experts to speak about their beliefs, values and culture.	Easa (2012)
	S13	The RMN fleet encourages informal meetings for tea, coffee, having lunch and others.	Easa (2012)
	S14	The RMN fleet encourages social activities outside the workplace.	Easa (2012)
Externalization	E1	When others can't understand me, I am usually able to give examples to help explaining.	Easa (2012)
	E2	Most the time, I can transcribe some of the unorganized thoughts into concrete ideas.	Easa (2012)
	E3	I tend to describe professional or technical terms with conversational language to help communication.	Easa (2012)
	E4	I tend to use analogy when expressing abstract or theoretical concepts.	Easa (2012)
	E5	I will help others in clearly expressing what is in their minds by encouraging them to continue what they are saying.	Easa (2012)
	E6	Our team develops new ideas through constructive dialogue by using figures and diagrams.	Easa (2012)
	E7	I facilitate creative and constructive conversation among group members.	Easa (2012)
	E8	The RMN fleet documents its staff's point of view regarding relevant topics.	Easa (2012)
	E9	The RMN fleet asks its staff to report results of discussions with concerning parties.	Easa (2012)
	E10	The RMN fleet documents the findings of conducted meetings, seminars, workshops, conferences and training programmes.	Easa (2012)
	E11	The RMN fleet issues reports of externals based on its cumulative experience.	Easa (2012)
	E12	The RMN fleet establishes the topics of training programmes and seminars based on its qualified members and external experts.	Easa (2012)
	E13	The RMN fleet documents the useful experiences of its qualified members into reports.	Easa (2012)
Combination	C1	During a discussion, I tend to help organize ideas and make conclusions to facilitate the discussion.	Easa (2012)
	C2	When coming across problems, I tend to use my experience to help solve problems.	Easa (2012)
	C3	After every event, I have the habit of organizing and making a summary of what happened.	Easa (2012)
	C4	During discussion, I will organize everyone's thoughts in my mind.	Easa (2012)
	C5	I like to collect new information and make connections between new and old knowledge to develop new concepts.	Easa (2012)
	C6	I engage in developing criteria to determine the value of new concepts.	Easa (2012)
	C7	Our team conducts experiments and shares the newly developed concepts with the entire organization to evaluate the value of the concepts.	Easa (2012)
	C8	The RMN fleet classifies information mentioned in databases, networks and reports.	Easa (2012)

Process	Items		Source
	C9	The RMN fleet updates its databases.	Easa (2012)
	C10	The RMN fleet considers information mentioned in databases, networks, and previous reports to develop its rules and decisions.	Easa (2012)
	C11	The RMN fleet uses documented information as a means of connection between its personnel and with external bodies, e.g., stakeholders such as OEM, suppliers, sister services, private or other government agencies.	Easa (2012)
	C12	The RMN fleet collects, classifies and informs its personnel with reports and decisions issued by external bodies.	Easa (2012)
	C13	The RMN fleet depends on relevant published research and reports to develop its policies and aims.	Easa (2012)
Internalization	I1	After hearing a new idea or concept, I tend to compare it with my experience to help me comprehend the meaning.	Easa (2012)
	I2	I understand others' thoughts better by repeating what they said and asking them "is this what you mean?"	Easa (2012)
	I3	I will tell others what I think to make sure my understanding is the same as theirs.	Easa (2012)
	I4	When I have finished saying something, I will ask the other person if it is necessary to repeat to make sure he/she understands exactly what I mean.	Easa (2012)
	I5	Our team-members use newly learned knowledge as the sources for next time applications.	Easa (2012)
	I6	When communicating with others, I will give them time to think about what we just discussed.	Easa (2012)
	I7	We combine existing and new concepts in meaningful ways.	Easa (2012)
	I8	The RMN fleet encourages its personnel to join postgraduate courses, e.g., Diploma, Master's or PhD.	Easa (2012)
	I9	The RMN fleet facilitates the access to outcomes or recommendations of training programmes, workshops and seminars.	Easa (2012)
	I10	The RMN fleet facilitates the access to its databases and the internet to get required information.	Easa (2012)
	I11	The RMN fleet arranges meetings to explain the content of related reports or documents.	Easa (2012)
	I12	The RMN fleet arranges meetings to explain and analyse the relevant reports issued by stakeholders such as OEM, suppliers, sister services, private or other government agencies.	Easa (2012)
	I13	The RMN fleet believes that the available data and information strongly shape its point of view and culture.	Easa (2012)

The questionnaires were also completely anonymous so that the respondents would provide honest feedback, especially when they encountered sensitive issues. The questionnaires were distributed to 250 respondents (Sekaran, 2013), who were stratified accordingly based on the senior management, middle management and operations staff

levels. A collective administrative survey procedure was used, as the nature of the personnel on board allowed the researcher to carry out such a survey, to ensure a high response rate, and to have personal contact with the participants (Kumar, 2011). The questionnaire is provided in Appendix D.

Salman, Sumaiya, and Ghulam (2017) explained that electronic questionnaire (i.e., questionnaire distributed online) usage has increased with the advancement of technology. However, according to Nulty (2008), respondents to electronic questionnaires need to be self-motivated in order to return the completed survey questionnaires. So, the response rate is the prominent problem in utilizing electronic questionnaires (Dommeyer, Baum, Chapman, & Hanna, 2002). Fink and Ploder (2009) further added that the respondents also need to be connected with the internet to complete the survey, and in the RMN fleet context, the nature of operations causes difficulties in the process of utilizing electronic questionnaires to get the feedback. Most of the warships in the RMN fleet inventory are not equipped or fully fitted with internet facilities. The utilization of internet or wi-fi on board, if the ship is fitted with that, is limited to operational purposes due to security reasons. Hence, the self-administered way of distributing survey questionnaires was preferred for this study.

According to Menon (2015), the traditional survey method is ideal for respondents that do not have or have limited access to the internet. He further added that this process of collecting data will result in better and higher response rates compared to electronic questionnaires. From the RMN fleet perspective, where all the respondents are serving in the fleet and there is thus no need to cover a large geographical area, paper questionnaires are the most appropriate tool to get the descriptive data. With paper questionnaires, respondents can conveniently answer the questions within time

limitations, need not access the internet, which is limited on board ships, have the ease of understanding since the researcher is around to assist in explaining if they encounter any ambiguity or doubt, confidentiality is guaranteed, and they have the ability to express their true beliefs, feelings, opinions, perceptions or interpretations in answering the questions in this study. Some data that were gathered in this survey using questionnaires were used along with qualitative data triangulation to acquire better understanding of results.

3.6.2 Interview

In this study, data were also collected from interviewees by the means of semi-structured questions (Maxwell, 2012), and the focus was the identification and determination of detailed information about creation of knowledge processes within the RMN, specifically related to operations on board ship within the fleet. The interview semi-structured question protocol guidelines are presented in Table 3.2.

Table 3.2: Interview Semi-Structured Question Protocol Guidelines

Process	Guideline	Source
Socialization	1. How do you share your knowledge? 2. How many times do you have formal/informal discussion in a week or a month? How good? Why? 3. How is knowledge created in the fleet? Give an example.	Easa (2012) Easa (2012) Easa (2012)
Externalization	1. How does the ship store her knowledge? 2. How is experience from operations and training by the ship being captured/utilized?	Easa (2012) Easa (2012)
Combination	1. How does the ship keep on developing and updating her knowledge? Examples? 2. How does the ship deal with feedback issued? Examples?	Easa (2012) Easa (2012)
Internalization	1. How does the ship encourage her personnel to access her documented knowledge? 2. How does this action add knowledge to you?	Easa (2012) Easa (2012)

Interviews were used to collect information on encounters in real world contexts where the phenomena under study occurred (Eisenhardt & Graebner, 2007). The key participants were from all levels of management in ship's organization as per listed in Table 3.3. This research excluded other ships because the ships selected represented their respective squadrons in the RMN inventory and would be adequate to represent the RMN fleet operation. The interview guide covered the key areas of knowledge creation processes and practices and was created to guide the researcher in obtaining the information that was needed (Kane, Ragsdell, & Oppenheim, 2006). The interview protocol or guide as per Appendix E was adapted from a previous study conducted by Easa (2012).

Table 3.3: Interview Participants

Interviewee and Designation	Level
1. Executive Officer (XO) of Frigate	Senior Management
2. Executive Officer (XO) of NGPV	Senior Management
3. Executive Officer (XO) of MPCSS	Senior Management
4. Weapon Engineering Officer (WEO) of Frigate	Senior Management
5. Supply Officer (SYO) of NGPV	Senior Management
6. Coxswain (COXN) of MPCSS	Middle Management
7. Senior Rate (Supply) of MPCSS	Middle Management
8. Senior Rate (Technical) of NGPV	Middle Management
9. Senior Rate (Gunnery) of Corvette	Middle Management
10. Operation Room Supervisor (ORS) of Frigate	Middle Management
11. Helicopter Controller of Frigate	Lower Management
12. Navigation Yeoman of NGPV	Lower Management
13. Junior Rate Seaman of MPCSS	Lower Management
14. Junior Rate Supply of MPCSS	Lower Management
15. Communications Yeoman of NGPV	Lower Management

3.6.3 Documentation Review

Document analysis was conducted systematically when evaluating and reviewing documents (Bowen, 2009). Bowen (2009) added that a variety of documents could be used for systematic evaluation such as minutes of meetings, manuals, books, brochures, etc. Denzin (1970) posited that documentation review is usually used for triangulation with other qualitative research methods. In this study, descriptive data from survey and interpretive data from interviews were triangulated with reviewed documentation. Eisner (1991) opined that the researcher attempts to merge all essential findings to produce credible findings by conducting triangulation.

It is always much easier to acquire data from documents, and according to Myers (2013), by providing some evidence, documents can build a wealthier picture than can be acquired by interviews or fieldwork alone. For example, in the RMN context, BOI reports show the findings of investigations carried out for mishaps or when discrepancies happened. A clearer picture is provided from the investigation because all aspects were taken into account before the members of the BOI arrived at their conclusions. Based on this documentation, the researcher could conclude the study by doing triangulation of data from the findings of the survey and interviews to further strengthen the study. A list of documentation used is provided in Appendix F.

3.7 Data Processing and Analysis

In qualitative research, the researcher will always end up with lots of data (Myer, 2013) from multiple sources. Myers (2013) further posited that focusing on qualitative data analysis is to transform the data so that it will be meaningful to everybody. In this study, all the data obtained from series of survey and interviews with the selected fleet members will be analyse, coded and put into themes (Taylor-Powell & Renner, 2003).

Data from interviews will be transcribed into word process documents and will be analysed manually or using NVivo12 software, so that they would make sense for interpretation (Myers, 2013). On the other hand, data obtained from the survey questionnaire (SPSS used) and reviewing of documentations, will also provide the knowledge of knowledge creation thinking level and awareness among the crew and the basis of doing things right and following the RMN rules and regulations.

3.7.1 Survey Data

The main reason of conducting survey utilizing questionnaire in this study is to investigate to what extent knowledge creation process is taking place within the RMN fleet in order to ensure the awareness and knowledge of all the crew members on board the RMN ships with regards to knowledge creation processes. On top of that, this study also identified knowledge creation mechanisms being used and based from the findings, the researcher appreciated better on the level of knowledge creation processing in the fleet through descriptive analyses done utilizing SPSS software.

3.7.2 Interview Data

As for the data collected from the interviews, themes were developed using thematic analysis. According to Clarke and Braun (2013), thematic analysis is widely used as a qualitative data analysis technique in many research studies as it provides a method to identify and analyse patterns in qualitative data. Data acquired from the interviews were also codified. Braun and Clarke (2006) stated that coding is not just a data reduction method but instead an analytic process to facilitate a semantic (linguistic and philosophical study of meaning) and conceptual reading of the data. Codes were used to

organize themes, and in this study, semantic themes were identified based on explicit meaning contained within the data.

3.7.3 Documentations Review

The researcher also used all related and available documents which were accessible to further strengthen the study. Some important and classified data were very useful in this study, such as directives pertaining to job rotation requirements, higher echelon directives pertaining to knowledge, and reports that showed the importance of having systematic knowledge creation in the fleet. With this data, the researcher added value to the study and further instilled the importance of knowledge creation in the RMN fleet. The researcher also gained insights on whether the fleet was practising what they were supposed to for managing knowledge. The researcher then triangulated to find answers for each of the research problems and objectives in the study using these multiple sources of data.

3.8 Summary

This study utilized a case study design with qualitative methods with the support of descriptive data from a survey conducted within the RMN fleet. Some relevant documentation was used to get more details to support the study, especially in determining the research problems. These processes showed that the research method had been designed as rigorous as the researcher could obtain the findings. The cooperation obtained from the HQ and the fleet was satisfactory in providing assistance to the researcher in conducting the survey and interviews. The research instruments used, i.e., the questionnaires and interview protocol, were relevant to the study context, thus making the findings beneficial to the organization. Research ethics were strictly adhered to in order to eliminate any ambiguities and to ensure the appropriateness of the

study. The SECI knowledge creation model used as the research framework was deemed to be suitable as it provided guidelines in determining the level of knowledge being created in the RMN fleet and provided a foundation for the researcher in proposing the extended knowledge creation process model to further enhance the process within the fleet. The data were collected and analysed from the survey, interviews and reviewed documentation, and software such as SPPS version 24 and NVivo12 were utilized to assist the management of data. Finally, a triangulation method was conducted to seek the conclusions of the study.

CHAPTER 4: ANALYSIS

4.1 Introduction

This chapter discusses the findings of the study based on a survey with 234 respondents and followed by interviews with 15 participants. In this study, a preliminary survey was conducted to know the extent of knowledge creation in the RMN fleet. Some other information like the mechanisms used and venues where the knowledge creation processes took place in the RMN fleet were obtained. The preliminary study was conducted with the use of a five-point Likert scale questionnaire adapted from Easa (2012) to determine the extent of knowledge creation and to know the level of awareness of personnel on knowledge creation processes within the RMN fleet. Statistical analysis of the data from the questionnaire responses were used to answer the research questions and accomplish research objectives as a stepping stone for the next level of this study, which was qualitative in nature with the use of semi-structured interviews following interview protocols adapted from Easa (2012) that suited the context of this research. Triangulation was made between the descriptive statistics, interpretive data and some references in order to strengthen and expand the interview findings and explain in more detail the extent of knowledge creation processes in the RMN fleet based on the SECI model.

Before embarking on the research, firstly, approvals were sought from the appropriate authorities before the researcher started the survey (see Appendices A, B and C). The sampled participants, as discussed in Chapter 3, were chosen from the fleet, and each ship visited represented the squadron in the type and class of ship deemed to be appropriate for this study. Sample distributions (see Table 4.1) according to the types of ship and the demographic characteristics such as gender, academic background, job

position, length of service, departments and number of times in training are followed with elaboration on importing the collected data into SPSS version 24 for statistical analysis.

4.2 Descriptive Analysis

4.2.1 Profile of Respondents

Table 4.1: Demographic Data of RMN Fleet Personnel (N = 234)

Demographic		Frequency	Percentage (%)
Gender	Male	223	95.3
	Female	11	4.7
Highest Education	High school	159	67.9
	Diploma	49	20.9
	1st degree	21	9.0
	Master's degree	5	2.1
Job Position	Lower	119	50.9
	Middle	62	26.5
	Senior	53	22.6
Length of service in current post	Under 1 year	35	15.0
	1–2 years	42	17.9
	2–3 years	34	14.5
	More than 3 years	123	52.6
Ship's type	Frigate/Corvette	92	36.3
	New Generation Patrol Vessel (NGPV)	63	26.9
	Multi-Purpose Command Support Ship (MPCSS)	79	33.8
Department	Operations	84	35.9
	Technical	81	34.6
	Logistics	37	15.8
	Others	32	13.7
Number of times in training since appointed on board	Never	16	6.8
	Once	47	20.1
	Twice	62	26.5
	More than two times	109	46.6

The validity and reliability tests were conducted after data entry to ensure the quality of the questionnaire. Sekaran and Bougie (2016) posited that validity is how accurate instrument measuring the measure. The validity of the instrument could also be

established by using instrument that already validated in other studies or by other researchers (Nunnally, 1978). In this study, the instrument used was adapted from Easa (2012), only in the different context, i.e. the RMN fleet context. On the other hand, Treiman (2009) opined that reliability test is to measures instrument that can produce consistent results. In this study, Cronbach Alpha was utilized and the score for every instrument items with regards to the individual SECI mode was more than 80% (see Table 4.2). The instrument was tested reliable and valid in the RMN fleet context.

Table 4.2: Reliability Test Result

SECI Mode (items)	Cronbach Alpha (α)
Socialization (14)	.835
Externalization (13)	.856
Combination (13)	.846
Internalization (13)	.863

The first stage of the preliminary data analysis used a frequency distribution to explore the agreement of respondents regarding the performance of the SECI knowledge creation process model (Nonaka & Takeuchi, 1995a, 1995b) in the RMN fleet. Next, the results on the mechanisms used in knowledge creation were determined for the researcher to identify the mechanisms required to create and capture knowledge within the fleet. Additional results like the venues where knowledge creation took place in the RMN fleet, level of knowledge and type of knowledge possessed by the RMN fleet's personnel were very helpful in preparing answers on how to develop and propose a knowledge creation enhancement framework. The final part involving descriptive analysis focused on testing the difference between the respondents' demographic

information regarding the SECI knowledge creation process activities using one-way ANOVA.

4.2.2 Mechanisms Used in Knowledge Creation

Table 4.3: Mechanisms Used in Knowledge Creation Processes

Mechanisms	Percentage (%)
WhatsApp	88.0%
Facebook	52.6%
Email	47.9%
YouTube	46.6%
Face-to-face	38.9%
SMS	27.4%
Instagram	26.1%
Twitter	18.4%
Others	15.8%
WeChat	13.2%
Line	4.3%
Skype	1.7%

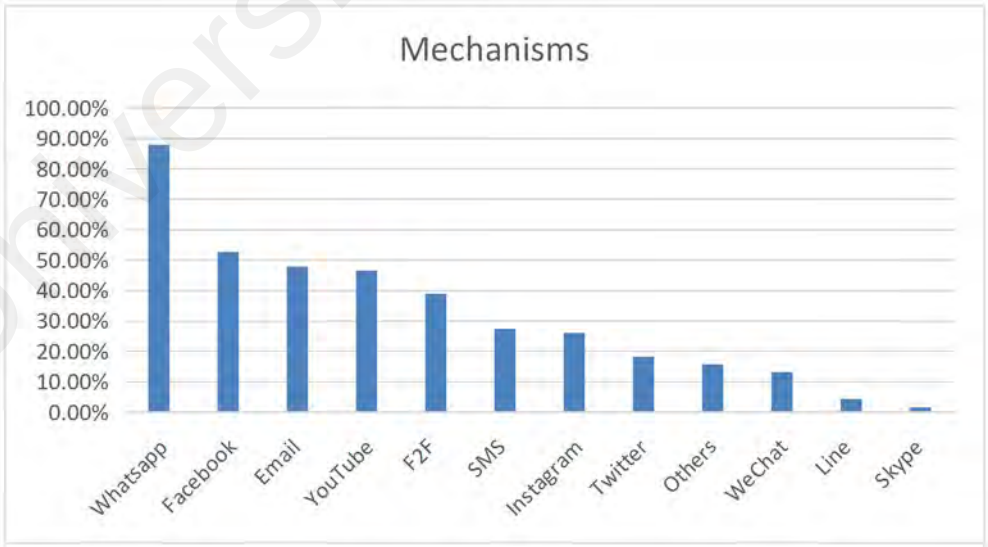


Figure 4.1: Mechanisms Used in Knowledge Creation Processes

From the data analysed utilizing SPSS on the frequency of mechanisms used in knowledge creation processes within the RMN fleet, Table 4.3 and the histogram in Figure 4.1 show the most popular mechanisms according to the percentages used. Social media, especially WhatsApp (88%) seems to have lot of effect in the knowledge creation processes within the fleet. With regard to the respondents, they came from all levels of management, namely, senior, intermediate (middle) and operational (lower) management levels. This clearly showed that all levels were vigorously using social media as a means to share and create knowledge among them. WhatsApp was the most utilized mechanism with 88.0% respondents having used it. The second mechanism in the list was Facebook with 52.6%. Email and YouTube were utilized by the respondents at 47.9% and 46.6%, respectively. This indicates that available mechanisms were being used by the RMN fleet personnel to exchange information, for sharing ideas, opinions etc. However, the extent of utilization of these mechanisms varied, and the extent of knowledge creation in the fleet thus remains unclear regarding the utilization of these available mechanisms. On the other hand, face-to-face sessions cannot be disregard since they played a major part in the SECI knowledge creation model processes, as mentioned by Nonaka and Takeuchi (1995a, 1995b), and 38.9% of the respondents felt that they were part of the mechanisms used in knowledge creation processes.

4.2.3 Venues for Knowledge Creation

Respondents chose seminars and workshops as the most popular venues to create knowledge (see Table 4.4 and Figure 4.2), both representing 56.8%. Meetings, study groups and simulators comprised 48.3%, 38.9% and 36.8%, respectively. This shows that the RMN fleet made efforts to organize such events, and there were venues where knowledge creation took place within the fleet. However, the effectiveness and efficiency of these venues as platforms of knowledge creation largely depends on the

willingness of personnel to share knowledge, the quality of knowledge shared and performance of the fleet itself in organizing events.

Table 4.4: Venues for Knowledge Creation

Venues	Percentage (%)
Seminars	56.8%
Workshops	56.8%
Meetings	48.3%
Study Groups	38.9%
Simulators	36.8%
Forums	35.0%
Brainstorming	28.2%
Others	21.4%
Conferences	19.2%

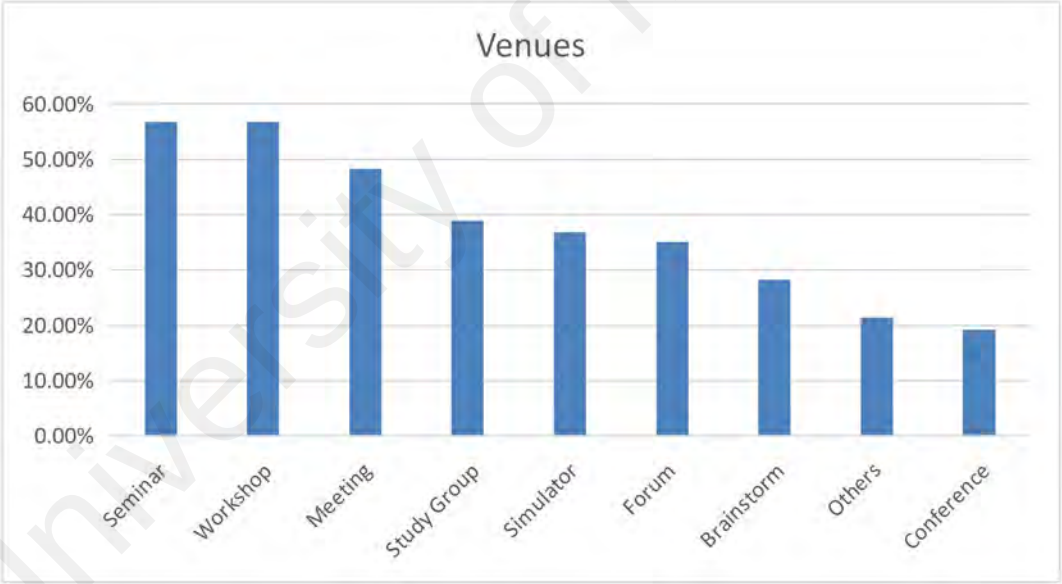


Figure 4.2: Venues for Knowledge Creation

4.2.4 One-Way ANOVA

Further analysis utilizing demographic information of the respondents with the modes in the creation of knowledge process based on the SECI model were carried out. One-way analysis of variance (ANOVA) was conducted, the results of which are shown

in Table 4.5. Based on the results, the researcher determined that the type of ships and training frequencies had significant values for all four processes of knowledge creation based on the model. The values from the socialization phase for ship and training are .022 and .003, which are significant since they are less than .05 ($p < 0.05$) and .01 ($p < 0.01$), respectively. For externalization, the values are .009 and .05, for combination, the values are .01 and .048, and lastly, for internalization, the values are .016 and .029, and they are all significant values.

Table 4.5: One-way ANOVA for Demographic Details and SECI Modes

One-way ANOVA												
	Academic		Position		LengthSvc		**Ship**		Department		**Training**	
	F	Sig.	F	Sig.	F	Sig.	**F**	**Sig.**	F	Sig.	**F**	**Sig.**
Socialization	1.814	.145	.722	.487	1.971	.119	**3.871**	**.022****	.641	.590	**4.667**	**.003*****
Externalization	1.945	.123	1.583	.208	2.183	.091	**4.796**	**.009*****	.516	.672	**2.633**	**.050****
Combination	1.652	.178	.662	.517	1.137	.335	**2.231**	**.010*****	.268	.849	**2.671**	**.048****
Internalization	3.705	.012**	.707	.494	2.262	.082	**4.204**	**.016****	.612	.608	**3.055**	**.029****

** $p < 0.05$; ***$p < 0.01$

There are a few types of ship in the RMN fleet inventory that are grouped into squadrons. These squadrons are determined by the ship's capabilities. For instance, a frigate is an example of a combatant vessel equipped with state-of-the-art technology consisting of systems, sensors and weaponry to fight in anti-surface warfare (ASuW), anti-submarine warfare (ASW), anti-air warfare (AAW), electronic warfare (EW), etc. Meanwhile, there are some vessels which are categorized in supporting or logistic roles such as multi-purpose command support ships (MPCSS). The researcher determined from the analysis that the types of ship determine the number of training programme, exercises or even the operations involved. With that kind of exposure, it is evident that

the crews need to attend lots of knowledge creation activities, including courses, classes, seminars, workshops, etc., to become specialists. Furthermore, ships that are fitted with advanced technology need competent crew to operate them. Hence, the difference between personnel on board high-technology equipped warships and those who are not so is quite significant. So, in the case of the RMN fleet, the knowledge creation process will take place more on board a frigate compared to a MPCSS, and that was why the one-way ANOVA analysis resulted in values which are significant for the types of ship and the SECI model. Therefore, this indicates that the activities involved in the model took place on board the ships.

Secondly, as mentioned for the types of ship, combatant vessels require more training compared to the rest of the vessels in the RMN fleet inventory. The crew has to be competent in handling state-of-the-art and technologically advanced equipment. The training must also include the application of knowledge in warfare scenarios such as on how to fully utilize equipment fitted on board and get the systems to work efficiently and effectively for the benefit of the organization.

4.2.5 Level of Knowledge

For the level of knowledge, the knowledge found most available in the RMN fleet was operational knowledge. From Table 4.6, out of 234 respondents, 145 (62%) claimed to possess operational knowledge. This can be understood as the fleet is the operational wing of the RMN.

Table 4.6: Fleet Personnel's Level of Knowledge

Level of knowledge	Frequency	Percent	Valid percent	Cumulative Percent
Conceptual	48	20.5	20.5	20.5
Contextual	41	17.5	17.5	38.0
Operational	**145**	**62.0**	62.0	100.0
Total	234	100.0	100.0	

4.2.6 Type of Knowledge

The type of knowledge found most available in the RMN fleet was experience. From Table 4.7, out of 234 respondents, 121 (51.7%) claimed that they had experience. Experience is a form of tacit knowledge that is vitally important to an organization like the RMN fleet. RMN personnel undergo lots of training and courses pertaining to ship operations from day one when they join the RMN. The training can be divided into theoretical training, which is normally held in training facilities, and practical training either on board ship or in training facilities. This training allows them to accumulate experience before serving on board. That was the main reason why most of the respondents in the study claimed that they had experience when asked about the type of knowledge that they possessed.

Table 4.7: Fleet Personnel's Type of Knowledge

Type of knowledge	Frequency	Percent	Valid percent	Cumulative Percent
Routine	52	22.2	22.2	22.2
Experience	**121**	**51.7**	51.7	73.9
Technical	52	22.2	22.2	96.2
Others	9	3.8	3.8	100.0
Total	234	100.0	100.0	

4.2.7 Item Analysis

4.2.7.1 Socialization

For the socialization mode, the descriptive statistics (see Table 4.8) show that the respondents acknowledged that during discussions, they tried to find out others' opinions, concepts, thoughts or ideas when they socialized. The respondents often encouraged others to express their thoughts, concepts or ideas, and they agreed that they actively shared work or life experience with each other. Meanwhile, the highest mean value of 3.8675 for item S4, indicated that the respondents gathered information from other departments to equip themselves with knowledge.

Table 4.8: Descriptive Statistics of Socialization Items

Code	Socialization items	N	Mean	Std. Deviation
S13	Encourage informal meetings	234	3.3761	1.01259
S8	Systematic plan to rotate staff	234	3.4744	.91798
S9	Encourage face-to-face (F2F) discussions	234	3.6538	.84142
S12	Qualified experts invited for talks	234	3.6538	.79419
S11	Meeting, seminars etc. conducted	234	3.7308	.88390
S1	Find out others' opinion	234	3.7521	.93484
S5	Collect information and show to colleague	234	3.7650	.76980
S2	Encourage others to express	234	3.7692	.84289
S14	Encourage social activities outside workplace	234	3.8077	.78709
S3	Share experiences	234	3.8162	.84177
S7	Collect information in formal/informal ways	234	3.8376	.68656
S10	Operations/Exercises support knowledge through F2F interactions	234	3.8419	.74451
S6	Get to know people before working together	234	3.8590	.70664
S4	Gather information from other departments	234	3.8675	.79939

The RMN fleet personnel collected necessary information and showed it to their colleagues before they engaged in any discussions. They also responded that they would like to get to know the people whom they would work with before working together, and the respondents then agreed that they collected work-related information and ideas in either formal or informal relationships with other people. At the lowest mean value of 3.3761, the respondents hardly believed that the RMN fleet encouraged informal meetings for coffee, tea, having lunch and others, but on the other hand, the respondents concurred that the fleet encouraged social activities outside the workplace (3.8077). On top of that, at a mean value of 3.4744, the respondents hardly believed that the RMN fleet follows a systematic plan to rotate personnel in all departments. Nevertheless, they believed that the fleet encouraged detailed face-to-face discussions of work issues. On the other hand, the respondents agreed that involving the RMN fleet in joint operations/exercises supports knowledge through face-to-face interaction with others, and they also agreed that the RMN fleet conducted meetings, seminars and workshops to discuss the updating of work issues and agreed that the fleet invited its qualified members and external experts to speak about their beliefs, values and culture. These findings showed that the socialization (tacit to tacit) knowledge creation process took place within the organization. However, the respondents claimed that the fleet did not encouraged enough informal meetings for them to create knowledge and does not really follow systematic ways to rotate personnel for acquiring more knowledge. However, the descriptive statistics mean value data, ranging from 3.3761 to 3.8675, indicated that the socialization mode was happening and the researcher concluded that there was still room for improvement in the RMN fleet for knowledge creation processes.

4.2.7.2 Externalization

For externalization mode, the descriptive statistics distribution (see Table 4.9) shows that the respondents agreed that when others could not understand them, they were usually able to give examples to help in explaining any issues. At only the mean value of 3.5684, the respondents hardly agreed that most of the time, they could transcribe some of the unorganized thoughts into concrete ideas. However, they tended to describe professional or technical terms with conversational language to help communication (3.8034).

Table 4.9: Descriptive Statistics of Externalization Items

Code	Externalization items	N	Mean	Std. Deviation
E11	Issues reports of external experience	234	3.5641	.82227
E2	Transcribe unorganized thoughts into ideas	234	3.5684	.71587
E9	Report results of discussions	234	3.6239	.81009
E4	Use analogy to express concepts	234	3.6410	.76356
E8	Documents staff's point of view	234	3.6410	.74651
E6	Develop new ideas using figures/diagrams	234	3.6453	.81182
E7	Facilitate creative and constructive conversation	234	3.6795	.73234
E13	Documents useful experiences	234	3.6880	.77023
E10	Documents the findings	234	3.7051	.79336
E1	Give examples to help explaining	234	3.7179	.81663
E12	Establishes topics of training programme	234	3.7735	.68395
E5	Help to encourage to express	234	3.7821	.69912
E3	Describe professional/technical terms in conversational language	234	3.8034	.69627

Apart from that, they tended to use analogy when expressing abstract or theoretical concepts. The respondents also agreed that they would help others to clearly express what was in their minds by encouraging them to continue what they are saying (3.7821), and they believed that their team developed new ideas through constructive dialogue by

using figures and diagrams. The respondents facilitated creative and constructive conversation among group members, and they agreed that the RMN fleet documented its personnel's points of view regarding relevant topics, asked its personnel to report results of discussions to concerned parties, documented the findings of conducted seminars, meetings, conferences, workshops and training programmes, established the topics of the training programmes and seminars conducted by its qualified members and external experts, and documented the useful experiences of its qualified members into reports, but hardly issued reports of externals based on its accumulated experience (3.5641). These findings showed that the externalization (tacit to explicit) knowledge creation process was taking place within the organization. The descriptive statistics mean value data (3.5641 to 3.8034) indicated that the externalization mode was being practiced within the fleet, and the researcher concluded that there was also room for improvement in the RMN fleet for knowledge creation processes in this mode. However, the respondents claimed that the RMN fleet hardly transcribed unorganized thoughts into ideas and hardly issued reports of external experience.

4.2.7.3 Combination

For combination mode, the descriptive statistics (see Table 4.10) for the mean values ranged between 3.5299 to 3.8675. This shows that the RMN fleet personnel practiced the combination mode of knowledge creation processes. The respondents agreed that during discussions, they tended to help organize ideas and made conclusions to facilitate the discussions (3.8205). When coming across problems, they tended to use their experiences to help solve problems (3.8675). The respondents also agreed that after every event, they had the habit of organizing and making summaries of what happened, and agreed that during discussions, they would organize everyone's thoughts in their minds.

Table 4.10: Descriptive Statistics of Combination Items

Code	Combination items	N	Mean	Std. Deviation
C11	Uses documented information with external bodies	234	3.5299	.78147
C13	Depends on published research and reports to develop policies and aims	234	3.5427	.84425
C12	Collects, classifies and inform reports and decisions	234	3.5641	.80112
C4	Organize everyone's thoughts in mind	234	3.5940	.76521
C9	Update databases	234	3.6197	.92451
C3	Habit of organizing and making summary	234	3.6368	.79192
C6	Develop criteria to determine value of new concepts	234	3.6709	.72260
C10	Consider information in databases to develop rules and decisions	234	3.6752	.77879
C7	Conduct experiments and share new concepts	234	3.7009	.66507
C8	Classifies information in databases	234	3.7350	.78498
C1	Help organize ideas and conclusion	234	3.8205	.64343
C5	Collect new information and make connections between new and old	234	3.8376	.76352
C2	Use experience to solve problems	234	3.8675	.72625

They concurred that they like to collect new information and make connections between new and old knowledge to develop new concepts (3.8376). They claimed that they engaged in developing criteria to determine the value of new concepts, and their team conducted experiments and shared the newly developed concepts with the entire organization to evaluate the value of the concepts. They also believed that the RMN fleet classified information mentioned in networks, databases and reports, updated its databases, considered information mentioned in networks, databases and previous reports to develop its rules and decisions, used documented information as a means of connection between its personnel and with external bodies (e.g., stakeholders such as

OEM, suppliers, sister services, private or other government agencies). They responded with the lowest mean values that the fleet hardly collected, classified and informed its personnel with reports and decisions issued by external bodies (3.5299), and the fleet was hardly dependent on relevant published research and reports to develop its policies and aims (3.5427). These findings showed that the combination (explicit to explicit) knowledge creation process was taking place within the organization. However, based on the statistics, the researcher concluded that there was still room for improvement in the RMN fleet in the combination mode of knowledge creation processes, and this could be improved by looking into utilizing documented information with external bodies and trying to depend on published research and reports to develop policies and aims.

4.2.7.4 Internalization

For internalization mode, the descriptive statistics (see Table 4.11) show that the respondents agreed that after hearing new ideas or concepts, they tended to compare them with their experience to help them comprehend the meaning (3.7949). They agreed that they understood others' thoughts better by repeating what they said and asking them "is this what you mean?" Hence, they would tell others what they thought to ensure that their understanding was the same as theirs (3.7949). On the other hand, when they had finished saying something, they would ask the other person if it was necessary to repeat to make sure he/she understood exactly what they meant.

Table 4.11: Descriptive Statistics of Internalization Items

Code	Internalization items	N	Mean	Std. Deviation
I11	Arranges meetings to explain content of reports (internal)	234	3.6453	.79039
I12	Arranges meetings to explain and analyse reports from stakeholders (external)	234	3.6624	.81911
I2	Repeat others' thoughts to understand better	234	3.6838	.77126
I8	Encourages to join postgraduate courses	234	3.7094	.93625
I10	Facilitates access to databases	234	3.7179	.80605
I5	Use new knowledge for next applications	234	3.7265	.82477
I13	Available data; shape point of view and culture	234	3.7308	.70570
I4	Ask others whether to repeat to ensure understanding	234	3.7393	.79994
I9	Facilitates access to outcomes	234	3.7479	.83928
I7	Combine existing and new concepts	234	3.7564	.74441
I6	Give time to think of things discussed	234	3.7863	.78973
I1	Compare new ideas with experience	234	3.7949	.71811
I3	Tell others of thinking to ensure same understanding	234	3.7949	.74740

The respondents also agreed that their team-members used newly learned knowledge as the sources for the next time applications. Meanwhile, they concurred that when communicating with others, they would give others time to think about what they just discussed, and they claimed that they combined existing and new concepts in meaningful ways. The respondents also agreed that the RMN fleet encouraged its personnel to join postgraduate courses (e.g., Diploma, Bachelor's degree, Master's degree or PhD), facilitated the access to outcomes or recommendations of training programmes, workshops and seminars and facilitated the access to its databases and the internet to get required information. In contrast, at the lowest mean value (3.6453), they claimed that the fleet hardly arranged meetings to explain the content of related reports or documents and hardly arranged meetings to explain and analyse the relevant reports

issued by stakeholders such as OEM, suppliers, sister services, private or other government agencies (3.6624). Nevertheless, the respondents agreed the fleet believed that the available data and information strongly shaped its point of view and culture. These findings showed that internalization (explicit to tacit) knowledge creation processes took place within the organization and was the highest mode practiced by the personnel of the RMN fleet based on the mean value data (3.6453 to 3.7949). However, as with the three previously discussed modes of knowledge creation processes, there was still room for improvement in the RMN fleet in internalization mode, as well.

4.2.7.5 Summary of Item Analysis

The summary of descriptive analysis results from the items on the SECI knowledge creation process model in the RMN fleet context is provided in Table 4.12. The difference between all four modes can be considered as minimal since the range of mean values is over 3 but less than 4 on the Likert scale. Nevertheless, as mentioned by the researcher previously, there is still room for further improvement within the RMN fleet based on these survey findings.

Table 4.12: Summary of Instrument Item Analysis (Highest and Lowest Mean Scores)

Code	Items Information	Mean
S4	Gather information from other departments	3.8675
S13	Encourage informal meetings	3.3761
E3	Describe professional/technical terms in conversational language	3.8034
E11	Issues reports of external experience	3.5641
C2	Use experience to solve problems	3.8675
C11	Use documented information with external bodies	3.5299
I1/I3	Compare new ideas with experience/Tell others of thinking to ensure same understanding	3.7949
I11	Arranges meetings to explain content of reports (internal)	3.6453

From the overall descriptive instrument item analyses, the assumption can be made that knowledge creation processes do exist within the RMN fleet. From the survey, the knowledge creation extent and practices were recorded in socialization, externalization, combination and internalization modes, respectively. However, the researcher can conclude that there is still a lot of room for improvement in knowledge creation processes, thus it is proposed that a framework for knowledge creation enhancement in the organization needs to be promulgated accordingly to assist in contributing back to the fleet.

4.3 Interpretive Analysis

Interviews were conducted with 15 RMN fleet personnel for a duration of approximately 30 to 45 minutes per session. The researcher interviewed 3 personnel in the preliminary study and subsequently, 12 more from the ships in the RMN fleet. In order for the researcher to improve the reliability of interviews and eliminate any bias of the interviewees, the researcher asked similar participants based on their job positions, types of ships, years of experience, etc., about the same issues of SECI knowledge creation processes in the RMN fleet context, to test the reliability and consistency of the answers provided during the interviews.

The point of saturation of data achieved after 12 interviews were conducted. So the researcher decided to interview 3 more interviewees to ensure. The interviewees represented ships of different types and from different squadrons of the fleet. They also represented all levels of management, i.e., senior, middle and lower management levels. Apart from that, they had different academic backgrounds, were from different departments when working on board ship, different lengths of service on board,

different numbers of training activities since appointed on board, and all of them claimed that they knew what organizational knowledge creation was all about. The list of participants with some demographic data are listed as an account summary log below (Table 4.13).

Table 4.13: Account Summary Log

NO	PARTICIPANT CODE	GENDER	ACADEMIC B/GROUND	JOB POSITION	LENGTH OF SERVICE	SHIP'S TYPE	DEPART.	NO. OF TRAINING	KNOW ORG. KC
1.	SM1	M	Diploma	Senior Mgt	< 1 year	Logistic	Operation	3+	Yes
2.	SM2	M	Bachelor's degree	Senior Mgt	1–2 years	Combatant	Operation	3+	Yes
3.	SM3	M	Bachelor's degree	Senior Mgt	1–2 years	Combatant	Technical	2	Yes
4.	SM4	M	Bachelor's degree	Senior Mgt	< 1 year	Patrol	Operation	3+	Yes
5.	SM5	M	Master's degree	Senior Mgt	1–2 years	Logistic	Operation	2	Yes
6.	MM1	M	Others	Mid Mgt	< 1 year	Logistic	Logistic	3+	Yes
7.	MM2	M	Diploma	Mid Mgt	1–2 years	Combatant	Logistic	2	Yes
8.	MM3	M	Others	Mid Mgt	Over 3 years	Patrol	Logistic	2	Yes
9.	MM4	M	Others	Mid Mgt	< 1 year	Patrol	Logistic	3+	Yes
10.	MM5	M	Others	Mid Mgt	2–3 years	Logistic	Logistic	2	Yes
11.	LM1	M	Diploma	Lower Mgt	< 1 year	Combatant	Operation	1	Yes
12.	LM2	M	Others	Lower Mgt	1–2 years	Patrol	Operation	3+	Yes
13.	LM3	M	Diploma	Lower Mgt	1–2 years	Logistic	Technical	1	Yes
14.	LM4	M	Diploma	Lower Mgt	2–3 years	Patrol	Technical	2	Yes
15.	LM5	M	Diploma	Lower Mgt	1–2 years	Combatant	Technical	1	Yes

Data was obtained from 15 semi-structured face-to-face interviews. The interviews aim was to get insights on the interpretation and meaning of knowledge creation processes from fleet personnel. This data was then compared to the survey findings by explaining which SECI conversion processes were widely practiced or limited in the RMN fleet. The interview data were used to triangulate the survey data. According to Saunders, Lewis and Thornhill (2009), although triangulation typically looks at a topic from independent sources to support findings, interviews offer some level of triangulation since the nature of collecting data is different. For instance, findings on the frequency distributions and interviews were utilized in order to explore the extent of each SECI process in the RMN fleet.

The researcher described the interview process by presenting the backgrounds of the interviewees. Then the interview data for knowledge creation processes utilizing SECI model within the RMN fleet. Semi-structured interviews were carried out in face-to-face manner with personnel serving on board the RMN warships for three months, between March and June 2019. A total of 15 interviewees, all males, took part in this study (Table 4.13). Five were attached on board combatant ships, namely, frigates and corvettes, five were from patrol squadrons (NGPV) and five were from logistic ships (MPCSS). These personnel had rich and diverse experience from their service on board the RMN ships and in the fleet. Five interviewees (33.3%) had less than one year of experience serving on board the RMN ships. Seven of the interviewees (46.7%) had one to two years of experience working on board. Two interviewees had two to three years of experience, while one interviewee had over three years of working experience on board the RMN ships. The interviewees were stratified accordingly as such, five (33.3%) representing the senior management, followed by five (33.3%) from the middle management and then five (33.3%) from the lower management. Given that sailors are

usually very busy, 5 interviews (33.3%) were arranged outside the workplace located at an office in the Naval Air Wing Headquarters in Lumut and ran for approximately 30 to 45 minutes, lasting on average 35 minutes, and 10 interviews (66.7%) were conducted inside their workplace and on board their ships, which ran for approximately 20 to 35 minutes, lasting on average 30 minutes. One of the interviewees (6.7%) had a master's degree, three (20%) had bachelor's or first degrees, six (40%) had diplomas and five (33.3%) were at high school level. They were also divided into five interviewees (33.3%) from each squadron of patrol vessels, combatant and logistic ships with six interviewees (40%) represented the operations department, four interviewees (26.7%) were from the technical department and five interviewees (33.3%) represented the logistic department. Regarding the number of training experiences that they had since appointed on board, six interviewees (40%) had attended three or more training programmes. Another six interviewees (40%) had attended two training programmes, while three more interviewees had only one training experience. All of the participants also claimed that they knew organizational knowledge creation. All 15 interviews were voice-recorded, and notes were taken. Interviews were conducted and coded and were later transcribed and translated into English for analysis.

The interview protocol (Easa, 2012) used by the researcher covered the participants' backgrounds and their experiences in the fleet, the type of knowledge required by them to accomplish work/tasks and discussion on how knowledge could be developed within the fleet based on the SECI model. The interviews covered the same elements as in the questionnaire with regard to SECI knowledge creation processes. Both the survey and interviews also covered venues and mechanisms where knowledge creation processes were commonly practiced and used in the RMN fleet to transfer tacit knowledge from one service member to another, to document tacit knowledge, to transfer tacit

knowledge into a proper form and to transfer explicit knowledge into tacit knowledge and also mechanisms that enabled the fleet to perform effectively and efficiently.

After transcriptions were made of the interviews, content analysis of interviews was carried out manually. The list of manual coding is provided in Appendix G. The transcriptions were also analysed using Nvivo12 software. The profiles of interviewees were also coded, as explained in Table 4.13. The researcher then searched for words, phrases or sentences mentioned by interviewees that had a connection with the knowledge creation processes. Themes were identified for each of the knowledge creation processes. For example, in socialization mode, participants agreed that sharing knowledge is part of the process regardless whether it is done in formal or informal venues. Next the relevant data related to the processes were collected for further analysis by the means of comparing them with the survey data. This method allowed the researcher to obtain comprehensive and detailed insight for each item. The list of automatic coding is provided in Appendix H.

As mentioned earlier, based on the survey findings, the four processes of the SECI model were confirmed as being practiced within the RMN fleet. However, the degree or extent of practices varied. The following provides an overview of each knowledge creation processes in detail based on the SECI model and the transcribed findings.

4.3.1 Socialization (Tacit to Tacit Knowledge)

This mode of the knowledge creation phase consists of the transfer of tacit-to-tacit knowledge from one personnel to another, normally by the means of face-to-face discussions to share experiences. This is either achieved from formal or informal discussions conducted in meetings, seminars, workshops, forums or training

programmes and also by involving personnel in on the job training, or rotation of personnel within departments, internally. Discussions with external bodies, for instance, sister services like the Royal Malaysian Air Force (RMAF) and Malaysian Army, and other government agencies such as the Malaysian Maritime Enforcement Agency (MMEA) and Royal Malaysian Police (RMP) contributed to the process, as well. The descriptive statistics mean value data acknowledged the socialization mode as taking place within the RMN fleet. Data from the interviewees provided insights with more details with regard to these findings.

In the RMN fleet, most of the participants claimed that the socialization mode of knowledge creation processes was widely practiced, where tacit-to-tacit knowledge transfer, sharing and learning from experiences, more often in the informal ways, were taking place directly or indirectly and sometimes without the awareness of the personnel themselves. The participants also expressed that personnel's knowledge is the most important element in the socialization mode. This will determine the quality of knowledge and contribute to the effectiveness of the organization.

> … (personnel's) knowledge is involve with functionality of the ship and existing human capital. I communicated a lot with the crew in order to ensure the success of any operation and administration. … effective communication to ensure all the crew are heading towards that (same direction) … means it will lead to (safe) operation and to ensure the normal administrative direction. (SM3)

On the other hand, some of the participants also claimed that they had both formal and informal discussions on board to share and disseminate their knowledge. Their knowledge came from experiences that they had when serving on board and from operations and exercises conducted with the involvement of the fleet.

> … mingled with them to tell about the ship's roles and responsibilities that we already carried out and to share all the experiences … opportunities to share and cascade all my experiences and knowledge that I have …. (SM1)

In socialization mode, individual personnel's personal knowledge is very important to ensure that the knowledge created and passed will benefit the organization.

> … on board ship, the experience will be depending on individual…..like my experience, I have the knowledge about it and when I asked, means the knowledge that I got, I will pass to the subordinates … my own experience I will tell and share the story and knowledge with them … their (subordinates) knowledge will be better and the rest of crew will not be looking down at them …. (MM1)

However, these experiences and knowledge vary from one individual to another. According to the interviewees, what matters is to keep on learning because by learning they would create a new knowledge base in order to perform better in the fleet. The interviewees also mentioned about training as a part of learning. By doing and handling things practically, they could acquire and store knowledge.

> … the experiences varies ... my experience always changing to new … have to relearn what I had learn during my course … with the knowledge, we can do our work easily …. (MM4)

> … knowledge is acquired through training … from the book is lacking but for training we need to carry out more … to store … the knowledge is up to individual responsibility … after evolution … the officers will conduct debrief, to discuss everything done …. (LM1)

In socialization mode a lot of knowledge is created by sharing and cascading it from top to bottom or bottom to top in the hierarchy of the organization.

> … obtained all this knowledge from all levels and I seek the advise from the Commanding Officer … seek the opinions from other officers especially the senior one … my knowledge and with my all officers … all officers that involve with me, sharing knowledge between department … grouping knowledge to.. to

> solve any issues or to continue with any works that have been designated …. (SM1)
>
> … the way that I share my knowledge, for my subordinates, I will tell them … follow the way that I am carrying out my work … during the conduct of work, I will teach them ... that is how I ensured the continuity of my knowledge … told them (subordinates) to look on how the seniors performed, on how the civilians perform …. (MM1)
>
> … I will teach the newcomers with my knowledge … we will do training for them … I got the experiences from buffer (senior seaman personnel) ... I will teach … usually during sailing we will conduct (training) … in a week it will be around 3 times of training … at jetty, when we have free time, I will teach …. (LM1)

The question raised was only whether the knowledge creation should be during informal or formal events. According to the interviewees, it should be both because socialization took place in every scenario and environment.

> … there were briefing and discussions at all management levels … during the both watches (morning parade), before and after conducting evolution … even when they were hanging around in their own messes … chit-chat, discussed about works etc …. (MM1)
>
> … gained knowledge from there (informal and formal discussions) and I only shared their knowledge, from their experiences, … we can gained knowledge from our peers, doesn't matter from whatever background … good platform for us on how to gain knowledge … to learn and receiving the knowledge … we will share knowledge among peers …. (SM1)
>
> … briefing of the fleet training (formal), they will share their knowledge with the personnel … always reminded them during both watches (formal morning parade and brief) … to keep updating their own departments … HOD (head of department) to ensure everything and the feedback from HODs are to inform about whether the personnel has done everything … Personnel will understand better and know about their work scopes and at the same time … they know a little bit about other departments too …. (SM1)

The interviewees claimed that personnel could share their knowledge easily between departments, groups, and between the top and bottom of the organizational hierarchy as

all managerial levels convened on board the same platform. However, they need more formal platforms to gain aligned knowledge in order to possibly have multi-skilled personnel that can contribute on board.

> … need to have more workshops … fleet training is enough but maybe we can invite SME (subject matter expert) to give the collective talk to the whole fleet. … if the whole ship know about the procedure … then it will be very great … meaning to say we are all aligned … a gunnery personnel but he managed to solve the problem of tripped generator due to cloaked strainer … could also cook delicious dishes ….so it shows that personnel can become multi-skill. (SM1)

The RMN fleet encourages face-to-face discussions through working on board the ships and conducting seminars, meetings, etc. Nevertheless, the interviewees claimed that informal discussions between the personnel was limited due to work issues, and not all personnel were invited for the meetings, seminars, etc. due to constraints and limitations of the ships and sponsors. This could have been due to limitations of space, the personnel who were on duty, the personnel who were on leave, ships conducting operations/exercises and some other circumstances. According to the survey, the RMN fleet does not really support and encourage informal meetings for coffee, tea, having lunch and other activities. Interviewees pointed out that they need these kinds of activity for discussion to support the social relationships between them in order to build trust with each other, which is necessary in the creation of knowledge.

> … get together in the same area to discuss informal ways for works, operations, exercises … managers limit because they think we were doing nothing … only discussing personal rather than work issues. (MM2)

> … we need more opportunities for informal discussions … to attend formal discussions, they will select from few of us … so, we need more informal discussions … because we can (be) close to each other, share ideas and also help each others. (LM2)

Regarding the workshops and training programmes, the interviewees indicated that the RMN fleet was interested in giving their personnel the chance to share their knowledge with external and internal experts through external or internal training. Regarding the external training, the RMN fleet usually involves their personnel in training programmes. The fleet also supports their personnel to attend programmes in private institutions, e.g., *Universiti Malaya* (UM), *Universiti Teknologi Malaysia* (UTM), *Universiti Teknologi MARA* (UiTM), *Universiti Tun Abdul Razak* (UNITAR), etc., as they think that these institutions are professional in educating their personnel.

> … fleet will allow personnel to pursue their education, regardless on full-time basis or part-time … as per directed by the HQ … normally they will be send to few local universities such as UTM, UNITAR, UiTM etc. (SM3)

With regard to internal training, the RMN fleet usually depended on their own internal training centres and invited some external and internal experts from different RMN operational or training establishments, for example, from HQ or squadron leader and from sister services like the RMAF and Malaysian Army counterparts to deliver training. The participants agreed that they got significant benefit from their discussions with the experts. They mentioned that they could share their knowledge and speak about the problems that regularly occurred and obtain good recommendations and feedback from those experts. The interviewees added that the internal and external training/seminars were not only a good opportunity to create and share knowledge with executives and academic experts but also a good opportunity to create and share knowledge with colleagues from either different squadrons or different departments.

The personnel rotation process was another mechanism used by the RMN fleet to support the socialization process. The fleet believes that the personnel should have a comprehensive knowledge and be aware of all operations that enable personnel to

perform professionally. The interviewees acknowledged that personnel rotation gave them wide experience and knowledge about most operations/exercises and allowed them to share knowledge with other personnel from different departments and branches. To maximize the benefits of rotation, the fleet provides internal training to personnel for the new jobs they will be rotated into. On average, the RMN fleet rotates their personnel every two years. The interviewees agreed with the rotation time and commented that "the duration of personnel rotation should be neither short nor long, every one or two years is enough to get the advantages of specialization and to transfer their experience …" (MM2). In addition, it was clear that the rotation policy was also used for aspects of managerial control regarding the selection of personnel and jobs. However, it was mentioned that rotation is not for all personnel. The perception of the interviewees appeared to be that if personnel were particularly efficient, the higher management might decide to keep them in the same job and rotate the less efficient personnel. The interviewees responded that the fleet would rotate only the less important or the undesirable personnel who were perceived as not performing or causing problems to the organization. On the other hand, descriptive statistics also showed that the respondents hardly believed that the fleet follows a systematic plan to rotate personnel.

> … crew change is normally after they served approximately 2-3 years on board … there is no fixed duration sometimes …. (SM13)

> In the fleet, rotating personnel is usually done every two years on average … we try to keep the one which is efficient and we automatically accepts to rotate the low-qualified personnel and those with unwanted behaviours … for example, the senior one that stopped to develop themselves or those who have unethical behaviour and always cause problems …. (SM2)

The last mechanism used by the fleet to support the socialization process is allowing face-to-face discussions with externals. The interviewees confirmed that these

discussions are very important in terms of getting more experience and valuable feedback about the fleet's performance. Therefore, the fleet needs to provide opportunities for their personnel to meet personnel from other units, sister services and related public or private companies and agencies' representatives for creating more valuable knowledge. Continuous discussions with representatives from the Fleet Command HQ West and East or perhaps with other units in fleet operations would also provide guidance, advice and consultation services such as operational feasibility studies, area studies, meteorological conditions etc.

4.3.1.1 Personnel's Knowledge

The interviewees suggested that the socialization mode is taking place within the RMN fleet organization, either in formal or informal ways and internal and external of the organization. Nevertheless, the participants also suggested some limitations that minimized the benefit of socialization processes within the fleet. Some negative feedback was observed on the need for more formal platforms for knowledge creation processes to happen due to the small number of participants invited and the small number of meetings, informal opportunities were limited as the higher managerial levels perceived that it as a venue for more personal rather than work-scope discussions, and non-systematic ways of rotating personnel where efficient personnel had to serve longer on board when compared to the non-performing ones. This negative feedback was supported by the survey findings, especially on informal opportunities and systematic ways of rotating personnel. To sum up on this mode, the researcher can see the positive extent of socialization knowledge creation processes within the fleet still has room for improvement and 'personnel's knowledge' is the best theme identified from the socialization mode of knowledge creation processes, as shown in Figure 4.3, as this

knowledge will determine the creation of new knowledge and better understanding of sharing that valuable knowledge among the personnel in the RMN fleet.

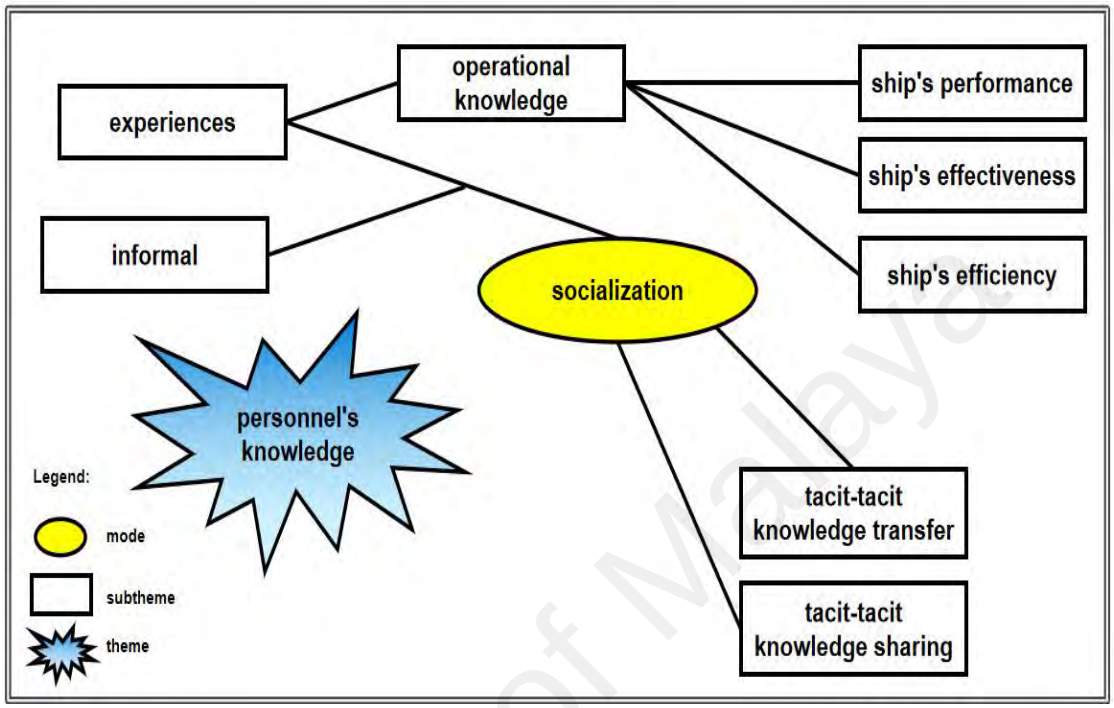


Figure 4.3: Theme from Socialization Mode — Personnel's Knowledge

Personnel's knowledge in socialization mode plays an important part in tacit to tacit knowledge sharing and knowledge transfer. This is because the intangible knowledge possessed by personnel will allow new knowledge to be created when the sharing and transfer processes activities are conducted. These processes mostly happened informally with some conducted in formal ways. Most of the participants claimed that they had and used their experiences in creating knowledge to be shared and transferred, which was mostly identified as operational knowledge. Thus, by capitalizing on its personnel's knowledge, the operational wing of the RMN fleet can ensure that ship performance, effectiveness and efficiency is enhanced through this socialization mode.

4.3.2 Externalization (Tacit to Explicit Knowledge)

The process of converting tacit into explicit knowledge happens in externalization mode. In this mode of knowledge creation processes, the participants claimed that they would help others to clearly express what was their minds by encouraging them to continue what they were saying. This was in order for the fleet's personnel to freely express or convey their ideas and problems for the benefit of the organization in any venue.

> … so we will ask them to give their opinions on how we can improve the course or training … they (OJTs) will tell their opinions or problems … apart from that, they will fill in the course critique (form) for the feedback …. (MM4)

Documenting course or training critiques will allow the fleet and training establishment to carry out post-mortems and find means and measures to improvise. On the other hand, the participants added that documenting alone will not suffice. They argued that practical training combined with documentation will give better results, especially when the personnel can understand the training better with discussions and giving their opinions.

> … adding knowledge by make existence of the documents … and frequently doing the evolution that can add benefits … if briefing, they will only know, but if practical, they can really understand … when we conducted training, maybe they can give opinions and add value for any training … when we received messages, we will read and look into it and we will do it practically …. (LM1)

> … when we are carrying out the training, we will produce the slides for us to brief the audience … so they can understand better …. (MM3)

According to the interviewees, there was a tendency in the RMN fleet of not documenting the findings of conducted meetings, seminars, workshops, conferences and

training programmes and hardly documenting the useful experiences of its qualified members into reports.

> … new knowledge learned and kept within the individual mind … yes (long pause) … there was no written document … only for individual … there were none for all … ship will conduct briefing for the new personnel … senior rates (middle management) … for example, the seaman trade, they will talk about evolution or seaman activities …. (LM1)

> … no knowledge storing … and what do we have are from the previous one … I should have been thinking ahead to document all the knowledge but it is not happening … have some sort of handing over notes or even the verbal handing over etc and I feel that it will be the way of them storing knowledge within their parts of ship … Commanding Officer had directed every level to have their handing over notes even a piece of paper indicating number of things etc … always reminded them during both watches (morning parade and brief) … to keep updating their own departments … HOD (head of department) to ensure everything and the feedback from HODs are to inform about whether the personnel has done everything …. (SM1)

> … to document all the works, was not the culture but only depending on the senior guys to walk the talk … so if we can document all these experiences, my subordinates can always refer when I retired and they can combined the experiences given by me with the documentation available … when the documentation is available, they can read and indirectly it can expand their thinking of work … knowledge available … took it and keep or retain, it will be continuous, but if you take … and being ignorant … not practicing then it will be useless …. (MM5)

The interviewees agreed that the RMN fleet established the topics of training programmes and seminars based on its qualified members and external experts. They also explained that when others could not understand them, they were usually able to give examples to help explain and facilitate creative and constructive conversation among group members.

> … the HQ and fleet work hand in hand in 'work up' (training programme for the ship after long absent from the fleet in carrying out maintenance and servicing in the dockyard) and inspection … so when the crew need to undergo the work up, the refresher classes and discussions will be conducted with the HQ and even we organized … so personnel can help each other … in discussions to make everybody understand about the procedures …. (SM7)

They claimed that their team developed new ideas through constructive dialogue by using figures and diagrams and they tended to use analogy when expressing abstract or theoretical concepts, but the interviewees argued that most the time, the fleet did not transcribe some of the unorganized thoughts into concrete ideas. The participants also claimed that documenting personnel's points of view regarding relevant topics, asking personnel to report results of discussions with concerned parties and issuing reports of externals based on accumulated experience were less practiced, and these processes need to be looked into in order for the fleet to create more knowledge in externalization mode.

> … when we do exercises or operations, teamwork is very important … we go to PUSTAKMAR (RMN tactical training centre) for table top discussions and war games … we do discussions on board also … but fleet do not really document our discussions for everybody to see …. (MM9)

The need to document knowledge was stressed during interviews since the participants believed that documentation would help them in work, and knowledge could be retained for the next generation to use.

> … need to document to further enhance the knowledge and this can be used for guidance for us to work …. (LM15)

> … with documentations, with experiences, guidance and attitude to show to the subordinates, the combination will make things work …. (SM14)

> … we need to document … we documented it and we call the subordinates to listen to the seniors about their experiences …. (MM13)

On the other hand, the participants also disagreed that the fleet has mechanisms to document personnel's personal experience and informal skills for others to have access.

> … new knowledge learned and kept within the individual mind … yes (long pause) … there was no written document … there were none for all …. (MM12)

When the fleet arranges training programmes, workshops and seminars, the sponsors normally will provide handouts to all participants and they usually will document the content of these activities. The fleet also asks the participants, normally the most senior one, to write a report to capture the experts' tacit knowledge and to include their feedback about these events.

> In seminars or training programmes by externals parties … the fleet itself does not have any formal system for documenting … except for written report … normally the most senior will write … they gave us handouts and some of us leave their copy on board for our colleagues to have a look … in informal manner. (MM9)

> We got handouts … we keep these documents as a reference that we can refer to whenever we want. (LM8)

> … gave us a course content booklet … we take notes during the lectures. If we want to know anything, we have booklet that we personally keep … ship does not keep this booklet in its databases. There is no available database which could enable you to access…. (SM1)

> The outcome of seminars or workshops conducted by the HQ are documented in minutes, notes and reports and sent to respective representative from the fleet. (MM7)

Documenting the findings of direct discussion was another mechanism used by the fleet to transfer tacit into explicit knowledge. The interviewees who were involved in direct discussions confirmed that they usually reported all findings in detail to their superiors. They explained that the fleet filed the report but the limitation was about the time taken to document a report, and it would depend on the HODs to explain to subordinates about the outcomes of meetings or what transpired during the meetings.

> …sometimes it took too long to get the minute … not everybody can see the document … if officers or senior rates took the initiative, then they will explain what is going on during meeting or discussion …. (LM11)

Some interviewees also mentioned that the fleet sometimes did not follow any formal process to document their discussions. They criticized this ignorance of the fleet and mentioned that they sometimes needed to document important issues that would be available to the management and all personnel in order to raise awareness of any problems which could occur in the future.

> … never asks us to write a report about our discussions … does not have any formal process to document these discussions. It is not good because sometimes important issues which are necessary to be shared for all personnel … to avoid further problems … and this never happen …. (MM12)

4.3.2.1 Knowledge Documentation

The above arguments highlight some limitations that have minimized the benefit of the externalization process within the fleet. The tendency of not documenting the findings from meetings, seminars, workshop, etc., hardly documenting experiences of the fleet's qualified members into reports, fleet not transcribing some unorganized thoughts into concrete ideas and hardly issuing any reports of external experiences for the personnel to access were confirmed by the survey descriptive statistics. On the other hand, the participants also claimed that the fleet was not practicing much documentation of personnel's points of view or asking personnel to report results of discussions, and disagreed the fleet had mechanisms for others to have access to documentation. By ignoring the documentation of discussions, the fleet missed the chance to circulate valuable knowledge to all personnel and reduced the benefit of the externalization

process in general. These negative findings marked externalization as one of the dimensions that needs to be scrutinized by the RMN fleet.

Documenting knowledge requires a lot of effort and commitment (see Figure 4.4). This is because the process of transferring and exchanging knowledge, storing and retention of knowledge and accessibility to that knowledge as in the externalization mode of knowledge creation processes will need determination, bull-necked awareness, interest, attitude and culture to do so. Leader's awareness, interest and eagerness are important in this knowledge creation mode. Hence, based on the findings, the researcher concurred that 'knowledge documentation' is the theme for externalization mode.

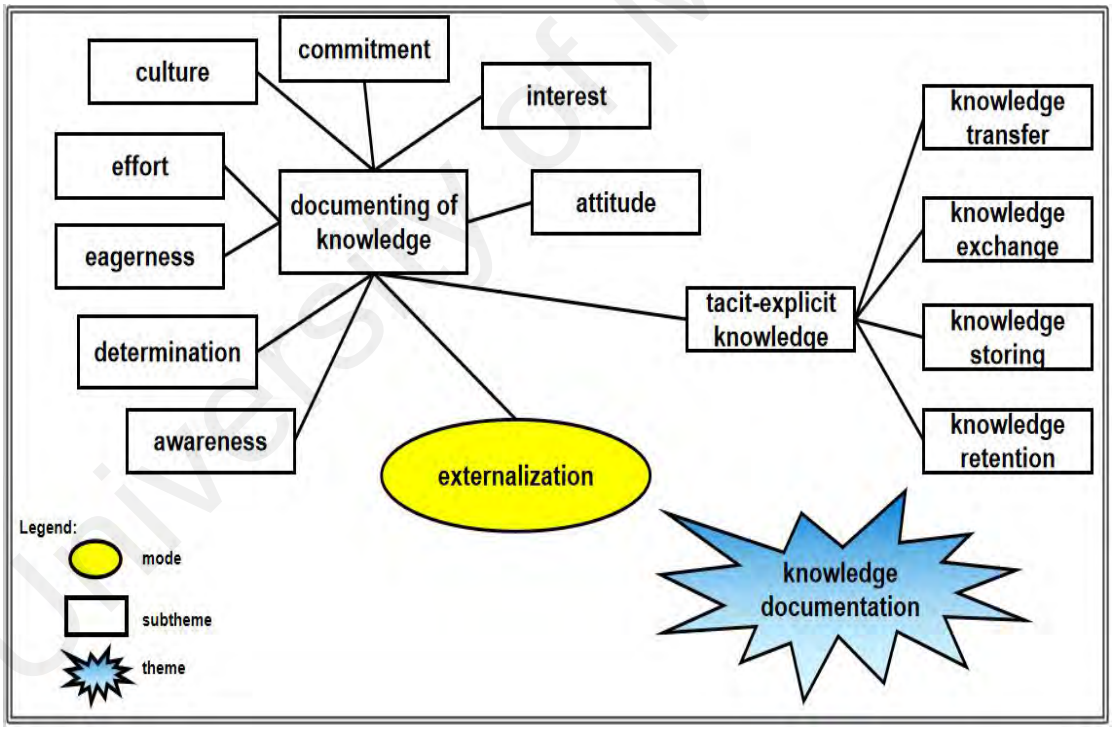


Figure 4.4: Theme from Externalization Mode — Knowledge Documentation

4.3.3 Combination (Explicit to Explicit Knowledge)

In the combination mode of knowledge creation processes, explicit knowledge is converted to become 'modified' explicit knowledge. This modified explicit knowledge

can be promulgated through the use of experiences in collecting new information and making connections between this new and old knowledge from documentation by helping to organize ideas and conclusions derived from any events. This process could be applied by reformulating explicit knowledge into a clearer and more beneficial form for the fleet and its personnel.

> … experience personnel with knowledge is valuable … they have done the operations practically and we need their experiences to combined with procedures and policies that we have in place …. (SM11)

The survey and interviews showed that the RMN fleet performed certain activities to implement this process. This process of reformulating was deemed to be in the manner of the RMN fleet conducting war gaming, navigation training and damage control and firefighting training in their simulators. By conducting the training, the process of upgrading the procedures from lessons learned could be identified. This can be called challenging or 'testing' the existing or current procedures so innovative thinking and culture can be established within the fleet's personnel.

> ... we conducted training in PUSTAKMAR, WASPADA and TANGKAS (simulators) to test the procedures, to refresh our knowledge, to come up with new ideas or solutions …. (MM12)

However, the interviewees argued that the fleet did not use the updated instructions and reports taken by the top management on all relevant issues to update personnel's knowledge and circulate them from top to bottom.

> … the ship most of the time did not update any revision of documents … so we are always confuse … maybe few higher management (personnel) knew but they never cascaded them down to the grass root level …. (MM11)

> … the fleet did not collect and recycle reports from meetings, forums, seminars etc to lower level …. (MM14)

The interviewees also highlighted a few more negative points. Firstly, reformulating documents into a clearer and more beneficial form was limited and they claimed that there were times when they were confused about the directives or orders given. They believed that the managers at higher levels interpreted them wrongly or did not want to take the risk of interpreting these documents. The interviewees criticized this and said that all personnel have to interpret the instructions based on their own points of view or interpretations, and this may cause a lot of confusion and perhaps conflict among them and between them and their managers.

> … directives given (by higher levels of management) were sometimes confusing when we compared to operational or administrative orders … we have to read orders and ask questions to clarify. (MM10)

> … sometimes the orders given make us confused … officers [senior management] said like this and senior rates (middle management) mentioned something else …. (LM9)

Secondly, the issue is related to the lack of dealing with reports. The fleet does not follow any formal process to inform personnel of these reports, especially the ones pertaining to the personnel or personnel's interests. Issues of information security or sensitivity of classified data are well understood regarding reports or documents associated with operations. However, issues on the welfare of personnel and their entitlement were brought up during the interviews. The only thing that would happen is that the personnel themselves would have to collect the information on their own. These findings were supported by the quantitative data, which showed the lowest mean value from descriptive statistics in combination mode of knowledge creation processes for the

instrument item associated with "the respondents agreed that the fleet was keen to collect and reformulate reports issued by external bodies."

> … there is less or sometimes no formal process to inform us … all informal … especially about our entitlement and welfare … most of the time we only know some of them, through our friends …. (LM15)

An interesting finding was 'testing' the knowledge as mentioned by the interviewees, where personnel would be tested impromptu in order to test their knowledge, and this would be used to improvise documented references when and if needed.

> … I will ask and I will test and if they do not know, I will ask them to find first but if they failed then I will open the documentations and explain to them according to my experience and my practical experiences …. (MM4)

> … this 'test' will get them to always remember along their tenure on board at specific appointment … I will ask from time to time, so that my subordinates' knowledge are up to date, especially when our officer asked them about something … they can answer them spontaneously … then it will be good. (MM6)

4.3.3.1 Knowledge Testing

To summarise regarding the combination mode of knowledge creation processes in the RMN fleet, these findings underline the importance of these processes in the RMN fleet and support the survey finding that their personnel are still helping the organization by organizing ideas and collecting new information, making connections between this new and old knowledge, and testing this 'new' knowledge made in combination apart from externalization, which is one of the dimensions that the RMN fleet needs to look into, even though the process is deemed to be ongoing within the fleet. The participants also claimed that the fleet did not use updated versions of instructions and reports to update personnel's knowledge and did not circulate them from top to bottom. They

explained that reformulating documents into a clearer and more beneficial form was limited because the higher management interpreted them wrongly or did not want to risk interpreting them, which resulted in the personnel having to interpret them personally, and this could introduce conflicts within the organization. The fleet was also found lacking in dealing with reports where the participants claimed that there was no formal process to inform personnel, especially on their welfare and entitlement issues.

On the other hand, the participants claimed that the personnel keep on updating and developing knowledge by carrying out practical knowledge and documenting feedback. Knowledge sharing and knowledge transferring are the main activities in updating knowledge, developing knowledge and producing 'modified' explicit knowledge. In order to improve the fleet's documentation, this new and old or existing knowledge need to be tested, implemented and improvised. This is a dynamic process where updating, developing and producing new 'modified' explicit knowledge will take place. Hence, from the discussions and arguments above, the researcher chose 'knowledge testing' as the theme in this combination mode of knowledge creation processes (see Figure 4.5).

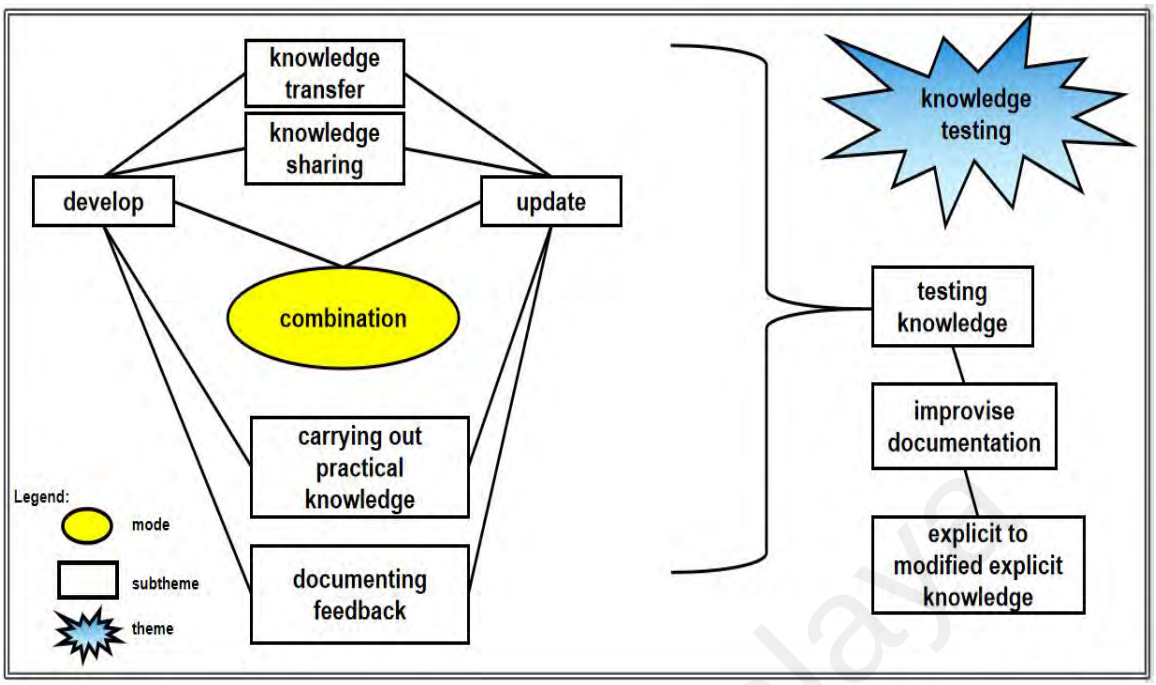


Figure 4.5: Theme from Combination Mode — Knowledge Testing

4.3.4 Internalization (Explicit to Tacit Knowledge)

From both survey and interviews, the data highlighted that the RMN fleet supported activities related to the knowledge creation process in internalization mode, which is the conversion process of explicit to tacit knowledge. The participants claimed that they always compared new ideas with their experiences, especially ideas from new or updated documentation or via databases that the RMN fleet had. They conveyed these ideas and their thinking to ensure all personnel in their departments, or the ship as a whole, were thinking and had the same understanding.

> … always encourage subordinate to read … especially book of references or utilization of CBT (computer-based trainer) … they can always tap knowledge from the books and CBT…. and compare with their experiences and discuss among them … this way, they can sharpen their knowledge, and everybody will follow the guidelines and procedures …. (SM7)

The interviewees highlighted the importance of documentation, i.e., books, handouts etc., as good sources to provide them with updated theories and to support their personal knowledge.

> … these documentations provide us with more experiences and knowledge … as we can refresh our knowledge, or we can compare our old knowledge with the new one …. (SM3)

The interviewees also agreed that the fleet encouraged personnel to improve their personal knowledge by studying relevant courses and by accessing outcomes of training programmes, seminars, minutes, etc. They claimed that all the available information strongly shaped their organizational culture and points of view. Concurrent with these findings, the interviewees mentioned that the fleet allowed its personnel to enrol for postgraduate degrees or certain professional courses, for example, management, technical and logistic courses, that suited their knowledge and career advancement. These courses offered good opportunities to transfer explicit knowledge into tacit knowledge by reading all materials provided such as the handouts, books and any electronic materials. The fleet also strongly supported personnel to attend theoretical or practical fleet and HQ programmes by increasing the chances of getting new knowledge.

> … there are lots of opportunities to further study … part time and sometimes full time if they are lucky …. (LM9)

> … with knowledge we can be effective, efficient…. thinking process also will be different … with good academic qualification, we can further improve ourselves …. (MM10)

> … minimum requirement for officers now to have 1st degree … other ranks with diploma … most of senior officers have masters and some are doing their PhD … this shows that the navy is aiming to have educated personnel in the service …. (SM13)

In contrast, some of the interviewees also mentioned that some higher management did not fully support higher education, based on the view that these more academic degrees were not necessary or appropriate for their naval career.

> The support of higher learning in the fleet is limited … no formal system for promotion … promotion system is still based on seniority basis …. (MM12)

> … sometimes there are no encouragements for academic courses, if you wish to commence … go ahead, but this is under the conditions that it will not be affecting your job … no financial incentives or study leave … the fleet considers that the extent of your success in doing your job, is the standard of your performance assessment. (SM11)

The participants also claimed that the fleet rarely arranged meetings to explain contents of reports internally and seldom arranged meetings to explain and analyse reports externally. They also argued that they could not easily access all the ship documentation, such as the internal reports, documents, instructions and files, because either their ship did not have any databases for any personnel to have access to, or only authorized personnel could do so since some documents have strict security classifications. They highlighted this documentation as important sources to update their knowledge and to be aware of any updates was necessary in order to do their jobs professionally and to fulfil their job requirements effectively.

> … we at the lower level can hardly have access … especially documents … we have to wait for officers and senior rates to tell us … if they have the initiatives …. (LM14)

> … reports, feedback from others … we seldom see … but sometimes … some of the good officers will organize talk or discussion to explain on reports and feedback …. (MM15)

4.3.4.1 Knowledge Accessibility

The analysis above highlights that the fleet supports internalization mode of the knowledge creation process by allowing personnel to attend relevant and more practical courses to allow them to compare their own experiences with new ideas and share their thinking with others. The fleet also stressed the importance of the documents and encouraged their personnel to pursue their knowledge and access outcomes. Although this full support did not include the more academic courses, interviewees still informally attended discussions to hear about new ideas or concepts and tended to compare them with their experience to help them comprehend the meaning. They also communicated with others and would give others time to think about the discussions and later combine existing and new concepts in meaningful ways.

On the other hand, the fleet was found to seldom allow personnel to access outcomes of training programme/seminars and ship's databases and rarely arranged meetings to explain the content of relevant reports and documents. The interviewees argued that they did not have easy access to all documentation, either from ship's databases or documented files. They also explained that ICT would provide the ways and means of easy access to knowledge. In the internalization mode of knowledge creation processes, where explicit knowledge is converted to become tacit knowledge, the first few steps of gathering, storing and retention of the knowledge performed in ICT facilities would allow easy access for the processes of transferring and sharing knowledge among personnel (see Figure 4.6). In view of the findings, 'knowledge accessibility' was chosen as the theme for the internalization mode of knowledge creation processes and is deemed to be of much assistance in knowledge creation enhancement within the RMN fleet.

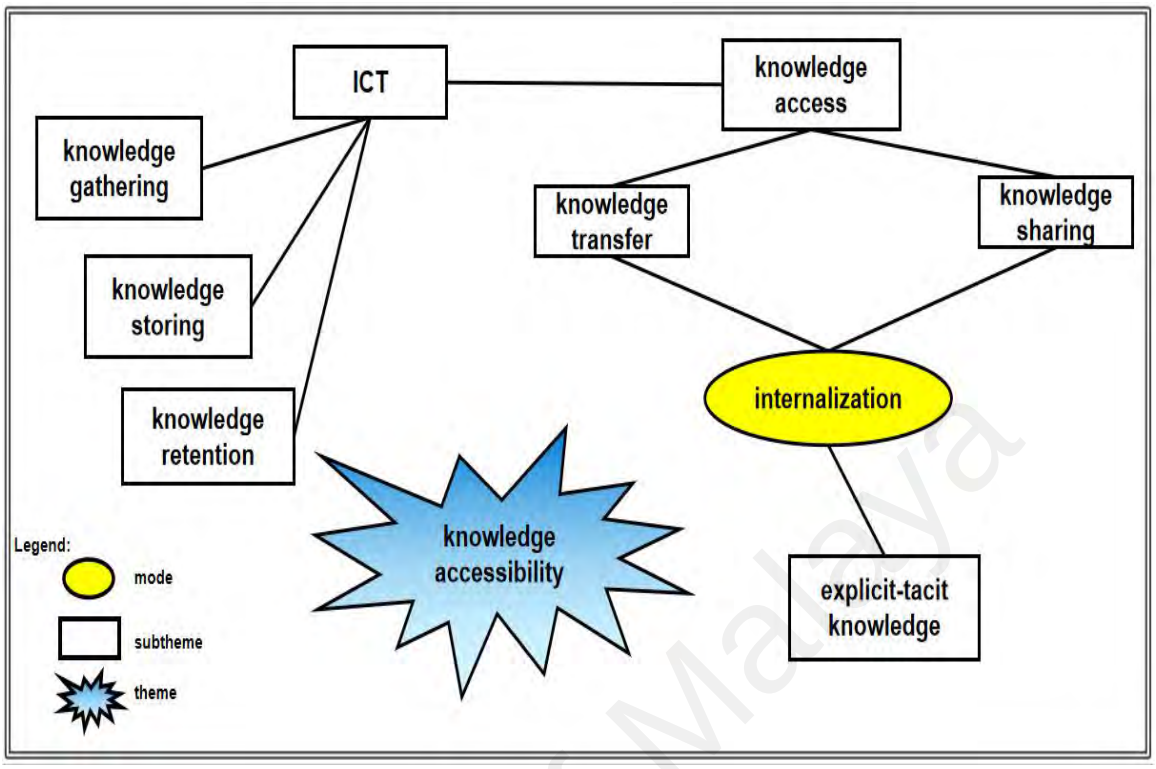
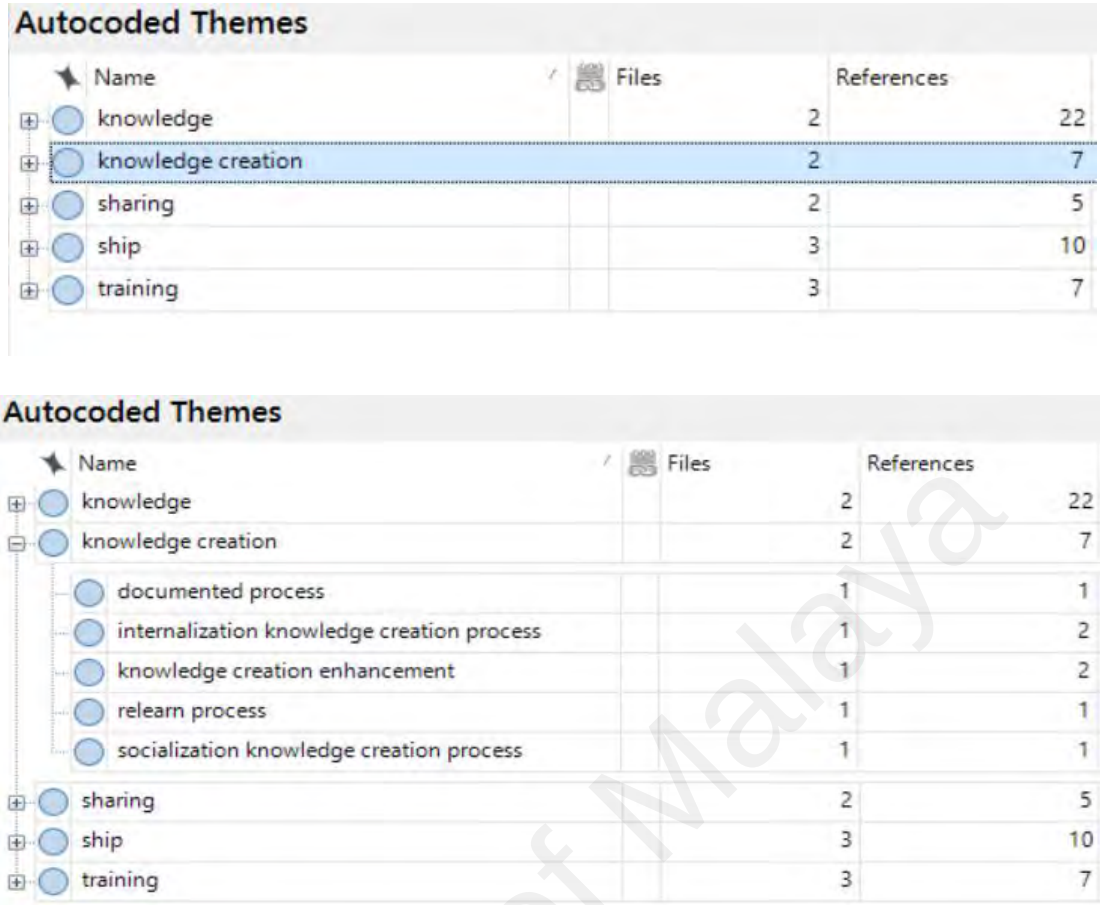


Figure 4.6: Theme from Internalization Mode — Knowledge Accessibility

These findings also showed the importance of the internalization process within the fleet. They demonstrated the extent of this process, which also correlated with the mean values of the descriptive statistics, indicating the process is the most important process in the SECI model for the RMN fleet.

4.3.5 Transcriptions Automatic Coding

In order to strengthen the findings from both survey and interviews, automatic coding was also done utilizing NVivo12 software. Transcriptions in Microsoft Word were imported into the software, analysed, and the resultant themes were autocoded (see Figure 4.7).



Autocoded Themes

Name	Files	References
knowledge	2	22
knowledge creation	2	7
sharing	2	5
ship	3	10
training	3	7

Autocoded Themes

Name	Files	References
knowledge	2	22
knowledge creation	2	7
documented process	1	1
internalization knowledge creation process	1	2
knowledge creation enhancement	1	2
relearn process	1	1
socialization knowledge creation process	1	1
sharing	2	5
ship	3	10
training	3	7

Figure 4.7: Autocoded Themes from NVivo12

Figure 4.8 shows the initial themes derived from the autocoded transcription. The list of automatic coding is provided in Appendix H, and the themes are knowledge, knowledge creation, sharing, ship, and training.

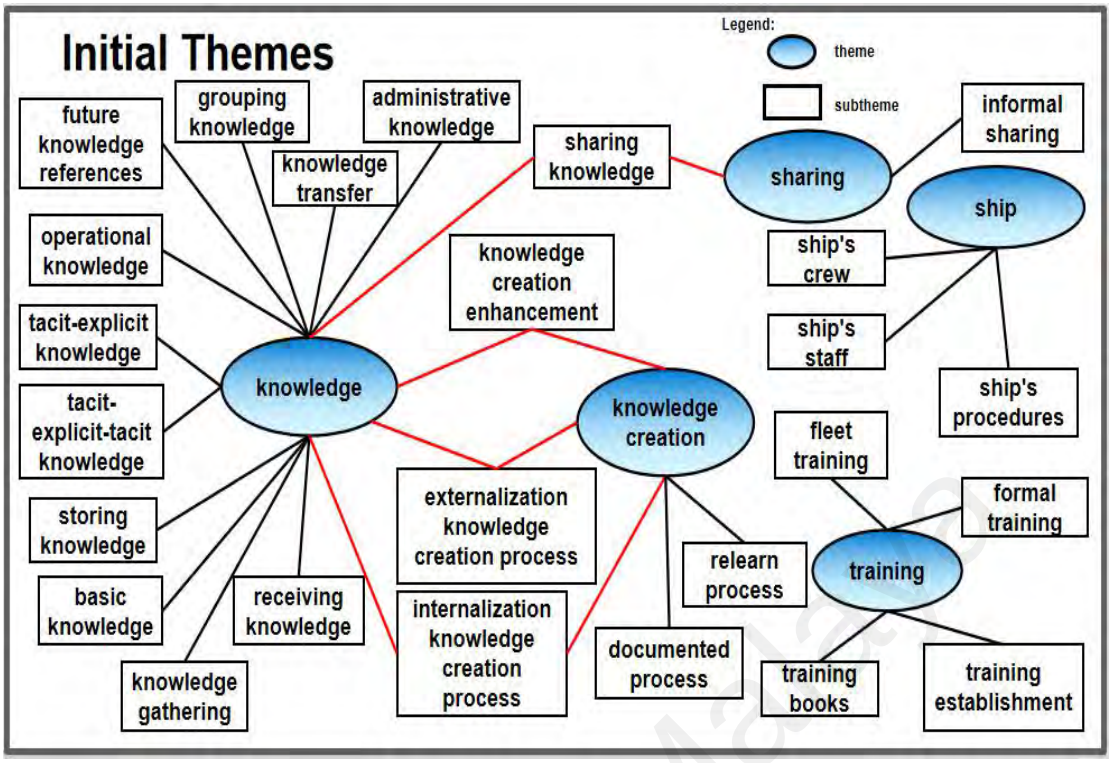


Figure 4.8: Initial Themes

The first theme, “knowledge” in the RMN fleet, was associated with tacit to explicit knowledge conversion in externalization mode and explicit to tacit knowledge conversion in internalization mode. The basic knowledge in terms of experience becomes operational knowledge to suit the operational context of the fleet in both modes of conversion of knowledge, and there is some that becomes administrative knowledge as well. The knowledge received is then gathered and stored for future knowledge reference. This knowledge will be shared and transferred among the fleet’s personnel.

The second theme is “knowledge creation.” This theme is well developed in the externalization and internalization mode of knowledge creation processes. In externalization mode, knowledge is created by the conversion of tacit to explicit knowledge, and in internalization mode, knowledge is created by the relearning process

or ‘learning by doing’ process in conversion of explicit to tacit knowledge. Hence, the knowledge creation enhancement activity needs to be taken into consideration since it will enhance the promulgation of knowledge being created within the RMN fleet.

The third theme is “knowledge sharing.” Sharing of knowledge was determined as an informal activity since the RMN fleet personnel felt more comfortable in executing it informally during informal events, such as over coffee or lunch break and during their rest periods or after working hours. “Ship” is identified as the next theme, and this is because ship’s crew and personnel are the main players for the knowledge creation processes within the fleet. Apart from that, the procedures and policies are promulgated and updated from the ships’ operations and practices.

The last theme identified is “training.” Formal training in terms of fleet training was regularly conducted to keep the RMN fleet on the move and is part of mandatory activities observed and monitored by the HQ. The personnel in the RMN must undergo training from the first day that they join the navy. Official training is conducted in the RMN training facilities and also on board ships, and this process is an ongoing and dynamic process of learning that never ceases until the personnel leave the service. Some other training that the personnel have might be from external sources. Some lucky ones will be sent overseas to take up the challenge, and they will bring back the knowledge garnered to be shared within the fleet. This learning process, either in house or externally, is based on the syllabus documented in the RMN book of references or that of the sponsor organization and is done systematically. The learning outcomes are anticipated to be from the learning objectives. Thus, “training” is made an important factor for the fleet to establish a formidable force to be reckoned with.

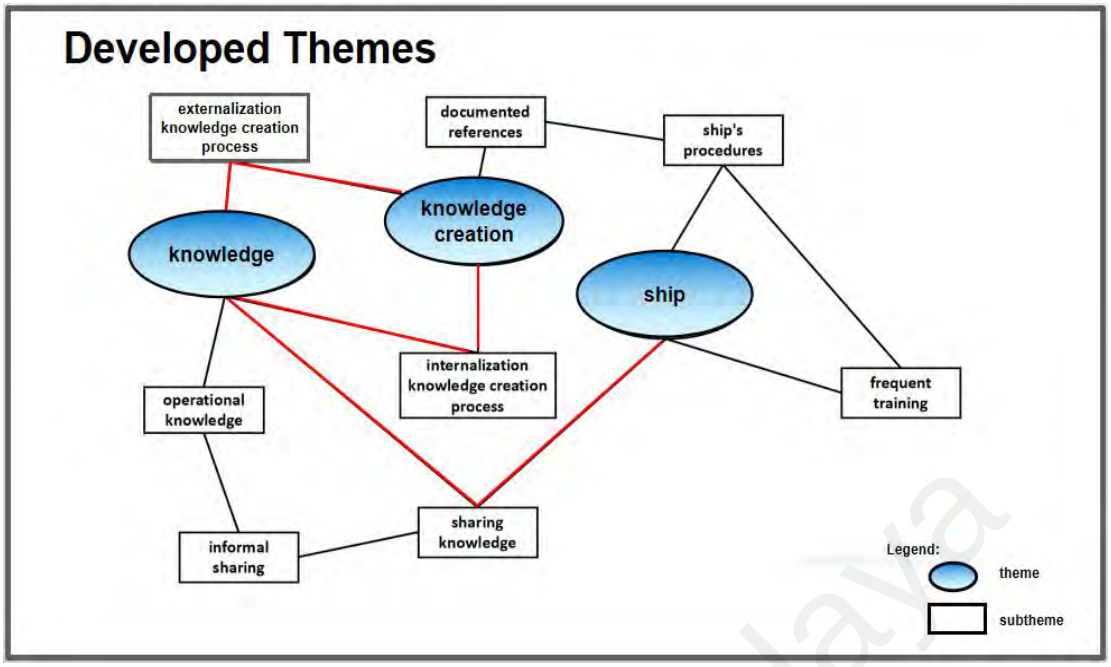


Figure 4.9: Developed Themes

After vigorous analysis on the data (themes and sub-themes) from the initial themes mentioned above, the researcher derived the developed themes (see Figure 4.9), namely knowledge, knowledge creation and ship. They were taken as the developed themes after the initial themes were analysed again utilizing Nvivo12 software. Most of the knowledge was derived from the externalization and internalization modes of knowledge creation processes. From the analysis, knowledge is created based on the documented references and informal sharing of knowledge, which were identified as the main activities that produce operational knowledge. Documented references in terms of ship's procedures supported by frequent training determine the success of the ship's organization in any operations and exercises. From review of the analysis, two more initial themes, which are sharing and training, became the sub-themes and were combined because they showed the relevancy and redundancy to support the developed themes.

Lastly, the final themes were derived from the developed themes as Figure 4.10. From the knowledge and knowledge creation themes, it is observed that externalization and internalization mode of knowledge creation process with personnel's knowledge (mainly operational knowledge) that the RMN fleet personnel claimed to have possessed, were synonym. Those modes were further strengthened with informal kind of sharing knowledge and knowledge creation that took place presently in the RMN fleet, procedures to adhered to that already have in placed (which are documented references) and frequent training designed and planned for the fleet. This showed that the process of tacit to explicit knowledge and explicit to tacit knowledge conversion were taking place widely in the RMN fleet. Hence, in order to further enhancing the knowledge creation processes within the fleet, those socialization and combination modes need to be taken seriously so that means and measures can be taken quickly to solve any issues. The process of retracting or retrieving tacit knowledge from personnel and modifying, updating and reformulating knowledge need to be stressed upon at all level of the organization in the RMN fleet.

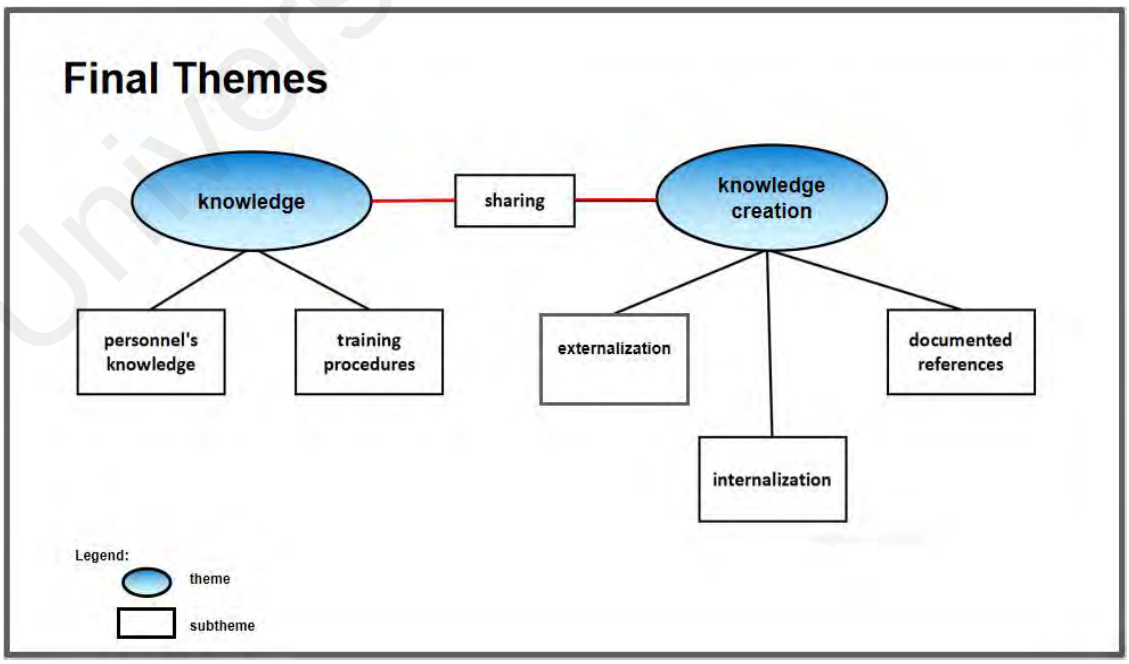


Figure 4.10: Final Themes

4.4 Summary

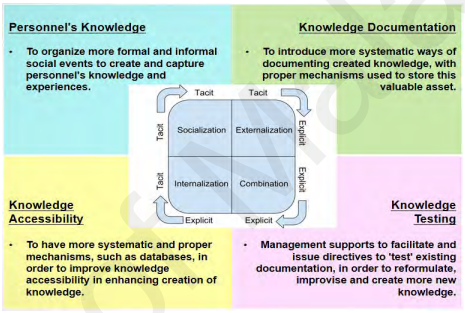
Table 4.14: Summary of Analyses

Documention Review	Descriptive	Interpretive
Littoral Combat Ship (LCS) project in Lumut & Littoral Mission Ship (LMS) project in China.	Knowledge creation process took place in RMN fleet.	S - Personnel's knowledge.
Aim of training and acquiring knowledge.	Extent of knowledge creation processes were identified between 3.3761 to 3.8675 in all modes.	E - Knowledge documentation.
Organization requirement of rotating personnel.	Externalization & internalization modes identified in creating more knowledge.	C - Knowledge testing.
RMN Chief of Navy addressing BOI findings.	Several venues were identified as place for knowledge creation.	I - Knowledge accessibility.
Main roles of the RMN fleet.	Level & type of knowledge that personnel possessed are operational & experiences.	Training & procedures enhance knowledge possessed by personnel.
Career progression for promotion.	Available ICT infrastructure & social multimedia identified as mechanisms in creating knowledge	Documented references utilization provide guidance in creating knowledge.
Human capital development.	Type of ships and numbers of training determine knowledge being created within fleet.	Externalization & internalization modes identified in creating more knowledge.

Table 4.14 is the summary of analyses discussed above. From the findings, all the SECI processes have been confirmed as being practiced in the RMN fleet. However, the extent of the practices varied based on the mean values of descriptive analysis. The values were identified between 3.3761 to 3.8675 from 5-point Likert scale thus, answering the first research question and meeting the first research objective. The extent of knowledge creation practices in the RMN fleet deemed to be satisfactory, even though the interviewees highlighted some discrepancies in the processes. On the other hand, findings from interpretive analysis stated that personnel's knowledge, knowledge documentation, knowledge testing and knowledge accessibility as the themes to be considered in proposing the new knowledge creation enhancement framework. Hence,

the proposed framework developed and introduced (see Chapter 5) in answering and meeting the last research question and research objective (see Table 4.15).

Table 4.15: Study Accomplishment Table

Research Questions	Research Objectives	Findings/Proposed Framework	Accomplishment
1. What is the level of knowledge creation processing in the RMN fleet?	1. Identify the current extent of knowledge creation processing in the RMN fleet.	All SECI processes confirmed being practiced in the RMN fleet. However, the extent of the practices varied. The extent of knowledge creation processes were identified between 3.3761 to 3.8675 (5-point Likert scale) in all modes.	The findings answered and achieved both RQ and RO. 
2. How can a knowledge creation framework be developed to improve RMN fleet operations?	2. Propose knowledge creation enhancement framework to capture knowledge and improve fleet operations.		The proposed framework developed and introduced. The objective met. 

The researcher believes that there are rooms for improvement based on the findings from both survey and interviews. The researcher also believes that the fleet has managed to get some benefit from all the processes. Furthermore, the interviewees did not suggest major limitations in any of the SECI model knowledge creation processes. However, to further enhance the performance of the organization, to have a competitive advantage and to become a world class navy, the fleet needs to improve in certain areas, as will be discussed in the next chapter on the proposed knowledge creation enhancement framework that is based on the improvised SECI model.

CHAPTER 5: DISCUSSIONS AND CONCLUSIONS

5.1 Introduction

This chapter begins with summary and discussions of findings on this study and the conclusions based on Nonaka and Takeuchi's SECI creation of knowledge processes model in the RMN fleet context, with practical and theoretical contributions explained. Next, the chapter continues with the limitations of the study and suggested future research that could further enhance the study described.

The results from the analysed data from survey, interviews and documentation were reviewed. Triangulation between data sources was conducted to arrive at the research findings. The findings discussed in this chapter are presented in relation to on how they can contribute to knowledge creation processes utilizing the SECI model, especially in the RMN fleet. The discussions are framed in comparison with the reviewed literature, and SECI processes form the basis for determining the enhancement of knowledge creation and effective working environment of the fleet.

First, the researcher discusses the utilization of the the SECI model in the RMN fleet by providing the strengths and limitations of utilizing each SECI model process and the model as a whole. Next, the researcher discusses how every SECI model process affects the creation of knowledge processes and why the fleet needs to pay more attention to the processes as well as how to improve conversion of knowledge processes within the RMN fleet.

5.2 Summary of findings

The aim of this study was to investigate the extent of knowledge creation processes through the use of the SECI model in the RMN fleet. Therefore, the use of each process was investigated, followed by identifying the means or measures to enhance these creation of knowledge processes in every mode of the SECI model. The four processes of the SECI model, namely, socialization, externalization, combination and internalization, are considered in this study. The study utilized survey questionnaires (234 respondents) and interview protocols (15 interviewees) adapted from Easa (2012) to investigate the research questions and ultimately, to achieve the research objectives. Descriptive statistics from the survey conducted are meant to provide a contextual background and supplement the interpretive results. Some documentations were also used for reference of this study, and the results from all these methods were triangulated to make the study more rigorous in reaching the absolute findings.

From the study, the researcher determined that all processes in the SECI model (Nonaka & Takeuchi, 1995a, 1995b) were utilized by the RMN fleet. However, the extent of utilization varied among the processes. This was due to some limitations that will be discussed as we progress further in the discussions. All four modes of SECI model knowledge creation process were useful to create and transfer knowledge in the RMN fleet.

The transfer of tacit knowledge from one personnel to another is achieved in the RMN fleet through discussions conducted in general interactions, for example, when the personnel are at work, attending formal meetings or seminars and also training programmes. However, negative feedback from the personnel was received regarding

the involvement of personnel in discussions with either their colleagues, internally, or with other agencies, externally.

The RMN fleet converts tacit into explicit knowledge by documenting both internal and external discussions and dialogues. Personnel are asked to write reports, feedback or minutes of the meetings, training or courses that they attended. Nevertheless, both internal and external events were found to be limited due to perceived thoughts of higher management on internal discussions and limited numbers of attendees able to be present for external dialogues.

The RMN fleet supports and practices a number of mechanisms in collecting and reformulating their existing explicit knowledge, like organizing and participating in war gaming, exercises and operations. These platforms allow the fleet to test, revise, update, improve and reformulate the existing procedures and policies, thus this newly reformulated and developed explicit knowledge is turned into more accessible forms. However, 'testing' of knowledge alone without systematically updating and improving the documentation or databases will not solve any issues.

The RMN fleet also supports several mechanisms to convert their existing explicit knowledge into personal knowledge by allowing access to the outcomes of training programmes, seminars, meetings and the fleet's databases. However, accessibility to documentation or databases in the RMN fleet was put into question since the participants claimed that they had difficulties gaining access.

In the socialization mode, the processes support personnel experience and knowledge to enable the personnel to deal with different working scenarios or situations in order for

them to initiate and produce constructive ideas. The findings from this study confirm that every single SECI process affects the creation of knowledge processes; however, the weight of each process is different, depending highly on management support. The socialization process has a strong effect on creation of knowledge within the RMN fleet. However, limitations were found to be imposed, such as limited informal platforms and the need for more formal events, which minimized its effect on creating personnel's knowledge and sharing this knowledge within the fleet.

The research findings also suggest documentation of discussions as a systematic way of generating ideas and suggestions. Conversion of tacit into explicit knowledge improves the available knowledge bank in organizations and consequently, the organization's capability to improve the existing documentation by generating new ideas, opinions, suggestions and developments. Regarding externalization, the RMN fleet needs to look into these processes cautiously because the imposed limitations of non-systematic ways of documenting and a tendency toward not documenting things has hindered the conversion process of tacit into explicit knowledge, which as a result, minimized the benefits of externalization processes in creating and transferring knowledge. This surely needs strong support from all levels of management, especially the higher management.

In the combination mode of knowledge creation processes, updating knowledge is a prerequisite and utilized as a basis in developing existing fleet policies, procedures and processes. New policies, procedures, processes or even ideas are based on the effective reformulation, reconfiguration and organization of existing explicit knowledge within the fleet into new and more structured forms of knowledge. In this mode, the lack of updating documentation, lacking reformulation of documentations into clearer and more

beneficial forms, and the lack of dealing with documentation in the sense of informing and updating personnel have hindered the process of knowledge creation, which also minimized the benefits of this process. This mode is also identified as crucial because it involves directives and policies meant to ensure all explicit knowledge documented, read and tested by all personnel, to further update and reformulate existing knowledge.

Meanwhile, internalization mode is identified as an important process in creating and transferring knowledge within the RMN fleet. Experiences of learning by doing, such as on the job training (OJT), reading all available and relevant documentation and accessing the fleet's databases, enhances the digestion and absorption of existing knowledge within the fleet, which in turn enables personnel to create new ideas and new operational knowledge. However, personnel still need more formal support for accessibility to all documented explicit knowledge, and the organization needs to have systematic means of storing and safeguarding all this valuable data and information so that it can be easily accessed by all personnel in internalization mode.

The study recommended that the all four SECI processes, whether it is separated or acted as a whole, influenced creation of knowledge within the RMN fleet. In the organization, the use of the model processes varies but not to the extent of many differences occur. Hence, the model is useful within the fleet to promote knowledge creation processes with some recommendations that will further enhance the processes within the RMN fleet.

5.3 Discussions

It is observed that all the processes of the SECI model are confirmed as the modes for conversion of knowledge in the RMN fleet. However, the processes are not

implemented within the fleet at the same degree. Below is the discussion of this study, which is divided according to all four knowledge creation processes in the SECI model.

5.3.1 Socialization

From the findings, it is observed that transferring of tacit knowledge from one person to another in the RMN fleet was achieved through discussions conducted in formal events such as, seminars, meetings and training programme. However, Nonaka et al. (2000) posited that the processes of this knowledge conversion usually take place during informal social meetings, where tacit knowledge is created and shared. Martín-de-Castro et al. (2008) concurred by stating that this process happens through shared experiences that take place in everyday social interactions. The environment and working conditions in the RMN fleet allow personnel to conduct daily face-to-face discussions with each other. The interaction between personnel within the fleet resulted in tacit knowledge being created through shared experience or passed through practice, guidance, observation, etc.

On the other hand, the fleet continuously communicates with the HQ to seek advice and directives, and there was limited social context discussions with external parties such as other services or agencies. The fleet regards most informal discussions as being focused on social and personal interactions rather than being work related. Thus, higher management are reluctant and sometimes unwilling to give consent for informal socialization. Hofstede and Hofstede (2005) posited that this higher management acts as a representation of high power distance. This is a norm in military organizations such as the RMN fleet, where higher level management have strong authority over their subordinates. This suggests that the fleet supports formal over informal discussions.

The RMN fleet personnel, especially from middle and lower management, also claimed that knowledge sharing in the fleet was more towards the formal type of sharing and not as in friendly environments for them to comfortably share their experiences. Von Krogh et al. (2012) posited that this may hinder the willingness of personnel in the sharing of knowledge and the building up of trust between them.

Nevertheless, the fleet has implemented internal and external training programmes, seminars and workshops to further enhance sharing of knowledge among its personnel. Through these programme or events, personnel could add more knowledge and experience by the virtue of face-to-face discussions with others from the same organizations or from relevant external agencies, with every level of management and with subject matter experts. However, the personnel claimed that they had limited informal discussions due to higher management's perceived thoughts and limited external events to attend since only limited numbers had been invited.

Although personnel in the RMN fleet expressed and claimed that they were socializing among themselves, the findings discovered limitations that minimized the benefit of socialization processes. The sharing of knowledge benefits between personnel, in informal and formal settings, were limited due to the perceived thoughts of higher echelons and the limited number of personnel invited to formal meetings.

5.3.2 Externalization

In the RMN fleet, transformation of tacit knowledge into explicit knowledge is mainly done by documenting the outcomes of seminars, meetings and training programme. Documenting and reporting the outcomes of discussions from these events are tasks given to the personnel. Normally, the most senior one from a group will be

responsible for doing so. As Easa (2012) posited, documenting and reporting the outcomes of these events are effective methods for articulating personnel's tacit knowledge and converting the tacit into explicit knowledge. However, the findings suggested that there are differences in the willingness of the personnel in transferring their tacit into explicit knowledge. This needs the support of every management level to encourage and motivate all the personnel to volunteer in this process. Personnel were asked to give event feedback only to their superiors, and as a result, the access to the outcomes of events was limited. Accessibility to the reports is also limited since most of the formal reports are entered into the manual filing system and not entered into any database. Hence, only personnel selected to attend these events got the benefits. This reveals that the RMN fleet needs to look into documenting feedback as an important aspect of its management since it is possibly a big aspect of fleet's lamentable behaviour. Documenting important issues is a must and making them available to all, with convenient and friendly access, will create awareness of the problems that might happen again in the future.

The participants also claimed that the tendency toward not documenting findings, not transcribing unorganized thoughts into concrete ideas, and taking too long to explain or discuss the outcomes of documentation were the things that hindered the externalization process within the fleet. The RMN fleet needs a systematic way of documenting all the data and information garnered for easy access by all personnel because when tacit knowledge is converted to become explicit knowledge, this knowledge should be shared among personnel to become the foundation of new knowledge (Nonaka & Toyama, 2003).

To sum up, the limited extent of externalization processes in the RMN fleet was observed. These processes are observed in seminars, workshops, training and in discussions with personnel. However, the benefits of discussions are limited to those who attend these events, generally, and specifically to the personnel involved directly in the discussions. The fleet will miss opportunities for circulating and cascading the knowledge to all personnel if they ignore the process of documenting these discussions. This would reduce the advantages or benefits of the externalization knowledge creation process and result in some knowledge still remaining tacit and intangible.

5.3.3 Combination

Reformulating explicit knowledge, into clearer and more beneficial knowledge for the fleet and its personnel are the main purposes of the combination process. According to Easa (2012), systematic knowledge is created from the conversion of existing explicit knowledge. The RMN fleet performs certain activities to implement this process, for example, by testing all the policies and procedures during table-top evolution, war gaming, and exercises as well as in operations. These measures were taken to test and improvise the available documentation because the nature of the aforementioned events and environment are dynamic. The fleet needs to keep pace with fast and vast changes in surroundings and technology. Continuously updating its databases, networks and reports, is a must. By utilizing updated instructions and reports on all relevant issues, the fleet may then take necessary actions or means to circulate and cascade them to all the fleet personnel.

Instructions, rules and directives from the HQ need to be clearly reformulated by the top management so that they become understandable and beneficial for the fleet. Personnel might interpret them wrongly without the guidance of the higher management

level. This might create conflicts among the personnel and also conflicts between the personnel and higher management level. This happens because some of the personnel do not understand the requirements, hence they are struggling in interpreting what is required from them. This is a classic example of high power distance among military personnel, especially in the RMN fleet. As a result, the personnel become conservative in dealing with reports from the higher management level. It is also observed that the fleet has not been following a systematic and consistent process of informing or updating personnel about reports. Most of them claimed that they only knew about the reports informally either through their middle managers or their colleagues.

These findings show the importance of the combination mode in the RMN fleet. The existing documented explicit knowledge in its inventory are important, and the processes of updating and reformulating them in accordance with the dynamic scenario, vast surroundings and fast changing technology need to be looked into for newly modified explicit knowledge. This existing knowledge needs to go through the reconfiguration process as recommended by Nonaka (1994), i.e., by sorting out the knowledge and some additional processes needed to re-categorize and also re-contextualize, which will lead to new knowledge being promulgated.

5.3.4 Internalization

The RMN fleet encourages personnel to internalize explicit knowledge by accessing the outcomes of any training programmes, studying relevant and related courses to the fleet, accessing the outcomes of seminars attended and accessing the fleet's databases. Easa (2012) posited that in order to enrich personnel's tacit knowledge base, personnel can do so by internalizing explicit knowledge, i.e., by reading and digesting the documentation about their organization and jobs.

Personnel highlighted the importance of documentation such as related books, handouts, and reading materials to support and update their knowledge base. Furthermore, the transfer of explicit knowledge among personnel is aided by relevant documentation, which can help them to indirectly experience others' experiences (Nonaka & Takeuchi, 1995a, 1995b).

On the job training is important because internalizing knowledge is always associated with learning by doing (Nonaka & Takeuchi, 1995a, 1995b), and this is widely practiced by the RMN fleet. Accessing relevant materials from events like seminars, workshops, training programme, professional courses and databases is an important part of job training as the work in the fleet comprises mainly operational types of work. On the other hand, the fleet also supports personnel to attend practical training programme organized by the fleet itself or organized by the HQ.

Internalization mechanisms such as accessing outcomes of training programme, workshops or seminars and explaining content of documentation or reports are supported by the RMN fleet. Apart from that, the fleet also supports practical courses for the personnel to attend and acquiring relevant support materials for these events. Even though this support is not of the academic type, personnel still benefit by gaining knowledge when attending them.

However, apart from the support from the fleet managerial perspective, the fleet personnel still claimed that accessibility to documentation and databases is limited and unfriendly. Hence, the RMN fleet need to look into having more systematic and proper databases to further improve the internalization process.

5.4 Conclusions

It is concluded that all four modes of knowledge creation processes in the SECI model (Nonaka & Takeuchi, 1995a, 1995b) are contributing to knowledge creation enhancement within the RMN fleet. As for the mechanisms used for knowledge creation enhancement, respondents and interviewees agreed that existing mechanisms such as social multimedia and ICT infrastructure on board can be utilized for deriving and cascading knowledge to become collective knowledge among the crew of a ship. Even personal gadgets can be used for knowledge creation enhancement since the trend of utilizing social multimedia, for example, WhatsApp, Facebook and Instagram, are widely used in the fleet. However, when it comes to personal belongings, there is a point to ponder, especially with regard to information security when using one's own personal gadgets to share data and information. This needs to be scrutinized further in implementing knowledge creation enhancement in the RMN fleet. On top of that, understanding, awareness, attitude and higher management's involvement are a few more points to ponder in realizing the objectives of the study.

Currently in the RMN fleet, the externalization and internalization modes of knowledge creation processes were observed to be the most actively practiced. These were where tacit to explicit and explicit to tacit knowledge creation processes took place. Hence, stimulating knowledge creation enhancement in the RMN fleet needs to be focused more on the socialization and combination modes. Extracting all the personnel's tacit knowledge and testing and modifying it when it is necessary needs to be adhered to quickly and become a dynamic and on-going process. Although it is and will be a tedious process, it is paramount and a must for the RMN fleet to further improve in order to be an effective and efficient naval force to be reckoned with.

Descriptive analysis showed that knowledge creation processes took place in the RMN fleet. The extent of the knowledge creation processes was identified, where all four modes of knowledge creation, namely, socialization, externalization, combination and internalization were practiced within the fleet. However, the extent of knowledge creation processes in the organization varied from one mode to the other. According to the findings of the survey conducted, externalization and internalization are the most common practices within the RMN fleet as compared to socialization and combination. Although the statistical data's mean value differences are quite close and similar in each mode, between 3 and 4 on the five-point Likert scale, there is still room for improvement for all SECI processes in the fleet. On the other hand, the types of ship where the personnel served and the training underwent by the personnel have significant impacts because they determined the knowledge being created within the fleet. Accordingly, the more advanced the platform and the more training that the crew had, the more knowledge was created within the organization.

Meanwhile, interpretive analysis identified personnel's knowledge, knowledge documentation, knowledge testing and knowledge accessibility as the key factors that can further enhance the creation of knowledge within the RMN fleet. Training and implementation of procedures that took place further enhanced the knowledge possessed by the personnel. Presently, externalization and internalization were the knowledge creation process modes identified in creating more knowledge. So, the fleet needs to look more into how to promote knowledge creation in socialization and combination modes.

5.4.1 Overview of the Enhanced SECI model

As for the framework proposed, the modified SECI model with the elements as gathered from the analyses, as shown in Figure 5.1, is strongly recommended for knowledge creation enhancement within the RMN fleet. The fleet should work hard to maximize the benefits of all the knowledge creation processes and maximize their positive effects on fleet effectiveness and efficiency. The fleet should deal promptly with the points highlighted by the respondents and participants of this study with regard to the whole SECI processes and particularly, the socialization and combination processes without paying less attention to externalization and internalization processes, as well.

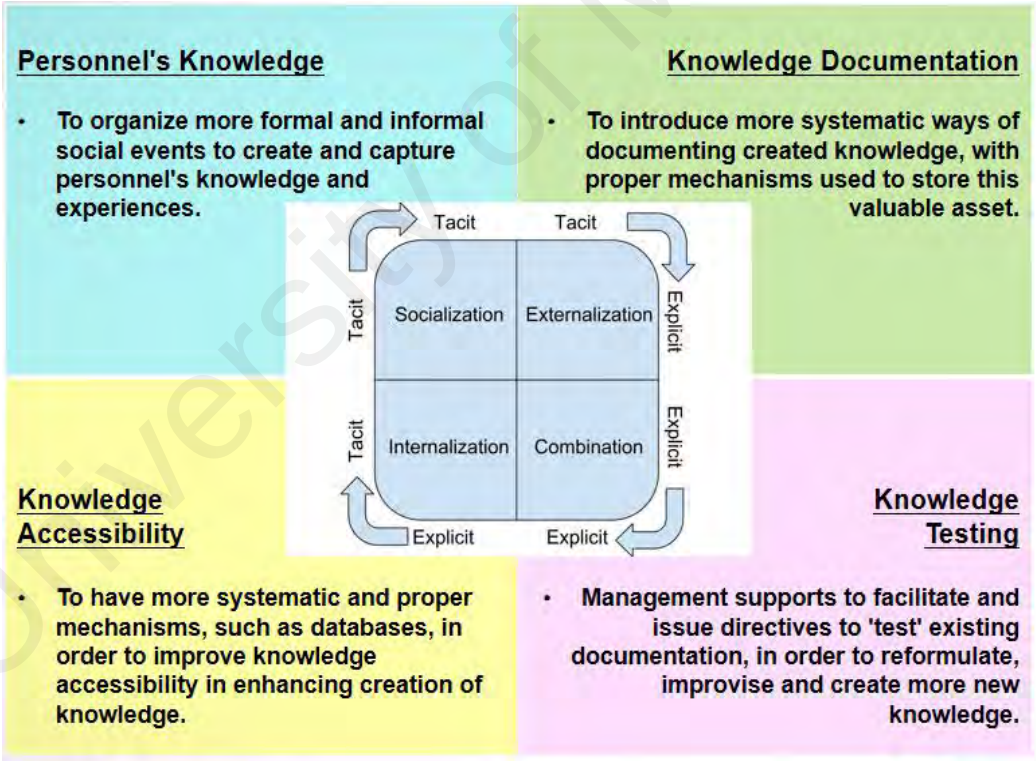


Figure 5.1: Knowledge Creation Enhancement Framework

The findings above indicate that all knowledge creation processes based on the SECI model have important roles in the RMN fleet. The fleet was seen as practicing all the

processes without noticing them. However, the extent of knowledge creation processes varies. The limitation in informal networks in socialization mode activity is mainly because of the lack of trust. This is representative of high power distance within the RMN fleet. This discloses that the nature of operations might affect each SECI process. Hence, the fleet needs to strongly support both formal and informal discussions between its personnel. Formal discussions are mainly for related tasks or work. However, trust and loyalty among the personnel are built up in informal discussions. This phenomenon needs to be scrutinized further to uplift personnel's knowledge, which is paramount in generating new valuable knowledge.

On the other hand, some scholars posited and concurred with the findings of this study to confirm that the social interaction among personnel and groups creates new knowledge in organizations (Aramburu, Sa´enz, & Rivera, 2006; Darroch & McNaughton, 2002; Nonaka & Takeuchi, 1995a, 1995b; Peltokorpi, Nonaka, & Kodama, 2007; Popadiuk & Choo, 2006; Schulze & Hoegl, 2008). In the RMN fleet, discussions among personnel, discussions between personnel and higher levels managers, and discussions with internal or external subject matter experts give the personnel a platform to share their knowledge and experiences. They also help in improving personnel's work processes, help them in solving problems and help personnel to come up with new ideas related to their working environment. Socialization processes can be said to support the personnel's knowledge and experience. This enables the personnel to deal with different scenarios and to present constructive and creative ideas in enhancing fleet performance. Hence, the RMN fleet needs to pay attention to supporting both formal and informal discussions to maximize the benefits of these processes within the fleet in socialization mode.

In this study, the externalization process is observed as influencing personnel's new knowledge. The basis of generating ideas is documentation of the findings from discussions regardless of whether these are with external or internal agencies. This will be the platform for creating new ideas because necessary data and information were provided. Personnel's knowledge and experiences are always associated with documentation. These valuable experiences and knowledge, once documented, can be the means and ways for personnel to recall previous information or memories. Hence, this research confirms a few researchers' findings, such as Li, Huang, and Tsai (2009), Lin (2007), Martín-de-Castro et al. (2008), and Tsai and Li (2007). They suggested that the available knowledge in the organization will improve by articulating tacit into explicit knowledge. The improvisation is with regard to the existing procedures and process and in generating new ideas. These findings disagree with the studies from Schulze and Hoegl (2008) and Kamasak and Bulutlar (2010) because the researchers suggested that externalization is related to the improvisation of existing procedures or processes but not to generating new ideas.

The RMN fleet requires an integration of both internal knowledge and external knowledge to furnish them with sustainable competitive advantage. They cannot be solely dependent on internal discussions or only external ones. This will limit the externalization process effects in the fleet. What the fleet needs to do to maximize the benefits in this process is to give more attention and priority to supporting the documentation of both internal and external knowledge. On the other hand, systematic ways of documenting with the utilization of proper mechanisms need to be immediately identified and promulgated. This is to eliminate the knowledge dissipation problem or to avoid valuable tacit knowledge remaining tacit.

For combination process, personnel's knowledge is influenced by the process of existing explicit knowledge conversion into more systematic sets of knowledge. The basis or prerequisite to develop existing RMN fleet procedures and processes is updating and testing the knowledge. This is in agreement with most of the literature stating that the promulgation of new procedures, processes or ideas needs effective organization of existing knowledge, effective connection of existing knowledge and the reconfiguration or reformulation of existing knowledge into more structured forms of new explicit knowledge (Koberg, Detienne, & Heppard, 2003; Li et al., 2009; Martín-de-Castro et al., 2008; Weilemaker, Volberda, Elfring, & Baden, 2003). In the RMN fleet, the combination process is important to reformulating, improvising and generating new knowledge or development of its existing explicit documentation. Revising and updating personnel knowledge with relevant documentation is also necessary in order for them to fulfil their daily work requirements for the benefit of the organization. Thus, management supports identified to facilitate 'testing' of the existing documentation and create more new knowledge.

The study observed that the internalization process influences personnel's knowledge. The findings found that experiencing by reading is likely to improve the RMN fleet personnel's absorption of existing knowledge, which in turn would enable the personnel to come up with new ideas and knowledge. This is in agreement with the studies of Ng, Goh, and Eze (2011), Schulze and Hoegl (2008), Koberg et al. (2003), Helfat and Raubitschek (2003), Hatten and Rosenthal (2000) and Hargadon and Sutton (1997). Therefore, the RMN fleet needs to have more systematic and proper mechanisms, for instance, databases, for the fleet to improve knowledge accessibility that is friendly to all the personnel in enhancing knowledge creation. Easy and friendly access to the procedures, processes, training or seminar outcomes or any other relevant materials will

provide personnel with knowledge that will improve their knowledge base and provide a platform for them to further develop their existing skills. This access to the RMN fleet's databases would also enable personnel to create their awareness on any related or relevant issues and help in generating valuable ideas for the betterment of the organization.

5.5 Contributions of Study

This applied research has several contributions for both practical and theoretical perspectives. The practical contributions are on more specific recommendations in utilization of the SECI model to further enhance the knowledge creation processes by the RMN fleet, specifically, and hopefully, it can be generalized to other military organizations or perhaps any other public or private organizations. Meanwhile, the theoretical contributions are in relation to the body of knowledge by continuing the argument or debate on utilization of the SECI knowledge creation process model and utilization of the study's extended theoretical framework in enhancing the creation of knowledge within the organization.

5.5.1 Practical Contributions

This study is the first in the navy fleet context and one of the few studies in the military context on the utilization of the SECI model by Nonaka and Takeuchi (1995a, 1995b) in order to enhance the creation of knowledge within the organization.

In the RMN fleet, the lack of support for informal discussions has affected the knowledge creation and sharing processes. These discussions were supposed to build up the trust and loyalty among all level of management. Hence, the RMN fleet should consider making changes to support informal interactions such as arranging social

events outside the workplace and arranging informal meet ups with all management levels, perhaps at their respective common areas or any suitable places that will let the personnel feel free and more comfortable to discuss things, express their feelings, and argue or debate maturely on any work related issues. By arranging such events, personnel can become closer to one another and build trust among them and among all management levels. This also will encourage the personnel to create knowledge by sharing their work problems in order to find correct remediation and solutions.

The limited number of personnel from the fleet selected for formal discussions or events with external parties is deemed to be affecting the absorption of external knowledge. This has ruled out valuable related knowledge and feedback for the benefit of the organization. Lack of documentation and reports on discussions and the unavailability of database access to the content of external events contributes to the limitations on acquiring expert knowledge. To capitalize from outcomes, the task is on the fleet's personnel to report in detail and compile their reports in the databases that can be accessed by all. This documentation of expert knowledge can later be used to develop or promulgate procedures and policies and can even be utilized as references in solving fleet problems. The RMN fleet might need to increase the number of formal events to increase the intra- or inter-organizational knowledge flow. This should also allow the process of accumulating external knowledge that can be used to reformulate, reorganize and improvise the existing knowledge within the fleet.

Documenting personnel's feedback was limited due to limited informal and formal events. Important issues pertaining to operation of the ships, safety, and security issues that are very useful to the RMN fleet, for example, need to be highlighted by the personnel and circulated in order for the fleet to be prepared for any circumstances.

Consequently, the fleet needs to ask its personnel to report their feedback promptly so that action may be taken immediately.

The rules and instructions that were issued by the HQ need to be rightly interpreted and explained by the higher management level to the subordinates. However, the study found that there was a lack of explanation being conducted in the RMN fleet. This led the personnel to take their own initiatives by interpreting the rules and instructions themselves because most of the time, the personnel were unable to understand what was required from them. This might cause conflicts among the personnel and also between them and their managers. Hence, the higher management levels need to take necessary actions to explain thoroughly to eliminate such conflicts.

Although the opportunity to pursue academic qualifications is given by the RMN, not all personnel are lucky enough to have the chance. It is important for the fleet personnel to develop their own personal knowledge by getting into the habit of reading in order to improve themselves. By obtaining the knowledge and translating it in their good work performance and attitude, higher management might provide the formal support to them in order for the personnel to pursue their higher level of academic qualifications.

Ideas volunteered by the RMN fleet's personnel were not recognized or sometimes the higher management was not alert to such ideas, which might lead to jeopardizing the personnel's commitment and loyalty towards the organization. On board the RMN vessels, it is observed that every department worked separately in generating, developing and collecting volunteered ideas. Therefore, the fleet should consider this issue of collecting valuable ideas and develop them to the benefit of the organization. By doing so, the personnel's commitment and loyalty could be increased.

The mechanisms to address the storing and accessibility of knowledge need to be acted on immediately. It is recommended that the RMN fleet increase the capability of their data storage or databases so that they will be convenient and easy to access by all management levels. However, the information security level must not be jeopardized in providing easy accessibility since the fleet deals with lots of sensitive and crucial data and information with regards to the safety and security of the nation.

5.5.2 Theoretical Contributions

Survey questionnaires were used to obtain the descriptive statistics data to gauge the extent of knowledge creation processes in the RMN fleet, but only in superficial ways. Semi-structured interviews went deeper to get insights, added depth and complexity for the understanding of the study by getting more details from the participants. Interviews also were essential in collecting more information for this study about the utilization of the SECI knowledge creation processes model within the RMN fleet. This study contributes to the body of knowledge by providing the SECI model application within a navy fleet and by proposing the knowledge creation enhancement framework of the SECI model within the RMN fleet context.

The use of every process in the SECI model is subject to leadership support and cultural context, even though the model is accepted as a universal model. The RMN fleet's personnel are regarded as a collective society, and they are expected to socialize more when compared to individualistic society. However, informal knowledge sharing processes were limited due to the lack of trust shown by the high power distance within the organization. The personnel's motivation for achievement would also be limited because of this limitation. This can be seen in the social events organized, where the

majority of personnel avoid interactions with the higher management because of the lack of trust.

The study suggests that all the knowledge creation processes in the SECI model are key resources of knowledge creation in the RMN fleet. Nevertheless, there are some limitations that hinder creation of knowledge in the fleet context. Creation of knowledge in the socialization mode is not an easy task. The task is heavily dependent on the elements of commitment, loyalty and trust of the personnel and between the personnel and their managers. In the externalization mode, limitations on the effectiveness are anticipated because some of the tacit knowledge can be very difficult to convert and become explicit knowledge because of ignorant attitudes about documenting. On the other hand, the fleet may need to have more control over formal knowledge for the combination process so as to promulgate new explicit knowledge and to offer ease of accessibility to the formal knowledge in internalization mode. The process of documentation in the externalization process and internalization of the explicit knowledge in generating new ideas were identified as successful occasions of knowledge creation within the RMN fleet. Hence, the knowledge creation process can begin with the externalization or internalization mode and does not necessarily have to start with the socialization mode, as posited by Nonaka and Takeuchi (1995a, 1995b).

Both internal and external knowledge are equally important in working with the SECI model. External knowledge can be derived from other external agencies such as sister services like the army and the air force, other relevant government agencies and also private entities. The external training programme or seminars gave the personnel the opportunity to acquire new knowledge either from their colleagues, from external expert panels or possibly from other organizations. In developing organizational

performance, personnel feedback is also crucial. Limited documentation and limited accessibility to this external knowledge limits the benefits and advantages that could be derived by the personnel that attend and those that were directly involved in the events.

5.6 Limitations of Study

This study answered the research questions promulgated and achieved its objectives. Nevertheless, there are a few limitations and constraints faced by the researcher while conducting the study. They were inevitable and do not invalidate the findings of this research. However, they may provide some form of guidelines for future study or research.

With regard to the triangulation of the research data, the researcher cannot regard both the descriptive statistics from the survey and interpretive data from the interviews as independent data since they were from the same population. Although both sets of data were different in the sense of how the respondents or the participants expressed their opinions and attitudes, the limitation mentioned above is still valid, i.e., they were from the same RMN fleet. In future research, a study with independent data sources might provide interesting findings.

Apart from that, it would be difficult if a study were to embark on investigating the SECI model with another navy fleet due to the nature of the military and security issues. On top of that, time and cost constraints will come into the picture, as well. It was also difficult for the researcher to conduct the study with regard to the implication of gender differences with the SECI model because there were not many female personnel serving on board the RMN ships (observations were made through survey with only 11 female personnel).

5.7 Recommendations for Future Research

It is recommenced for other researchers to examine the SECI model utilization in different environments, businesses or cultural contexts because the contribution will determine the universal application of the model. It is also suggested to investigate the use of the SECI model in other military establishments or units in the RMN because the nature of operations and culture are different from the RMN fleet and other military services, like the army or the air force. It would be beneficial to conduct the study to compare between the RMN and other services so that the SECI model can be used to gauge the extent of the processes in order to establish a foundation from which to delve into knowledge creation enhancement differences within those organizations.

Future research is also recommended on the fast and vast development of technologies within the military context. More detailed research on the SECI model and technology would be beneficial in identifying proper and systematic mechanisms for knowledge management and knowledge creation processes within the organization.

The use of other research methodology might also be useful to contribute to the body of knowledge and organizations. This could provide a broader scope and more appreciation for the SECI model knowledge creation processes. Finally, a study on different styles of leadership or gender differences and tasks could provide more interesting findings on how each of these knowledge creation processes or the processes as a whole could be different.

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