

INVESTIGATING KNOWLEDGE CREATION PROCESSES AMONG THE ROYAL MALAYSIAN NAVY (RMN) FLEET PERSONNEL

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Abstract: This study was conducted to gauge the extent of knowledge creation within the Royal Malaysian Navy (RMN) fleet. It was due to rotational of personnel serving on board for their career progressions and personnel retired that may bring with them substantial amount of knowledge. Thus, quantitative study was conducted, taking into account of descriptive data analyzed by SPSS software with 234 respondents utilizing SECI model as the theoretical platform. Items analysis was conducted to gauge the extent. Apart from that, level and type of knowledge, mechanisms and venues for knowledge creation were identified. The results showed the extent of knowledge creation processes varied in every mode of SECI. Operational knowledge and knowledge from experiences are common within the fleet. Social media identified as the common mechanism utilized. Seminar, workshop and meeting were identified as the venues for most of the knowledge creation processes took place. Besides identifying the extent of knowledge creation processes, this study could be the platform for the fleet to identify suitable recommendation to create and capture more knowledge, to retain and to disseminate knowledge in order to improve fleet operations.

Keywords: Knowledge Creation, Knowledge Management, Tacit Knowledge, Explicit Knowledge, SECI Model

INTRODUCTION

The survivability and development of organizations depend on knowledge since knowledge is part of the competency necessary for personnel in performing effectively [1] [2]. Shih, Chang and Lin [3] posited that the main input for organizations is knowledge and personnel within the organizations. Human knowledge is so important that it involves the current dynamic and rapid change of complex knowledge which is crucial to the organizations. Previous researchers [4] [5] [6], on the other hand, claimed that organization is a body of knowledge. They added that if the knowledge is properly leveraged within the organization, its importance can far exceed the physical resources. The initiatives of knowledge management (KM) are principally depending on how personnel share knowledge among them [7] [8]. Hence, in managing knowledge, organization emphasizes on knowledge creation and knowledge sharing, which are part of the KM processes [9].

Most successful organizations constantly create new knowledge [10]. Knowledge creation is the first stage in the life cycle of knowledge [11] [12]. Knowledge creation is seen to be the initiating component in KM and it 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 [13]. On top of that, military organizations all around the world agree that the personnel within their organizations are actually their main and most vital assets and at the same time the sources of their organizational knowledge [14]. So, when personnel are transferred or retired from the 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 [15] emphasized the need for managers and management to get actively involved in motivating and encouraging knowledge creation and knowledge sharing among personnel.

In the RMN fleet, saving created knowledge from dissipating due to personnel transfer or retirement is crucial in order to remain relevant in safeguarding the nation's maritime sovereignty. The fleet safe operations might be jeopardized without this valuable knowledge. This can be witnessed in the few mishaps which happened within the fleet, even though they were isolated cases [16] [17]. Unwanted incidences, for instance, collision at sea or fire on board, were associated with lack of competencies. Competencies can be defined as the combination of skills, knowledge, attitudes and behaviours of personnel required for performing effectively [2]. Both mishaps are avoidable if every personnel serving on board a vessel has adequate knowledge i.e. competent to respond to the situation. Liu et al. [18] further described that competency is the knowledge owned by the personnel or their skills demonstrated by behaviours at the workplace.

The transformation plan for the RMN will witness more newly built vessels to come into the RMN inventory with state-of-the-art capabilities and estimated to be worth of billions Malaysian Ringgit. 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 inclusive of knowledge creation need to be inculcated immediately [19].

Therefore, this study is to disclose whether knowledge creation is an important phenomenon within the RMN fleet by determining the current extent of the process for fleet operation improvement. This study is also stressing on the importance of knowledge, not only capitalizing on the development of resources but also to encourage and motivate knowledge creation and sharing [20], to build the fleet readiness as a knowledge-based organization and maintaining the safety aspects throughout the RMN fleet operations.

The focus on knowledge processes in this study is based on the SECI Model proposed by Nonaka and Takeuchi [21]. SECI Model in the study of management and organization, has provided the platform and framework which vastly covers knowledge sharing and knowledge creation process [22] [23]. Hence, a quantitative method utilizing this model was employed to investigate the issues related

to the RMN fleet through a survey among relevant personnel.

LITERATURE REVIEW

In the military context, the inadequacy of KM was mainly due to low awareness and also lack of understanding [14]. Bartczak [24] found that managerial, resources and environmental influence as the challenges in implementing KM within the United States (US) military, apart from funding, confusion, commitment and leadership education. Ali and Ahmad [25] posited that the implementation of KM in the military context is still a dilemma. According to them, the intricacy of the military environment makes it impracticable to exercise KM in military operation especially with regards to dealing with lots of data and information. The vast flow of data and information that will be arriving simultaneously in military operation are difficult to manage, able to create confusion and may lead to misinterpreting or misconception of the information if the user is not careful. Nevertheless, most of the world class military are adopting KM in order to achieve sustainable competitive advantages [26]. Ali and Ahmad [25] further posited that KM is intended to inspire and support new knowledge creation as crucial element in military operations success.

Knowledge

Knowledge is deemed as the main organizational asset that is able to produce competitive advantage if it is exploited correctly [4] [6] [27]. According to Dalkir [28], there are many overlapping categories of types of knowledge. Nonaka and Takeuchi [21] came up with the 'Justified True Belief' concept of knowledge which stated that given a true proposition, one must not only believe but must have to listen to the justification behind it. Gunnlaugsdottir [29] in his study mentioned about the utilization of knowledge as the prime mover of organization's competitive advantage and also for the global economy. According to Mahdi, Nassar and Almsafir [30] knowledge has been considered as a strategic resource and as such, it needs to be managed to promote the competitive performance of the organization.

Knowledge can also 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 [29]. However, Davenport and Marchand [31] argued that this

knowledge will remain as information until it remains in personnel's mind and when personnel can deduce meaning from the information with their cognitive capacity and has ability to interpret, it will lead to knowledge creation [32] [33].

Types of Knowledge

Knowledge is considered to be a high-value form of information because of its added experience, context, interpretation and reflection [34]. There are few types of knowledge and the common ones are tacit and explicit. [35] was among the first researcher to classify tacit and explicit knowledge. Sikombe and Phiri [4]; Chugh [36] 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.

Tacit knowledge is the knowledge that people have in their minds, whereas explicit knowledge is the kind of knowledge that is captured or written down [37]. The main difference between the two is that tacit knowledge cannot be accessed as easily as explicit knowledge. Tacit knowledge is less vulnerable but less accessible to personnel and explicit knowledge is more accessible but more vulnerable to illegitimate exploitation [38].

Tacit Knowledge

Tacit knowledge is the personal and intangible knowledge that is very hard to enunciate with the use of formal language [39]. Wilson [40] added that tacit knowledge is the personal knowledge that is impossible to be communicated in formal and also systematic languages. Nonaka and Takeuchi [32] posited the awareness and importance of tacit knowledge has been generally accepted in the literature of KM as a powerful element. Collins [41] posited that tacit knowledge is highly personal, context specific and deeply rooted in an individual's emotions, values, ideas and experiences and there is no doubt that in the sophisticated RMN fleet, there are lots of tacit knowledge that require to be transferred despite all the available documentations.

However, tacit knowledge cannot be easily transferred by only using word or writing, but may be done by the mean of mentoring and shadowing processes [42]. Since this knowledge is contained within personnel's

minds and due to the individual's epistemology possession, it is very difficult to access and cannot be detached easily [33]. Sikombe and Phiri [4] added that it is because of tacit knowledge nature influenced by social embeddedness that is characterized by trust, culture and also close relationship between personnel.

Explicit Knowledge

Wilson [40] posited that explicit knowledge is the knowledge that can be communicated in formal and systematic languages. Explicit knowledge is more expressive, objective and rational and this knowledge can be easily distributed or transmitted [43].

Few researchers such as Shih, Chang and Lin [3]; Nonaka and Takeuchi [44]; Suppiah and Sandhu [43] posited that explicit knowledge is easy to codify and write down or being documented to be transmitted either manually or electronically and Rutten, Blaas-Franken and Martin [42] added that explicit knowledge is the knowledge that can be easily transferred by using word or writing. Meanwhile, Meanwhile, Park, Vertinsky and Becerra [45] posited that explicit knowledge is the knowledge that has been articulated, codified, and stored. In the RMN fleet context, all this knowledge can be learned from written materials and readily available for others, such as doctrines, SOPs, manuals, standing orders, minutes etc.

Knowledge Creation

Mehralian, Nazari and Ghasemzadeh [13] 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. Creation of knowledge process is a process of learning [46] as argued by Garvin [47] that by learning from experience, solving problems, experimenting with new approaches and sharing knowledge, new knowledge created.

Jogulu and Pansiri [48] quoted that knowledge creation refers to different findings created through multiple data collection and analysis techniques provide insightfulness and extensiveness in overall results, from which the researchers can make more accurate inferences with increased credibility. On the other hand, Memon [1] posited that the researchers cannot abolish the influence of people, place and structure of the knowledge creation process during empirical investigation. He further added that influence of the higher echelon during knowledge

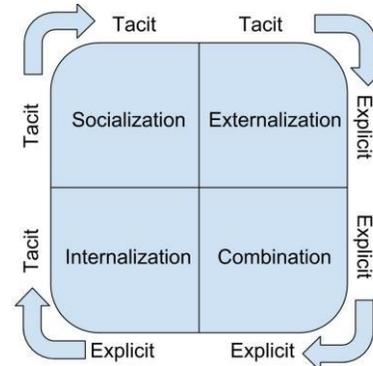
creation process, might also give impact to the process with regards to policies and decisions. Hence, making it very interesting to investigate further the knowledge creation extent in the RMN fleet.

SECI Model

Nonaka and Takeuchi [21] 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 [46] [21] [49]. According to Schaap et al., [51]; Baldé, Ferreira and Maynard [52], study on personnel involve in SECI model is scarce and [52] posited that the picture is still incomplete even though numerous researches have been conducted on SECI Model. A study by Yeh, Huang and Yeh [53] established that respondents' (in educational science) professional knowledge increased after working through the model. However, it was unclear on how and in what order they actually engaged in SECI. Hubers et al., [54] posited that it is still yet unknown, whether personnel are engaged in SECI in similar or different manner. They further theorized that the way personnel engages in SECI influences knowledge creation processes.

In KM studies, the SECI Model (Figure 1) has been widely used. It is universal and can also be generalize in other sectors for instance, educational science, resource-based industry, product systems development and also financial [55] and entrepreneurship [56]. The researchers feel that it can be generalize in the military context too.

This study attempted to provide clearer understanding in the aspects of each process contains in the SECI Model among the personnel in the RMN fleet. The personnel were divided into senior, middle and lower management level to get comprehensive insights at all level of management. Huang, Basu and Hsu [57] stated that the application of SECI Model enriched the insights of the organization into their knowledge creation and processes involved.



Sources: Nonaka and Takeuchi (1995)

Figure 1 : SECI Model - Knowledge Creation Process

Socialization mode of SECI Model is about sharing experiences through social interaction where the element of tacit knowledge being shared and created [44]. Externalization and internalization modes associated with tacit and explicit knowledge conversion, as both tacit and explicit knowledge are complementing each other [10]. Memon [1] 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 is taking place. Mehralian, Nazari and Ghasemzadeh [13] added that tacit knowledge is “articulated and crystallized” into explicit knowledge and shared among personnel to become the basis or foundation of new knowledge.

Meanwhile, in internalization mode, Nonaka, Toyama and Konno [49] posited that it is the process where knowledge becoming valuable when it is internalized in personnel. This process is actually closely related to learning-by-doing process [44]. In other words, internalization is the process where organizational knowledge is converted back into individual personnel knowledge [58]. Mehralian, Nazari and Ghasemzadeh [13] opined that it can be mentioned as the experiential learning process, where explicit knowledge becomes part of personnel’s knowledge and eventually becomes the important organizational asset.

Combination mode explains about creating explicit from explicit knowledge and knowledge conversion involves social processes to combine different bodies of explicit knowledge held by individuals [10]. In the combination mode, creation of knowledge process includes existing explicit knowledge converted into

more systematic sets of explicit knowledge [59] that can be disseminate throughout the organization [13].

Hence, to this extent, we know that every mode in SECI model can create knowledge independently. However, the most important thing here is the dynamic interaction between all modes of knowledge creation that are going to be investigated in this study within the RMN fleet.

RESEARCH METHODOLOGY

This study embarked on quantitative method using the SECI Model proposed by [21]. The study was conducted in the maritime scenario i.e. on board selected ships from the fleet and excluded other units in the RMN because the fleet forms the backbone of the RMN. 300 respondents were selected to answer the survey questionnaire and they were based on the justification of their roles as the senior, middle and lower management levels in relation to knowledge creation processes based on the SECI Model.

Research Ethic

The participation for the survey was on voluntary basis and the fleet personnel were answering the questions on behalf of themselves. Information was given to the respondents with regards to this by the means of consent form and they were free to withdraw at any time if they were uncomfortable and felt like doing so. Apart from that, prior to conducting the data collection, authorization was obtained from the University Malaya Research Ethic Committee (UMREC). This was in order for the researchers to assure the respondents with regard to compliance with certain ethical standards set by the university deemed to be mandatory in the data collection process. Hence, the respondents were guaranteed anonymity and confidentiality with their responses and personal details.

Questionnaire Design

The study was conducted with the use of a five-point Likert scale questionnaire adapted from [59] to determine the extent of knowledge creation processes within the RMN fleet. Apart from that, the questionnaire was also to determine the level of knowledge, type of knowledge, mechanisms for knowledge creation and most common venues for knowledge creation within the fleet.

Research Framework

In order to answer the questions and to achieve the objectives of this study, a research framework as shown in Figure 2 was utilized. This framework is the SECI Model and in this study, the researchers looked into the knowledge creation processes namely the socialization, externalization, combination and internalization perspectives.

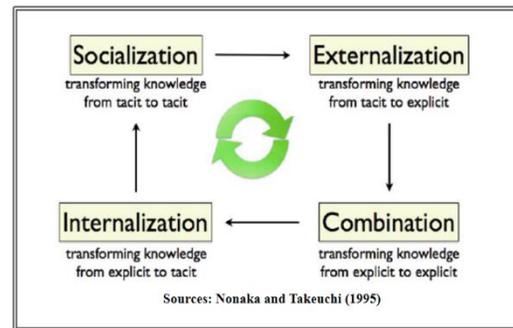


Figure 2 : Research Framework - Knowledge Creation Process

Data Collection

Data were collected using set of questionnaires adapted from [59]. McClure and Faraj [60] mentioned that it is necessary to use questionnaires since it seems to be almost impossible to interview every single personnel in an organization to obtain relevant data and information. So, a survey using questionnaire was conducted to get the gist of the research.

The researchers used stratified random sampling to highlight a specific subgroup within the population. It is the most efficient technique where all groups are adequately sampled and comparisons among them are possible [61]. Proportionate allocation was used in this study to infer the results that represent the whole RMN fleet. Hence, the fleet personnel were stratified into senior, middle and lower management level. 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 Leading Rate and below.

There were approximately 400 personnel serving on board the warships selected and according to Sekaran [62], 200 respondents are adequate for this study. However, the researchers took 300 respondents and a collective administrative survey was conducted, 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 [63]. Only 234 (78%) questionnaires were analysed because 66 (22%) questionnaires were either incomplete or had multiple answers for one question and were thus rejected and removed from the data set. Prior to the selection of samples, the researchers identified different types of ship from different squadrons for sampling. They were a frigate, a corvette, a new generation patrol vessel (NGPV) and a multi-purpose command support ship (MPCSS) that were located at the Lumut Naval Base. These ships were selected based on their importance in fleet operations, narrowed down to squadron leaders or the representative of the type of ships which adequately represented the fleet as a whole.

DATA ANALYSIS

Table 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 SPSS version 24 software was used to analyze the data collected from the survey. Data analysis uses a frequency distribution to explore the agreement of respondents regarding the performance of SECI knowledge creation process model. Statistical analysis of the data from the questionnaire responses were used to answer the questions and accomplish the objectives that suited the context of this research which is to explain in more detail the extent of knowledge creation processes in the RMN fleet based on the SECI model. The sample distribution according to the types of ships and the demographic characteristics such as gender, academic background, job position, length of service, departments and number of training as per listed in Table 1.

Validity and reliability tests were conducted after data entry to ensure the quality of the questionnaire. Sekaran [61] 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 [64]. Therefore, the instrument used was adapted from [59], only in a different context, i.e. the RMN fleet context. On the other hand, Treiman [65] opined that reliability test is to measures instrument that can produce consistent results. Cronbach Alpha was utilized and the score for every instrument items with regards to the individual SECI mode was more than 80% (see Table 2). The instrument was tested reliable and valid in the RMN fleet context.

Table 2: Reliability Test Result

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

Next, the researchers identified 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 are very helpful in achieving the objectives of this study. The final part of descriptive analysis focuses on testing the difference between the respondents' demographic information regarding SECI knowledge creation process activities using One-way ANOVA.

Mechanisms Used in Knowledge Creation

Figure 3 shows the most popular mechanisms according to the percentage used. Social multimedia seems to have lots of effect in the knowledge creation process within the fleet. It is clearly showed that all levels were using the multimedia means to share and create knowledge among them. The most popular tools according to frequency of used and trend were whatsapp, facebook, email and youtube. Whatsapp was the most utilized mechanism with 88.0% respondents had used it. The second tool was Facebook with 52.6%. Email and YouTube were utilized by the respondents, 47.9% and 46.6% respectively. However, face-to-face session cannot be disregard since it plays major part of the SECI Model knowledge creation process as per mentioned by [21] and 38.9% respondents feel that it was part of mechanisms for knowledge creation process.

This indicates that there are available mechanisms being used by the RMN fleet personnel to exchange information, for sharing ideas, opinions etc. However, the extent of utilization varies and the extent of knowledge creation in the fleet still remain in the dark while utilizing these available mechanisms.

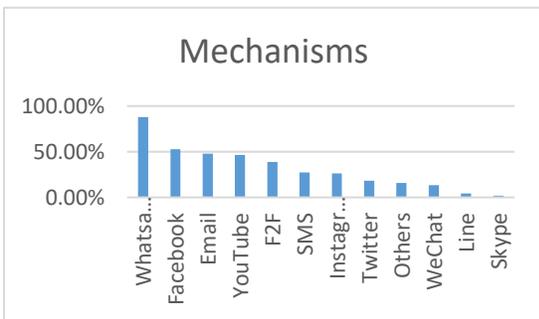


Figure 3: Mechanisms Used in Knowledge Creation

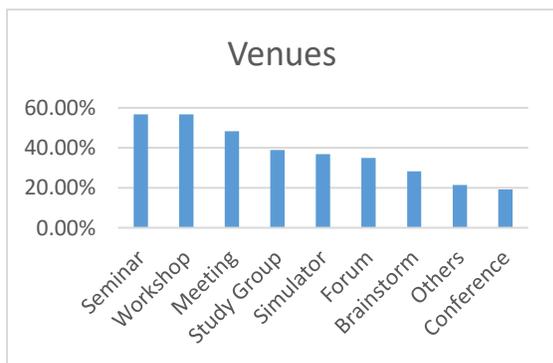


Figure 4 : Venues for Knowledge Creation

Venues for Knowledge Creation

In Figure 4, it is shown that respondents chose seminar and workshop as the most popular venues to create knowledge, both representing 56.8%. Meeting, study group and simulator were 48.3%, 38.9% and 36.8% respectively. This shows that in the RMN fleet, there were venues where knowledge creation took place but how effective and efficient these venues can become the platform of knowledge creation, will largely depend on the performance of the fleet itself.

Analysis of Variance

Further analysis utilizing demographic information of the respondents with the modes in the knowledge creation process based on SECI Model were carried out. One-way Analysis of Variance (ANOVA) was conducted and the results as per Table 2.

Table 2: 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**

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

Based on the results, the researcher can derive that type of ships and training frequencies were having significant values with all four processes of knowledge creation that was based on the model. The values for socialization phase with ship and training are .022 and .003 which are significant, since they are less than .05 (***) and .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.

In the RMN fleet there are few types of ship in her inventory that are grouped into squadrons. These squadrons are determined by the ship’s capabilities.

For instance, a frigate is an example of combatant vessel where they are equipped with state-of-the-art technology of systems, sensors and weaponry to fight in the Anti Surface Warfare, Anti Submarine Warfare, Anti Air Warfare, Electronic Warfare etc. Meanwhile, there are some vessels which are categorized in the supporting or logistic roles such as Multi Purpose Command Support Ship (MPCSS).

The researchers can derive from the analysis that the types of ship will determine the number of training, exercises or even operations involved. With that kind of exposures, the crew need to attend lots of knowledge creation activities from courses, classes, seminars, workshops etc., to become specialized.

Furthermore, ships that are fitted with advanced technology need competent crew to operates them. Hence, the difference between personnel on board high technologically equipped warship with the one which is 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 MPCSS and that was why from the one-way ANOVA analysis, the study gave values which are significant to the types of ship with the SECI Model. Therefore, it indicates that the activities involved in the model are taking place on board.

Secondly, as mentioned for the types of ship, combatant vessel needs more training compared to the rest of the vessel 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; on how to fully utilize equipment fitted on board and to get the systems to work efficiently and effectively for the benefit of the organization.

Level of Knowledge

Table 3 : 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	

Meanwhile, for the level of knowledge, the most knowledge availability in the RMN fleet is operational knowledge. From Table 3, out of 234 respondents, 145 (62%) claimed to possessed operational knowledge. This can be understood as the fleet is the operational wing of the RMN. The fleet is the backbone of the RMN and always carry the national flag in bilateral or multilateral operations, training and exercises, apart from safeguarding the sovereignty of nation’s maritime interest.

Types of Knowledge

The most type of knowledge availability in the RMN fleet is from experiences. From Table 4, out of 234 respondents, 121 (51.7%) claimed that they have experiences. Experiences are form of tacit knowledge that really important to the organization like the RMN fleet. The RMN personnel will undergo lots of training and courses pertaining to the ship’s operation from day one that they started to join the RMN. The training can be divided into theoretical training which will be held normally in the training establishment and practical training either on board ship or training establishment. The journey that they had will allow them to accumulate experiences before serving on board. That was the main reason why most of the respondent in this study claimed that they have experience when asked about the type of knowledge that they possessed.

Table 4: 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	

Knowledge Creation Analysis

The items analysis is divided into four modes:

1. Socialization

For socialization mode, the descriptive statistics (see table 5) show that the respondents acknowledged 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.

The RMN fleet personnel collected necessary information and showed them 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.

Table 5: Descriptive Statistics of Socialization Items (see Appendix 1)

Item Code	N	Mean	Std. Deviation
S13	234	3.3761	1.01259
S8	234	3.4744	.91798
S9	234	3.6538	.84142
S12	234	3.6538	.79419
S11	234	3.7308	.88390
S1	234	3.7521	.93484
S5	234	3.7650	.76980
S2	234	3.7692	.84289
S14	234	3.8077	.78709
S3	234	3.8162	.84177
S7	234	3.8376	.68656
S10	234	3.8419	.74451
S6	234	3.8590	.70664
S4	234	3.8675	.79939

At the lowest mean value of 3.3761, the respondents hardly believed that the RMN fleet encouraged informal meetings 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 (F2F) 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 took place and the researcher concluded that there are still rooms for improvement in the RMN fleet for knowledge creation processes in this mode.

2. Externalization

For externalization mode, the descriptive statistics distribution (see Table 6) 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 6: Descriptive Statistics of Externalization Items (see Appendix 1)

Item Code	N	Mean	Std. Deviation
E11	234	3.5641	.82227
E2	234	3.5684	.71587
E9	234	3.6239	.81009
E4	234	3.6410	.76356
E8	234	3.6410	.74651
E6	234	3.6453	.81182
E7	234	3.6795	.73234
E13	234	3.6880	.77023
E10	234	3.7051	.79336
E1	234	3.7179	.81663
E12	234	3.7735	.68395
E5	234	3.7821	.69912
E3	234	3.8034	.69627

The respondents tended to use analogy when expressing abstract or theoretical concepts. They 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 programme, established the topics of the training programme 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 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 took place within the fleet, and the researcher concluded that there are also rooms for improvement in the fleet for knowledge creation processes in this mode.

3. Combination

For combination mode, the descriptive statistics (see Table) 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. They also 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).

Table 7: Descriptive Statistics of Combination Items (see Appendix 1)

Item Code	N	Mean	Std. Deviation
C11	234	3.5299	.78147
C13	234	3.5427	.84425
C12	234	3.5641	.80112
C4	234	3.5940	.76521
C9	234	3.6197	.92451
C3	234	3.6368	.79192
C6	234	3.6709	.72260
C10	234	3.6752	.77879
C7	234	3.7009	.66507
C8	234	3.7350	.78498
C1	234	3.8205	.64343
C5	234	3.8376	.76352
C2	234	3.8675	.72625

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 knowledge creation process was taking place within the organization. However, based on the statistics, the researcher concluded that there are still rooms for improvement in combination mode 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. Internalization

For internalization mode, the descriptive statistics (see

Table) 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.

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.

Table 8: Descriptive Statistics of Internalization Items (see Appendix 1)

Item Code	N	Mean	Std. Deviation
I11	234	3.6453	.79039
I12	234	3.6624	.81911
I2	234	3.6838	.77126
I8	234	3.7094	.93625
I10	234	3.7179	.80605
I5	234	3.7265	.82477
I13	234	3.7308	.70570
I4	234	3.7393	.79994
I9	234	3.7479	.83928
I7	234	3.7564	.74441
I6	234	3.7863	.78973
I1	234	3.7949	.71811
I3	234	3.7949	.74740

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 programme, 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 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, comparatively the same with the three previously discussed modes of knowledge creation processes, there are still rooms for improvement in the RMN fleet for internalization mode, as well.

The difference between all four modes can be considered as minimal since the range of mean values are over 3 but less than 4 on the 5-points Likert scale. Nevertheless, as mentioned by the researchers previously, there are rooms for further improvement within the RMN fleet based on these survey findings. From the overall descriptive instrument item analyses, the assumption can be made that knowledge creation processes do exist within the RMN fleet. The knowledge creation extent and practices were recorded in socialization, externalization, combination and internalization modes, respectively.

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.

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 programmes. However, Nonaka and Toyama [49] 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, López-Sáez,

and Navas-López [66] 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.

However, 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 [67] 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.

Nevertheless, the fleet has implemented internal and external training programmes, seminars and workshops to further enhance sharing of knowledge among its personnel. Through these programmes 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.

Externalization

In the RMN fleet, transformation of tacit knowledge into explicit knowledge is mainly done by documenting the outcomes of seminars, meetings and training programmes. 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 [59] 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 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 [68].

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 benefits of the externalization knowledge creation process and result in some knowledge still remaining tacit and intangible.

Combination

Reformulating explicit knowledge, into clearer and more beneficial knowledge for the fleet and its personnel is the main purpose of the combination process. According to Easa [59], 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. As a result, the personnel become conservative in dealing with reports from the higher management level.

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 [10], 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.

Internalization

The RMN fleet encourages personnel to internalize explicit knowledge by accessing the outcomes of any training programme, studying relevant and related courses to the fleet, accessing the outcomes of seminars attended and accessing the fleet's databases. Easa [59] 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.

On the job training is important because internalizing knowledge is always associated with learning by doing Nonaka and Takeuchi [21], and this is widely

practiced by the RMN fleet. Accessing relevant materials from events like seminars, workshops, training programmes, 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 programmes organized by the fleet itself or organized by the HQ.

Internalization mechanisms such as accessing outcomes of training programmes, 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, 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.

CONCLUSIONS

It is concluded that all four modes of knowledge creation processes in the SECI model [21] 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. 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.

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 were practiced within the fleet. However, the extent varied from one mode to the other. According to the findings, 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 are still rooms for improvement for all SECI processes in the fleet. Hence, stimulating knowledge creation enhancement in the fleet needs to be focused more on the socialization and combination modes. Extracting all the personnel's tacit knowledge, testing and modifying existing explicit knowledge when it is necessary, needs to be adhered to quickly and to 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.

Limitations

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).

Future Research

Future research is 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 on SECI model knowledge creation processes. Finally, a study on different styles of leadership or 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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Appendix 1 - Instrument items adapted from [59]

Socialization Items		Externalization Items		Combination Items		Internalization Items	
A1	During discussions, I try to find out others' opinions, concepts, thoughts or ideas.	B1	When others can't understand me, I am usually able to give examples to help explaining.	C1	During a discussion, I tend to help organize ideas and make conclusions to facilitate the discussion.	D1	After hearing a new idea or concept, I tend to compare it with my experience to help me comprehend the meaning.
A2	During discussions, I often encourage others to express their concepts, thoughts or ideas.	B2	Most the time, I can transcribe some of the unorganized thoughts into concrete ideas.	C2	When coming across problems, I tend to use my experience to help solve problems.	D2	I understand others' thoughts better by repeating what they said and asking them "is this what you mean?"
A3	My colleagues and I will actively share life or work experience with each other.	B3	I tend to describe professional or technical terms with conversational language to help communication.	C3	After every event, I have the habit of organizing and making a summary of what happened.	D3	I will tell others what I think to make sure my understanding is the same as theirs.
A4	I gather information from other departments.	B4	I tend to use analogy when expressing abstract or theoretical concepts.	C4	During discussion, I will organize everyone's thoughts in my mind.	D4	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.
A5	Before discussion, I will collect necessary information and show it to my colleagues.	B5	I will help others in clearly expressing what is in their minds by encouraging them to continue what they are saying.	C5	I like to collect new information and make connections between new and old knowledge to develop new concepts.	D5	Our team-members use newly learned knowledge as the sources for next time applications.
A6	I like to get to know the people whom I will work with before working together.	B6	Our team develops new ideas through constructive dialogue by using figures and diagrams.	C6	I engage in developing criteria to determine the value of new concepts.	D6	When communicating with others, I will give them time to think about what we just discussed.
A7	I collect work-related information and ideas in formal/informal relationships with other people.	B7	I facilitate creative and constructive conversation among group members.	C7	Our team conducts experiments and shares the newly developed concepts with the entire organization to evaluate the value of the concepts.	D7	We combine existing and new concepts in meaningful ways.
A8	The RMN fleet follows a systematic plan to rotate its staff in all departments.	B8	The RMN fleet documents its staff's point of view regarding relevant topics.	C8	The RMN fleet classifies information mentioned in databases, networks and reports.	D8	The RMN fleet encourages its personnel to join postgraduate courses, e.g., Diploma, Master's or PhD.
A9	Detailed face-to-face discussions of work issues are encouraged in the RMN fleet.	B9	The RMN fleet asks its staff to report results of discussions with concerning parties.	C9	The RMN fleet updates its databases.	D9	The RMN fleet facilitates the access to outcomes or recommendations of training programmes, workshops and seminars.
A10	Involving the RMN fleet in joint operations/exercises supports staff's knowledge through face-to-face interaction with others.	B10	The RMN fleet documents the findings of conducted meetings, seminars, workshops, conferences and training programmes.	C10	The RMN fleet considers information mentioned in databases, networks, and previous reports to develop its rules and decisions.	D10	The RMN fleet facilitates the access to its databases and the internet to get required information.
A11	The RMN fleet conducts meetings, seminars, workshops to discuss the updating of work issues.	B11	The RMN fleet issues reports of externals based on its cumulative experience.	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.	D11	The RMN fleet arranges meetings to explain the content of related reports or documents.
A12	The RMN fleet invites its qualified members and external experts to speak about their beliefs, values and culture.	B12	The RMN fleet establishes the topics of training programmes and seminars based on its qualified members and external experts.	C12	The RMN fleet collects, classifies and informs its personnel with reports and decisions issued by external bodies.	D12	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.
A13	The RMN fleet encourages informal meetings for tea, coffee, having lunch and others.	B13	The RMN fleet documents the useful experiences of its qualified members into reports.	C13	The RMN fleet depends on relevant published research and reports to develop its policies and aims.	D13	The RMN fleet believes that the available data and information strongly shape its point of view and culture.
A14	The RMN fleet encourages social activities outside the workplace.						