Perceptions of knowledge creation, knowledge management processes, technology and applications in military organisations

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ABSTRACT

Current and future warfare depend on sophisticated sensor and imaging technologies and advanced communications and computers which demand the Malaysian Armed Forces (MAF) to develop its ability towards managing the battle space effectively. The development of modern warfare is reflected by the rising importance of having knowledge advantage and information supremacy over adversaries. Leadership, sense-making, problem-solving and decision-making are more complex and more demanding in military situations. Command and control is taking on new dimensions, and the role of military personnel is evolving into that of 'knowledge force'. A study on military officers of the MAF of perception towards Knowledge Management (KM) which incorporates knowledge creation, KM processes, technology and applications was conducted in the military environment. The focus of the study is to examine the perceptions of military personnel toward the KM key drivers, which include the people, process, and technology. The results of the study indicated that the demographic elements have influenced over the creation of knowledge, and the applications of KM were influenced by the KM processes and technology infrastructure in the MAF. The innovation of KM in the MAF could be implemented with the right leadership support in line with the aspiration of transformation towards developing Knowledge Force of the MAF.

Keywords: Military; Knowledge management; Knowledge creation; Information technology; Malaysia.

INTRODUCTION

Current challenges faced by the Malaysian Armed Forces (MAF) on the threat of globalisation and the advance of Information and Communication Technology (ICT)[1] has been shifted and identified as more complex in nature. As a result, the MAF now needs thinking soldiers, i.e. people who are innovative and creative to fight digital warfare, which present and future wars will be all about. A balanced and credible force guided by sound operational strategies and concepts, equipped with high-tech weapons and manned by competent professionals will be the direction of MAF in developing its forces.

[1] In the late 1990s, traditional tools of IT (such as computers) began to rapidly converge with communication technologies, leading to the introduction of the new terminology and yielding products that combined the two (such as mobile telephones with basic computing functions or personal digital assistants with communication capabilities). The term ICT and IT shall be used interchangeably (Yue and Lim 2002).

In anticipating future challenges, the MAF is projected to move from threat-based strategy to capability-based approach. This approach is to develop core capabilities in order to meet multi-spectral challenges on several critical goals to focus efforts on protecting critical bases of operations, assuring and conducting effective information operations, providing persistent surveillance, and leveraging ICT. In anticipating future warfare, the MAF's future development is envisaged toward Fourth Dimension MAF (4D MAF), which focuses on three features of Joint Force, Information Superiority, and Multi-Dimensional operational capabilities. With regard to this development, the Revolution in Military Affair[2] (RMA) has acknowledged an increase in information management (IM) requirements to manage modern warfare.

The next generation warfare relies heavily on information from many sources that must be assessed and compiled for immediate use. The "information superiority"[3] becomes the determinant of the future war management and requires drastic improvement in IM, assurance, exchanging and sharing of superior knowledge. Information superiority is a state that is achieved when a competitive advantage is derived from the ability to exploit a superior information position (Alberts, Garstka and Stein 2000). In order to achieve information superiority, knowledge is seen to be the most important strategic resource for capitalizing the conduct of battle space management. The awareness of managing knowledge effectively could be achieved through the application of knowledge management (KM). For most organisations without exception to the military like the MAF, the application of KM is regarded as inevitable. Hence, KM involves the management of knowledge assets, that has to do with the creation of explicit processes that enhance knowledge and learning throughout the organisation.

The military organisations have a unique context in which KM must be deployed and eventually operate. The transition from an industrial era into an information and knowledge era was significant and the relevance of acquiring and managing information and knowledge is becoming increasingly critical (Muzumdar 1997). KM was regarded as a strategic approach to achieve defence objectives. Military KM will play a valuable role in leveraging existing knowledge and converting new knowledge into action through the KM cycle (McIntyre, Gauvin, and Waruszynski 2003). KM strategy is the centre of the military's information revolution, which becomes the enabler for mission operations, knowledge generation, information delivery and technology innovation (Browning 2002).

The applications of KM strategy in military context is seen extensively applied in the military of major countries, like the United States of America, Britain, Canada, Australia and several countries within this region such as Japan, Korea, and Singapore to name a few. Based on those developments, it is inevitably for MAF to embark on knowledge-based organisation through KM strategy.

The situational analysis as a preliminary investigation was done in order to identify several problems that lead to this study. Based on the authors' observation, it was obvious that the MAF does not have any prominent KM practices and applications. However, it was found that the existence of knowledge in the MAF organisation is available and embedded in the form of doctrines, policies and procedures, operations and training manuals, information systems, work flow and databases. Unfortunately, those elements of KM were presence in silos and not

[2] A robustly networked force shares information by means of a secure infrastructure that enables self-synchronization and, ultimately, more effective military operations.

[3] That degree of dominance in the information domain that permits the conduct of operations without effective opposition. The capability to collect, process, and disseminate and uninterrupted flow of information while exploiting or denying an adversary's ability to do the same (The RMAF Air Power Doctrine 2002)

manage in concerted effort. The lack of KM practices and applications in the MAF was perceived as the lack of awareness and understanding and exposure about KM in the organisational context among the MAF personnel. The existence of KM practices in the MAF is regarded as at infancy stage and it would be interesting to examine the perceptions of military personnel about KM in the MAF. This study attempted to explore the relationships and influences between key drivers of KM implementation which is considered important for the innovation of KM practices in the MAF.

LITERATURE REVIEW

Knowledge has been identified as the ultimate competitive advantage for the modern organisations and therefore should be well managed. Managing knowledge within an organisation deals with both tacit and explicit knowledge with regards to knowledge creation and sharing, and how these activities promote learning and innovation. Knowledge assets within an organisation is the capitalisation of the members of the organisation, collaborative work in terms of sharing and using information which marks the effective use and promotion of knowledge (Milam 2001). The true process of creating new knowledge, takes place subsequently when the different pieces of knowledge are set in context, organised, linked to one another and compared to the individuals' previous experiences (Gauvin and Lecocq 2004).

The understanding of the role of knowledge and how it is created is fundamental to the development of a KM model and framework within an organisation (Gold 2001) and is the pre-requisite for KM innovation. Bartczak (2002) identifies the crucial elements that act as barriers to the KM innovation such as the elements of managerial, resources and environmental influences in the military. It was also suggested that, to implement KM there must be a continuous leadership guidance, support, reinforcement of KM systems, and technology support (Semmel 2002). Linkage (2000) suggested that the first step to the innovation of KM within military environment was the evaluation of personnel attitudes toward KM, identification of barriers to the implementation of KM strategy, and the education and exposure on KM practices in the organisation.

As the transition continues, the evolution of KM has become the current organisational learning theme (Hackney and Dunn 2000), to which the knowing organisation is prepared to sustain growth and development in a dynamic environment (Choo 1998). By identifying salient alternatives, Wiig (1995) suggested methods for dealing with KM and conducting activities to achieve the desired results. KM is then viewed as an increasingly important discipline that promotes the creation, sharing, and leveraging of the organisational knowledge (Fernandez et al. 2004). KM facilitates the creation and use of knowledge for increased innovation and value, could have a profound influence on the organisational excellence. Therefore, knowledge has become the key resource, for a nation's military strength as well as for its economic strength of any organisation in the knowledge society (Drucker 1994).

Knowledge and Knowledge Management

Knowledge is regarded as the processed or repackaged information. The terms data, information, and knowledge may be used synonymously. Data is a set of discrete, objective facts about events. In an organisational context, data is most usefully described as structured records of transactions. Structured data include distinct numbers, places, and costs displayed in databases. As organisations interact with their environments, they absorb information, turn it into knowledge, and take action based on it in combination with their experiences, values, and internal rules. They sense and respond. Without knowledge, an organisation could not

organise itself; it would be unable to maintain itself as a functioning enterprise (Davernport and Prusak 2000).

Tiwana (2002) defines knowledge as an actionable information in term of its relevance and available in the right place at the right time, in the right context, and in the right way so it becomes the key resource in intelligent decision making, forecasting, design, planning, diagnosis, analysis, evaluation, and intuitive judgment which, was formed in and shared between individual and collective minds. However, Fernandez, Gonzalez and Sabherwal (2004) distinguished knowledge from data and information in two different ways, which comprises facts, observation, or perceptions which represents raw numbers or assertions, and may therefore be devoid of context, meaning, or intent, and information is just a subset of data that typically involves the manipulation of raw data to obtain a more meaningful indication of trends or patterns in the data. Knowledge is also regarded as at the highest level in a hierarchy with information at the middle level, and data to be at the lowest level. Knowledge could be stored in a manual or computer-based information system, which receives data as input and produces information as output. Figure 1 depicts how knowledge, data, and information relate to information systems, decisions, and events. It also shows how knowledge helps to convert data into information (Fernandez, Gonzalez and Sabherwal 2004).

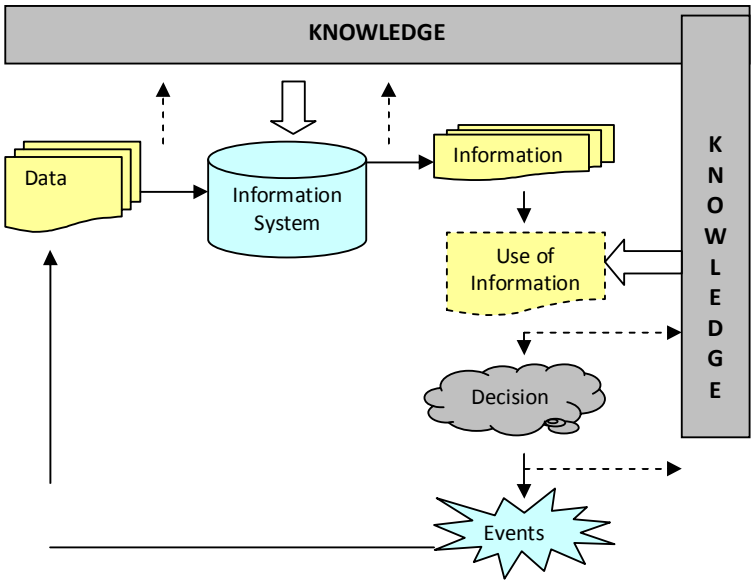

Figure 1: Relation of Data, Information, and Knowledge to Events
(Source: Fernandez, Gonzalez and Sabherwal 2004)

Knowledge can be categorised into tacit and explicit. Tacit knowledge is personal, context-specific knowledge that is difficult to formalise, record, or articulate and is stored in the head of people. It consists of various components, such as intuition, experience, ground truth, judgment, values, assumptions, beliefs, and intelligence (Fernandez, Gonzalez and Sabherwal 2004). According to the Army Knowledge Management, tacit knowledge is knowledge that people carry in their minds and is difficult to access and not easily shared. People are often not aware of this knowledge they possess and how valuable it can be to others. It is considered more valuable because it provides context for people, places, ideas, and experiences (AKM 2008).

Explicit knowledge is that component of knowledge that can be codified and transmitted in a systematic and formal language, documents, databases, webs, e-mails and charts (Fernandez, Gonzalez and Sabherwal 2004). Similarly, the Army defines explicit knowledge as the knowledge that has been or can be articulated, codified, and stored in certain media. It can be readily transmitted to others. The most common forms of explicit knowledge are manuals, documents and digital media (AKM 2008).

In a practical sense, Wiig (1993) elaborated KM as a set of distinct and well-defined approaches and processes to find and manage positive and negative critical knowledge functions in different kinds of operations, identify new products or strategies, augment human resource management, and other highly targeted objectives. While Young (2008) defined KM as the discipline of enabling individuals, teams and entire organisations to collectively and systematically capture, store, create, share and apply knowledge, to better achieve their objectives. However, Kidwell, Vander, and Johnson (2000), holding a different view and stated that KM is to make the right knowledge available to the right people at the right time. In simple perception, Barth (2002) perceived KM as the combination of cultural and technological processes of an organisation.

Knowledge Management in Military Organisations

KM application within military environment requires knowledge processes that are robust and reliable within operational contexts and the knowledge creation and conversion processes must match the pace of the military operations. In the context of today's military modernisation and organisational change efforts, the present is set off from the past by the current heavy reliance on knowledge resources and organisational learning. Thereupon, McIntyre, Gauvin and Waruszynski (2003) defined military KM as "a strategic approach to achieving defense objectives by leveraging the value of collective knowledge through the processes of creating, gathering, organising, sharing and transferring knowledge into action". However, the Army defined KM as a discipline that promotes an integrated approach to identifying, retrieving, evaluating, and sharing an enterprise's tacit and explicit knowledge assets to meet mission objectives (AKM 2008).

The development of KM in military has been accepted and used extensively for thousands of years, the military have been leaders in adopting and advancing KM practices as applied in the military "intelligence"[4]. KM, intelligence applications, and decision-making skills have been at the forefront of military doctrine over the past decades (Lambe 2003). In today's modern military management, for example, the Army of U.S. military has launched their Army Knowledge Online[5] (AKO), which enables the Army personnel to gain quick online access to important Army information, news, education and training opportunities, as well as knowledge centres and e-mail. The AKO is the Army's integrated enterprise portal for accessing information, conducting business, and managing operations. Integral to Army transformation, AKO crosses the warfighting, business, and intelligence mission areas to support the current and future force (Lord 2010). For an effective KM implementation, the Army had produced the Army Knowledge Management (AKM) as the strategy to transform itself into a network centric, knowledge-based force with KM methods and successfully applied them in its workplace (Santamaria 2002).

[4] The product resulting from the collection, processing, integration, analysis, evaluation, and interpretation of available information. Information and knowledge about as adversary obtained through observation, investigation, analysis, or understanding (The RMAF Air Power Doctrine, 2002).

[5] http://www.army.mil/ako/

Consistently, the U.S. Air Force has developed the Air Force Knowledge Now[6] (AFKN) with features include of customizable discussion forums for fostering worldwide communication among staff members, alert notifications to receive e-mail, notification regarding additions and changes to specific documents, forums and calendars, and links administration for providing access to relevant resources and items of interest[7]. Likewise, the Navy Knowledge Online[8] (NKO), gives sailors instant access to all training and educational information related to their chosen occupational fields. KM portal assists in identifying career paths, milestones, and educational tools and opportunities, which provides greater operational efficiency and eliminates organisational redundancies (Walter 2002). With regard to the MAF, the web portal which delivers the same functions as projected by the AKO, AFKN, and NKO was developed in order to support the needs of present and future information sharing. The MAF web portal can be accessed at http://maf.mod.gov.my/ and the three MAF services web portal can be accessed at http://army.mod.gov.my/ (Army Web Portal), http://www.navy.mil.my/ (Navy Web Portal) and http://www.airforce.gov.my/ (Air Forces Web Portal).

Conceptually, the KM in military is about connecting those who know with those who need to know (know-why, know-what, know-who, and know-how) and leveraging that knowledge across the military organisation and to contractors, non-governmental organisations, the other military services and coalition partners. KM goals are to support the shares of intellectual capital with no structural or technical barriers, which values good ideas regardless of their source and collaborates and values collaboration as a means to mission success. The principles are organised around the main tenets of KM: people/culture, process, and technology working together (AKM 2008) to facilitate knowledge sharing as shown in Figure 2.

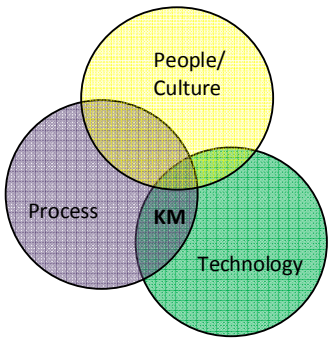

Figure 2: Main Tenets of Knowledge Management (Source: AKM 2008)

The AKM principles could be applied to military organisation that will help preserve tacit and explicit knowledge and accelerate learning as units and personnel rotate in and out of organisations. The principles provide authoritative guidance to military Commands and organisations developing or engaging in knowledge management efforts. By adhering to and applying the following principles, the military, as an enterprise, will accelerate individual, team, and organisation learning to meet mission objectives (AKM 2008). The three main tenets of AKM principle dimensions are explained as follows:

a) People/Culture dimension
   - Principle 1: Train and educate KM leaders, managers, and champions.

[6] https://afkm.wpafb.af.mil/
[7] http://www.afmc.wpafb.af.mil/HQ-AFMC/PA/index.htm
[8] https://wwwa.nko.navy.mil/portal/splash/index.jsp

- Principle 2: Reward knowledge sharing and make KM career rewarding.
- Principle 3: Establish a doctrine of collaboration.
- Principle 4: Use every interaction whether face-to-face or virtual as an opportunity to acquire and share knowledge.
- Principle 5: Prevent knowledge loss.

b) Process dimension
- Principle 6: Protect and secure information and knowledge assets.
- Principle 7: Embed knowledge assets (e.g. links, podcasts, videos, documents) in standard business processes and provide access to those who need to know.
- Principle 8: Use standard business rules and processes across the organisation.

c) Technology dimension
- Principle 9: Use standardized collaborative tools sets.
- Principle 10: Use Open Architectures to permit access and searching across boundaries.
- Principle 11: Use a robust search capability to access contextual knowledge and store content for discovery.
- Principle 12: Army Knowledge Online (AKO) or Defense Knowledge Online (DKO) is the preferred portal and access point to all Army enterprise knowledge assets.

RESEARCH OBJECTIVES AND HYPOTHESES

The objectives of this study are as follows:

a. To identify the perceptions of MAF officers on knowledge creation, KM processes, technology, and KM applications with four factors of demographic elements (type of services, rank, academic background and working experience).
b. To compare the perceptions amongst MAF officers of knowledge creation, KM processes, technology, and KM applications.
c. To determine the relationship between technology and KM processes, and KM applications in the MAF.
d. To determine the availability of KM applications in the MAF.

The following hypotheses were tested:

Hypothesis 1: There is no significant statistical difference in perceptions of knowledge creation, KM processes, technology, and KM applications by the MAF officers among the three services (Army, Navy, and Air Force).

Hypothesis 2: There is no significant statistical difference in perceptions of knowledge creation, KM processes, technology, and KM applications by the MAF officers based on their rank.

Hypothesis 3: There is no significant statistical difference in perceptions of knowledge creation, KM processes, technology, and KM applications by the MAF officers based on their academic background.

Hypothesis 4: There is no significant statistical difference in perceptions of knowledge creation, KM processes, technology, and KM applications by the MAF officers based on their level of working experience.

Hypothesis 5: There is no significant statistical relationship between technology and knowledge creation, and KM processes.

METHODOLOGY

In gathering the information, this study had selected 363 military officers of the MAF based on 95% confidence level and 5% confidence interval. Total samples were derived from the sample size table developed by Krejcie and Morgan (1970) and Cohen (1969). The sample size was then confirmed by using sample size calculator[9]. The population was divided according to the three military services (Army, Navy, and the Air Force) based on stratified random sampling. The respondents involved in this study were the military officers with the equivalent rank of Lieutenant to Colonel. The study was conducted based on the conceptual framework as depicted in Figure 3.

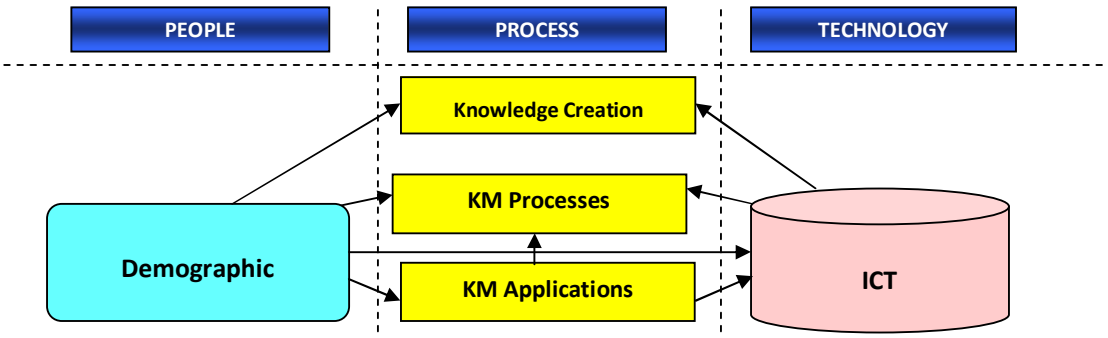

Figure 3: Conceptual Framework

The survey instrument was designed in order to assess and investigate the perceptions (attitude) of MAF officers about KM applications in ICT environment. The questionnaire consists of fifty-two (52) item statement which is divided into five parts. Each statement corresponds to five-point Likert scale where 1=strongly disagree, 2=disagree, 3=uncertain, 4=agree, and 5=strongly agree. Descriptive statistics were used to describe the results.

RESULTS

Demographic Characteristics

The variables selected to describe the respondents' background were the type of service (Army, Navy, and Air Force), rank (Lieutenant to Colonel equivalent), academic qualification (graduate: Diploma to PhD, and Others: represent highest secondary school achievement), and level of working experience (between <10 years, 10 to 19 years, and >20 years). The results for each demographic variable are shown in Table 1, 2, 3 and 4 respectively.

[9] Sample size calculator available at : http://www.surveysystem.com/sscalc.htm

Table 1: Frequency of Respondents by Type of Service

Type of Service	Frequency	Percent	Cumulative Percent
Army	218	60.1	60.1
Navy	67	18.5	78.5
Air Force	78	21.5	100.0
Total	363	100.0	

Table 2: Frequency of Respondents by Rank

Rank	**Frequency**	**Percent**	**Cumulative Percent**
Lieutenant	63	17.3	17.3
Captain	144	39.7	57.0
Major	130	35.8	92.8
Lt Colonel	22	6.1	98.9
Colonel	4	1.1	100.0
Total	363	100.0	

Table 3: Frequency of Respondents by Academic Qualification

Qualification	**Frequency**	**Percent**	**Cumulative Percent**
PhD	1	.3	.3
Masters	33	9.1	9.4
Degree	86	23.7	33.1
Diploma	106	29.2	62.3
Others	137	37.7	100.0
Total	363	100.0	

Table 4: Frequency of Respondents by Level of Working Experience

Length of Service (years)	**Frequency**	**Percent**	**Cumulative Percent**
<10	116	32.0	32.0
10 to 19	163	44.9	76.9
>20	84	23.1	100.0
Total	363	100.0	

Hypotheses Testing

Table 5 presents the summary of the hypothesis test results.

a) Hypothesis 1, 2, 3, and 4

Hypothesis 1, 2, 3, and 4 are focused on the associations of people variable as a key driver of KM with the variables of process and technology for KM. As can be noticed in Table 5, the MAF officer's perceptions of the four variables (knowledge creation, KM processes, technology, and KM applications) are not significantly determined by the type of military services. The results of ANOVA tests indicate that perceptions of officers from the three services on knowledge creation are similar. However, based on further examination, the

results demonstrate that, there are significant differences in officer's perceptions of knowledge creation which are based on individual rank ($H2_A$), academic background ($H3_A$), and working experience ($H4_A$). Thus, respondent's backgrounds implicate significant influence on the creation of knowledge in the organisation.

Other variable that shows differences in officer's perception is the technology. Their perception of KM technology is found to differ among the officers based on their academic background ($H3_C$). The results indicate that officers who have higher academic qualification demonstrated better perceptions as compared to officers with lower academic qualifications. As shown in Table 5, the results also indicate the generalisability of officer's perception of KM processes, technology, and KM applications do not differ except to knowledge creation.

Table 5: Summary of Hypotheses Testing Results

Hypothesis	Correlations		ANOVA	
	r	p	F	p
H1	There is no significant statistical difference in perceptions of knowledge creation, KM processes, technology, and KM applications by the MAF officers among the three services (Army, Navy, Air Force).			
$H1_A$			**1.167**	**.312**
$H1_B$			**.559**	**.572**
$H1_C$			**.004**	**.996**
$H1_D$			**.400**	**.671**
H2	There is no significant statistical difference in perceptions of knowledge creation, KM processes, technology, and KM applications by the MAF officers based on their rank.			
$H2_A$			**4.425**	**.002**
$H2_B$			**.621**	**.648**
$H2_C$			**1.772**	**.134**
$H2_D$			**.849**	**.495**
H3	There is no significant statistical difference in perceptions of knowledge creation, KM processes, technology, and KM applications by the MAF officers based on their academic background.			
$H3_A$			**5.171**	**.006**
$H3_B$			**.505**	**.604**
$H3_C$			**5.555**	**.004**
$H3_D$			**.866**	**.422**
H4	There is no significant statistical difference in perceptions of knowledge creation, KM processes, technology, and KM applications by the MAF officers based on their level of working experience.			
$H4_A$			**11.669**	**.000**
$H4_B$			**.813**	**.444**
$H4_C$			**.855**	**.426**
$H4_D$			**.404**	**.668**
H5	There is no significant statistical relationship between technology and knowledge creation, and KM processes.			
$H5_A$	**.380(**)**	**.000**		
$H5_B$	**.487(**)**	**.000**		

**p <.05

b) Hypothesis 5

Hypothesis 5 focuses on the associations between technology driver and the process drivers for KM. The data presented in Table 5, which are the results of correlation test between technology and the three variables of KM, indicates a positive relationship with the knowledge creation ($H5_A$) and KM processes ($H5_B$) at $p < .05$. The results of this study show that technology is an important driver that enables the KM processes and the creation of knowledge.

SUMMARY AND RECOMMENDATION

This study sought to examine the current situation of the KM activities in the MAF through the study of officer's perceptions of the knowledge creation, KM processes, KM applications and technology variables. The findings are summarised as follows:

a) The type of services (Army, Navy, and Air Force) has no influence on the knowledge creation, KM processes, KM applications and technology in the MAF organisation. It was also deduced that the perceptions of officers from the three services do not vary significantly.
b) The rank structure has no influence on the KM processes, KM applications and technology in the MAF organisation. It was also deduced that the perceptions of officers with different level of rank does not vary on the three variables.
c) There is no significant statistical difference in perceptions of KM processes and KM applications by the officers with different academic background.
d) The level of working experience has no influence on the perceptions of KM processes, KM applications and technology.
e) There is a positive relationship between technology and the knowledge creation and KM processes.

The results obtained through the statistical analysis could contribute to the feasibility of KM implementation in the MAF organisation. One of the implications of this study is that, it identified the attitudes of the military personnel towards KM innovation for future strategic solutions in order to be at competitive edge in line with the modernisation of the MAF. KM was identified as a new area of management which is incorporated with ICT in managing new knowledge for a superior decision making and problem solving in fields of military operations, tactical needs, and development in the military core competence. A general conclusion based on the findings obtained indicated that the level of KM availability in the MAF needs greater attention and awareness by the leadership as well as all level of personnel.

For the purpose of strategizing KM initiatives in the MAF, it is highly recommended that the MAF address the requirements based on a framework that includes the following:

a) Infostructure: The ICT (computers, software, architecture, security, communications, and programmes) required to support the net-centric MAF.
b) Intellectual capital: The individual, team, and enterprise knowledge, systems, services, and strategies necessary to improve operations and decision-making.
c) Change catalysts: The policies, resources, management, culture, processes and education required to optimize an adaptive organisation and an enterprise net-centric environment.

The MAF should also look into several factors that could encourage the successful implementation of the KM strategies in the MAF as follows:

a) The infrastructure must accommodate faster processing capabilities and dissemination of KM requirements;
b) Enterprise-wide systems must be easily accessible with net-centric processes and services available through a single portal;
c) The information that leads to knowledge must be well-organised and structured through content management, metadata and data hierarchies;
d) The ability to generate knowledge requires the transfer and sharing of knowledge across the enterprise using such techniques as collaborative processes, virtual teams and communities of practice; and
e) Recruitment, training, and retaining is emphasized to achieve an interdisciplinary workforce (soldiers and civilians) empowered to share knowledge.

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