KNOWLEDGE MANAGEMENT TOOLS AND ORGANISATIONAL PERFORMANCE: A STUDY OF THE INDIAN AIR FORCE

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By

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CANDIDATE'S DECLARATION

I, hereby certify that the thesis titled "**Knowledge Management Tools and Organisational Performance: A Study of the Indian Air Force**", submitted in fulfilment of the requirements for the award of the degree of **Doctor of Philosophy** is an authentic record of my research work carried out under the guidance of **Dr. Vikas Gupta**. Any material borrowed or referred to is duly acknowledged. The matter presented in this thesis has not been submitted elsewhere in part or entirely to any other university or Institute for the award of any degree.

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SUPERVISOR'S CERTIFICATE

Certified that **Mukesh Kumar Singh** (2K17/PhD/DSM/07) has carried out his research work presented in this thesis entitled **"Knowledge Management Tools and Organisational Performance: A Study of the Indian Air Force"** for the award of **Doctor of Philosophy** from Delhi School of Management, Delhi Technological University, Delhi, under my supervision. The thesis embodies results of original work, and studies are carried out by the student himself and the contents of the thesis do not form the basis for the award of any other degree to the candidate or anybody else from this or any other University/Institution.

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EXECUTIVE SUMMARY

Knowledge Management (KM) is a universal need for all organisations, and military organisation like the Indian Air Force (IAF) is no exception. IAF is a knowledge enterprise like any other organisation. However, the immense size, geographical dispersion and hazardous environment associated with the military make it an extreme case even among large global knowledge enterprises. Because knowledge is rarely distributed evenly through large organisations and the characteristics, objectives, conditions, structure and culture of the military are unique, the need for knowledge flow is more crucial and is particularly acute in military organisations. Realising the significance of a KM, few of the world's contemporary military organisations have reorganised their policies and doctrines to include KM at the core. The IAF is the fourth largest air force in the world and the aggressive KM initiatives assume a vital role. However, IAF is extremely diverse in its knowledge systems and practices and any attempt to summarise military KM in its entirety would be presumptuous, if not impossible. The environment in IAF is volatile, uncertain, complex, and ambiguous. The study made an effort to study the nuance of KM in such an environment without adequate support from the relevant literature. Therefore, for a wholistic appreciation of KM in IAF, a multifaceted study was undertaken with the objectives of understanding KM in a military context, developing parameters for measuring the performance of the IAF and then empirically testing the relationship between various enablers of the KM environment and KM tools with these performance measures.

A descriptive research design was employed and data was collected using non-random sampling techniques. Data was collected with the help of a self-administered questionnaire employing a Likert scale. IAF veterans with more than 15 years of experience were selected for the study. The Confirmatory Factor Analysis (CFA) marker approach which is considered to be the most comprehensive, integrated, current and best approach to test the common method bias (CMB) was applied to the study. The study adopted multiple methods to boost response reliability and content validity and reduce various biases. All the assumptions for multivariate testing were fulfilled and the sample was found adequate using the KMO test. All the criteria for the reliability of the measurement model and the validity of the instruments were satisfied. Model Fit indicated the level of consistency of the

hypothesised model and the data. A multi-staged analysis was conducted beginning with Exploratory Factor Analysis (EFA), CFA and finally testing the hypotheses with the help of Structural Equation Modelling (SEM). EFA resulted in the establishment of 11 variables that included eight independent variables (five variables of KM enablers and three KM tools) and three dependent measures of Organisational Performance (operational performance, maintenance performance and administrative performance). The factor structure was confirmed using CFA, reliability and validity were also checked through Composite Reliability (CR) and validity was established through SPSS and SEM and checking the Model Fit measures.

To commence, the study took a fine-grained approach to understanding KM issues in a complex military environment through a thorough review of the literature. The study endorses that military organisation is enormously intricate and has a unique context, missions, structural and cultural attributes, leadership style, resources and operating environment. In the absence of any specific measures of performance for the military organisations of a developing country like India, the study developed certain measures after a thorough review of the literature and consulting experts. Path Analysis was used further to test the relationship of these performance parameters with the enablers of the KM environment and KM tools. The findings of the study revealed a mixed result, with some KM indicators having a positive effect on the organisation's performance while others negative. The study found a positive relationship between the KM of air warriors and various measures of organisational performance in IAF. The data indicates that the people in the IAF understand KM and are willing to accept and learn from experts and share their knowledge with those in need. Whereas, the relation of other enablers that is KM culture, process, strategy and information technology with the measure of performance was not supported. The study indicates that though the individual air warriors support the KM activities, the other enablers which are key for creating a knowledge environment are not supportive or aligned towards KM initiatives. The probable causes which may act as a barrier towards creating a KM environment may include strict standard operating procedures with little margin for error, rigid processes, hierarchy, leadership style, a closed environment, lack of a formal KM strategy and absence of defined KM role or designated knowledge officers to name a few. The study found that KM tools used for sharing and application of knowledge (TSAK) which are mostly individually driven and rely on people for sharing and applying the knowledge have a

significant positive relationship with the performance in the IAF. Whereas, the KM tools used for identification and creation of knowledge (TICK) and for capture and storage of knowledge (TCSK), which mostly requires organisation support and resources were negatively related to the organisational performance in the IAF. The study indicates a possible lack of an organisational-driven or formalised setup that encourages the use of KM tools in the IAF. The KM initiatives and use of KM tools in IAF are deemed to be individually driven or undertaken in a fragmented form at lower levels. The IAF emphasises sticking to the laid down procedures and policies, and aggressive modernisation of its equipment and IT infrastructure, with little focus on the soft powers like KM that exploit individual and organisational knowledge for sustainable gains.

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Delhi, Mar 2024 Mukesh Kumar Singh

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

χ^2 /df – Chi-square to the degree of freedom

AAR- After Action Review

ASV – Average Squared Shared Variance

AVE – Average Variance Extracted

CFA – Confirmatory Factor Analysis

CMB – Common Method Bias

CR – Composite Reliability

CoP- Community of Practice

Df – Degree of freedom

EFA – Exploratory Factor Analysis

GFI - Goodness-of-fit Index

i.e. – That is

IT – Information technology

IAF- Indian Air Force

IA- Indian Army

IN- Indian Navy

KM – Knowledge Management

KME- Knowledge Management Environment

KMO – Kaiser-Meyer-Olkin

KMS – Knowledge management strategy

KMT- Knowledge Management Tools

MSV – Maximum Squared Shared Variance

OP – Organisational Performance

PhD – Doctor of Philosophy

RMSEA – Root Mean Square Error of Approximation

SEM – Structural Equation Modelling

SPSS – Statistical Package for Social Sciences

SOP- Standard Operating Procedures

TICK- KM Tools used for Identification and Creation of Knowledge

TCSK- KM Tools used for Capture and Storage of Knowledge

TSAK- KM Tools used for Sharing and Application of Knowledge

VIF – Variance Inflation Factor

Faith is my sword. Truth is my shield. Knowledge my armour."

~Stephen Strange, Doctor Strange (2016)

"If you know the enemy and know yourself,
you need not fear the result of a hundred battles.

If you know yourself but not the enemy,
for every victory gained you will also suffer a defeat.

If you know neither the enemy nor yourself,
you will succumb in every battle"

Sun Zu

CHAPTER 1

INTRODUCTION

Knowledge is power and therefore an asset for people and organisations. The ability of an organisation to utilise the knowledge base of its people is more important than ever in the current competitive global economy (Bartczak, 2002). Knowledge is therefore acknowledged as the most substantial organisation resource and managing knowledge is key to maintaining organisational competitive advantage (Novak, 2017). It has superseded traditional corporate assets and has become a strategic resource that drives the economy and provides a lasting competitive advantage (Chase, 1997; Gupta & Chopra, 2018). Leveraging individual and organisational knowledge to boost efficiency and effectiveness has now become a popular management technique that has been successful across the globe. To have an advantage over the competitors, organisations need to take conscious action to tap the knowledge of the intellectuals effectively and understand the impact of knowledge loss at the individual, group and organisational levels (Zaied et al., 2012). Identifying and capturing critical knowledge has now become utmost essential for an organisation which can be accomplished through an active Knowledge Management (KM) initiative.

KM is a widely accredited tool for a lasting competitive edge (Gupta & Jain, 2017; Horwitch & Armacost, 2002). KM is a universal need for all organisations, and armed forces are no exception (Adnan et al., 2020). Armed forces are knowledge enterprises like any other organisation. However, the enormous size, terrestrial diffusion, and perilous environment allied with the forces make it a rare case even among large worldwide knowledge organisations. Because knowledge is hardly distributed uniformly across great organisations, and the characteristics, objectives, conditions, structure and culture of the military being unique, the requirement for knowledge flow is more vigorous and is predominantly critical in military organisations (Nissen, 2003). Military organisations are techno-intensive forces and repositories of knowledge. For armed forces, capturing domain expertise has become an essential requirement, and to have a competitive edge over its adversaries, an effective KM of its intellectual assets is critical (Orhan, 2005). With the expansion of operational areas and sub-conventional warfare taking centre stage, the requirement of comprehensive

KM initiatives has become indubitable for military organisations (McIntyre et al., 2003). Xu et al. (2011) say the combat effectiveness of armed forces can be enhanced using KM. The cutting-edge technologies have resulted in dynamic, unpredictable and complex operations with problem-solving and decision-making becoming more complex and essential than ever (Ozturk, 2012). Hasnain (2016) says the successful transfer of knowledge ensures triumph in the battle if implemented through an appropriate knowledge transfer mechanism. Nunn and Wong (2013) say armed forces will lose the competitive edge if they don't regularly update, renew and share their knowledge, and use it to do things differently and better than their adversaries. Realising the significance of a KM in armed forces, most of the world's contemporary military organisations like the United States (U.S.), Canada, Israel, the United Nations, and the North Atlantic Treaty Organisation (NATO) have reorganised their policies and doctrines to include KM at the core (Boe, 2014; Jabłoński & Lis, 2012; Lepak, 2009; Martin, 2014; Marzukhi et al., 2018; Singh & Gupta, 2020). The Indian Air Force (IAF) being the fourth largest air force in the world is also no exception and therefore needs to keep pace with these changes, that is the IAF needs active KM (Layton, 2013). To achieve this, IAF needs to promote an environment that facilitates the identification, creation, capture, storage, transfer and application of knowledge across the organisation by actively using various KM tools (Singh & Gupta, 2021).

1.1 Overview of the Indian Air Force (IAF)

According to Global Firepower, the Indian military is the world's fourth-largest after the U.S., Russian and Chinese militaries with a total strength of approximately 2.9 million active, reserve, and paramilitary personnel (Bielawski, 2021). The Indian Army (IA), Indian Air Force (IAF), and Indian Navy (IN) constitute the main fighting arms of the Indian Military establishments (Ganguly, 2015). The IAF is the air-arm of the Indian armed forces. Its personnel and aircraft inventory place it fourth among all the air forces in the world. Its main objective is to protect Indian airspace and to conduct air warfare in armed conflict. The IAF also conducts search-and-rescue operations, provides swift evacuation and distribution of relief supplies via air cargo (Ladwig III, 2010). The IAF has Officers and Airmen as its combatant members (uniformed personnel, also referred to as air-warriors) and Non-Combatant Enrolled (NC(E)) and civilian staff for other non-combatant duties (*indianairforce.nic.in*, 2020). For the current study, only the combatants have been used

considering their qualifications, experience and job profile in the IAF. The available documents in the public domain estimate an approximate strength of 12,244 officers and 138,596 airmen in the IAF (Behera & Mohan Nayak, 2021; Singh, 2020).

The IAF is a highly specialised and techno-incentive fighting force and is in the process of capability built up, wherein it concurrently operates legacy and contemporary systems. Therefore, the requirement of effective human resource management in placing exceptionally skilled and motivated air warriors to maintain, these complex and state-of-the-art war fighting machines needs no mention (Cordesman et al., 2006). The IAF like any other air force invariably operates equipment with vanguard technology. However, the intricate and futuristic technological inventory of the IAF is no match for the efficacy and proficiency of the man behind the machine. Irrespective of the vast technological developments that warfare will undergo, its conduct will always be in the hands of human beings. It is the men in blues and the knowledge they possess in the operation and maintenance of these machines will always remain the greatest asset of the IAF which needs to be harnessed (Singh, 2009). Therefore, KM in the IAF is a vital issue because its strength has always been its air warriors and the specialised knowledge they possess (Pandey & Kothari, 2015). IAF has an exclusive context in which KM must be employed and eventually operate. Because of the distinctive cultural and structural traits, the hierarchy and environmental factors that influence KM efforts, the same needs to be fully understood (Ariely, 2011). This paper systematically tries to establish the relationship between various enablers of the KM environment and the use of KM tools on the performance of the IAF.

1.2 Background of the Study

Today in most organisations, there's solid intrigue in distinguishing ideal methodologies to use the mental capital of the organisation's workforce (Yılmaz, 2012). IAF being a techno-savvy force, there is ample knowledge that can be usefully harvested and transferred to those who need it most. Aggressive KM activities assume an imperative part for the IAF as judicious, precise, decision-ready and noteworthy knowledge is basic for arranging and conducting aviation operations (Tanham & Agmon, 1995). However, despite the best efforts, IAF continues to squander what may be its greatest assets in today's knowledge economy i.e. the wealth of experience, ideas, and insight of its air warriors that

are scattered across and deeply embedded within the organisation (Singh, 2009). The IAF is required to move beyond the simplistic incorporation of the latest information technology (IT) hardware and software to a more deliberate KM strategy. There is a need to progress beyond the simple network-centric force to a network-centric-knowledge-enabled force to achieve knowledge superiority (DiGiacomo, 2003).

IAF has been always proactive in managing its human assets, however, one of the areas which remain largely un-addressed and is of concern for the contemporary Air Force has been the huge 'pull' out of its trained air warriors and along with them is the pull out of the knowledge they possess (sofat, 2016). To keep their forces young and fighting fit, the military organisations by the policy itself have an option for voluntary retirement between 15-20 yrs. of service (Layton, 2013). Though, this policy helps the organisation to stay young, however at the same instance, withdrawing troopers take with them much of the organisation's information as well as the individual's inferred information that was created all through their residency with the organisation. Sminchise (2016) believes that half or more of the best officers leave the military earlier than serving a full career for various reasons such as narrow promotion aspects, lack of social measures and stressful climate. The departing soldier at the peak of their ability and experiences takes with them the most valuable knowledge they have gained over the years of their professional and personal lives. Their lifetime experience, in-depth knowledge of the environment, culture, attitude to understand complex issues and aptitude to integrate and correlate knowledge are of utmost importance for organisation sustenance (Singh, 2009). Therefore, the IAF need to provide a suitable KM environment and make use of KM tools like exit interview to capture and store this precious tacit knowledge before the departure of their air warriors.

Despite of fact that the extent of literature associated with KM execution in the civil domain is expanding, there exists a need for writing that comprehensively investigates such issues in a military organisation (Bartczak, 2002). The literature that supports the existence of any KM initiative or policy in the IAF or any of the Indian Armed Forces is also deemed lacking (Singh & Gupta, 2020). Adnan et al. (2020) say "We only found nine prior studies that mostly propose the design of KM system for military activities, however, the specific literature about KM practices for military

research is not found yet in the database we used as a source". Ozturk (2012) claims scarcity of literature that addressed KM application in the armed forces. While there may be varied reasons for this shortage, one possible reason could be that the military services are just now beginning to formalise their KM efforts. Ismail et al. (2011) believe the lack of KM practices and application is due to limited understanding and revelation about KM in military organisations. Adnan et al. (2020) claim that the military has concerns about the confidentiality of information, which constrains them from publishing their work easily as compared to civic researchers who have more liberty to publish. These are the gaps that exist in the existing literature when it comes to the KM of IAF or any of the Indian armed forces that this study aims to cover and therefore this paper would be a stepping stone in bridging the literature gap.

1.3 Research Problem

KM is grounded on the concept that an organisation's most precious asset is the knowledge of the individuals (Edwards, 2019). KM accepts that the majority of employment nowadays involves knowledge labour, making all employees to some extent knowledge workers. This demonstrates that practically every person inside an organization engages in the most significant tasks of creating, sharing, and applying knowledge (Gold et al., 2001). Similarly, the KM is a vital activity in military organisations. As a combatant, military leaders and soldiers, everyone relies on what they know to do their work effectively. Be it operating war fighting machines, maintaining these machines or running administrative, logistical or other support services (Lis, 2014). But does everyone know all they need to know or there are voids in knowledge? Certainly, there are. There is a rapid change in the way warfare is fought, rather than just relying on weapons, now psychological, technological, cyber and economic warfare is taking centre stage and so there is always new knowledge to be acquired (Lausin et al., 2003). Military technologies are evolving and the modernisation of the IAF requires its people to wipe out obsolete knowledge and learn and apply new knowledge. Change in the warfare dynamics, the arena of warfare extending beyond the geographical boundaries up to space, requires the IAF to change its complete approach to handling its intellectual assets i.e., the wealth of knowledge its air warrior possesses (Force, 2012). However, what the IAF is doing about it? The IAF is a 0.15 million strong force with thousands of units spread across the geographical boundaries of the

country each having their knowledge. Do the experts in IAF share what they know? How often have individuals or units resorted to 'reinventing the wheel', when lessons could have been learnt from others' mistakes? Do the personnel in IAF make the greatest possible use of their knowledge? How many times has an individual had an idea to improve an activity or process but couldn't do anything due to lack of time, resources or support from top management? How many times the individuals confined their ideas because they feared, that they would lose the importance of revealing their expertise or they thought their colleagues would not appreciate it? How many times did the individuals found wanting for suitable forums or avenues to share and explore their innovative insights? How many times IAF have lost the valuable knowledge of the experts once they proceeded on premature retirement? Is IAF able to capture this knowledge and experiences? These unanswered questions indicate a possible gap in the KM literature and a problem area that needs investigation (Bielawski, 2021).

Despite the strategic magnitude of the IAF and the broadly acknowledged potential of KM, it was rare to find any significant KM study in the IAF or any of the Indian armed forces or forces of any other developing countries (Singh & Gupta, 2021, 2022; Singh et al., 2021). Most of the KM literature is restricted to civic organisations and scarcity exists of published work highlighting the KM perspective in the IAF. This brings us to the other research issues that need to be addressed. However, for a holistic study of the KM approach in IAF, a multifaced study is required that empirically establishes the relationship between various enablers of the KM environment like people, culture, process and strategy; and various KM tools that are used for identification, creation, capture, storage, transfer and application of knowledge on the measures of performance of the IAF. Thus, it is considered crucial to advance an integrative research model to study the relationship of quintessential KMT and KM environment on the performance of the IAF.

Enablers of a KM environment are the instruments to foster and encourage knowledge generation and exchange within the establishment. Additionally, they serve as the essential building-blocks for improving the effectiveness of KM efforts (Yeh et al., 2006). It is considered crucial to identify the key element or enablers that creates a positive KM environment for the success of the KM efforts (Karidou, 2008). Researchers often imply the effect of a positive KM environment on organisational performance. Researchers have

explored various constituent elements or enablers of a KM environment that are essential for managing knowledge which includes; people, culture, structure, information technology, strategies, the methods of KM, etc. (Bennett & Gabriel, 1999; Davenport, 1997; Ho, 2009). The challenge, however, is to decipher the relationship among these enablers of the KM environment. Most studies have examined the associations between these elements in separation (Lee & Choi, 2003). Also, most of the research available is on commercial, educational, private, and public sector organisations in civil; however, any empirical research of such effect in a military environment is scarce. To this end, a consolidative research model is necessary: the relationship between the KM environment comprising various KM enablers and organisational performance in the IAF. This approach will better able to describe the intricate and dynamic characteristics of KM in a complex military environment.

Lee and Sukoco (2007) say that for an organisation to heighten its performance not only requires formulating KM policies and successfully deploying tangible assets but also through appropriate knowledge management tools (KMT). Knowledge can be considered power if it is rightly applied using the right KMT. This is because many organisations have the knowledge, but the issue lies with applying the right tools to the knowledge that will bring about improved organisational performance (Evwierhurhoma & Onouha, 2020). The institutions can achieve a competitive advantage and enhance their performance through KMT dovetailing with the organisation's process and strategy (Heisig et al., 2016; Jain & Gupta, 2019; Nedelko & Jevšenak, 2019; Singh & Gupta, 2022). Therefore, to manage \knowledge effectually, IAF needs to use the KMT that facilitates the acquisition, creation, storage, sharing, and use of knowledge (Merindol, 2005).

Researchers in civic society have specified various measures of organisation performance accrue due to the implementation of KM, such as profits, shares, cost, time, innovations, efficiency, customer satisfaction, and competitive edge, whereas hardly any such measures could be identified for any military organisations (Massingham, 2018; Meher & Mishra, 2019; Scuotto et al., 2017; Zaied et al., 2012). It is construed that specifying such performance measures for a military establishment is complex, as their primary objective is to safeguard the integrity of their country and therefore, their success can effectively be measured during the hostilities. However, to bridge the academic gap, this study chooses certain performance measures of civil and other organisations and tries to establish the

relation between these performance indicators with the KM environment and KMT in the IAF. This approach will better describe the intricate and dynamic characteristics of KM in a complex military environment. The findings of the study are exclusive and deliberations brought out may encourage armed forces, especially in developing nations, to incorporate appropriate KMT to leverage critical knowledge.

1.4 Research Questions

The following research questions are created with consideration for the problem statement:

Q1. What are various enablers that can facilitate creating a knowledge environment and how are these related to the measures of organisational performance in the IAF?

Q2. What are the most relevant KM tools that the IAF can adopt and how are they related to the measures of organisational performance in the IAF?

1.5 Research Objectives

To bridge the gaps in the literature and generate empirical insights into various issues of KM in the IAF the study formulated the following objectives: -

- To identify and adopt the most suitable measures of organisational performance for the IAF.

- To examine the relationship between the enablers of a KM environment with the measures of organisational performance in the IAF.

- To examine the relationship between relevant KM tools with the measures of organisational performance in the IAF.

1.6 Research Gaps Addressed by the Study

Literature Gaps. In contrast to the number of publications on KM in civil organisations, literature is scarce in military organisations. The literature that supports the existence of any KM initiative or policy in the IAF or any of the militaries in the developing countries is also deemed lacking. Adnan et al. (2020) say they could find only nine prior studies restricted typically to the design of KM systems for military activities. Most of the papers found by the author were also specific to the relevance of KM in armed forces and generally concerning the military organisations of developed countries like the USA, U.K. and NATO (Boe, 2014; Jabłoński & Lis, 2012; Lepak, 2009; Martin, 2014; Marzukhi et al., 2018; Singh & Gupta, 2020). It has been extremely difficult to find literature that explains relationships between the KM enablers, KMTs and organisation performance concerning IAF or any of the Indian armed forces (Bartczak, 2002). Unlike other institutions, a military organisation is known to have a distinct characteristic that impacts the publication (Ismail et al., 2011). The military has concerns about the confidentiality of information, which could restrict them from publishing their work easily as compared to civil research. The secluded boundaries of the military, further act as a moat for the researchers in accessing a deep understanding of the organisation. This study is unique and the apparently first to generate a detailed empirical insight into the KM in a military setup and therefore this paper would be a stepping stone in bridging the gaps in the KM literature.

Research object. The majority of studies on KM are focused on civic society including commercial, educational and public sector organisations. However, the types of knowledge, job, structure, culture, strategy and objectives of a military organisation are unique and different from a civic organisation. KM strategies differ in industries and companies and one one-size-fits-all approach may not work for all. Therefore, various KM theories, models, tools and strategies that have been elucidated in literature for civil society, their applicability in a military organisation remains uncertain. This study chose IAF as a research object with the hope of expanding the scope of KM in the military domain and bridging this gap between the military and civil society. The study highlights the complications of civil-military relationships and challenges the existing KM practices in civic society while applying these theories and practices in military organisations. The study

provides an opportunity for researchers to explore the hidden insights into the various aspects of KM in a military organisation. The study would motivate the aspiring researchers to choose the complex military establishment as a subject to research various issues, and problems faced by the militaries and provide a researched logical solution.

Research approach. Most of the studies in the domain of KM have been conducted in isolation to one of any specific areas of KM like assessing knowledge losses, identifying knowledge barriers, formulating KM strategies and studying KM tools concerning various organisations/industries. The current study has a broader scope wherein a comprehensive study is being conducted for IAF involving various knowledge enablers and KM tools and first to define a measure of performance for a military organisation. The integrated model studied in this research included five enablers of a KM environment comprising of people, culture, process, strategy and information technology; fourteen KM tools categorised as per the knowledge process; and ten measures of organisational performance categorised under the three verticals of IAF working comprising of operational performance, maintenance performance and administrative performance. The study would enhance the theoretical understanding of KM in a fortified military environment and fill the void in the literature.

Understanding the Complexity of Military Organisations. The study takes a fine-grained approach to understand KM issues in a complex military environment. The study endorses that military organisation is enormously intricate and has a unique context, missions, structural and cultural attributes, leadership, resources, and operating environment. The militaries across the world have acknowledged that KM is a force multiplier and must become part of their basic fabric to achieve information and knowledge superiority. However, there lacks a formalised strategy or policy on KM in most of the militaries other than that of a few developed nations. KM in developing countries like India is being practised in a fragmented way by individuals or local commanders. The study brings out all the relevant literature on KM in military organisations under one umbrella. This would facilitate researchers as well as practitioners to garner an in-depth understanding of the underexplored area of KM in a military environment.

Measures of Performance for KM. The research in civil industries has acknowledged various financial and non-financial parameters to measure the efficacy of KM

initiatives on organisations' performance. There is a lack of any such measures in the Indian military organisation. Considering the exclusive characterises that are unparalleled outside the military, the measures of the civil industry cannot be adopted in the same way for the armed forces. To bridge this gap, the study developed and empirically tested certain measures after a thorough review of the literature and consulting experts. Considering three main domains of the IAF's working, the selected measures were further categorised into three verticals comprising Operational Performance, Maintenance Performance and Administrative Performance for ease of implementation. The study provides a set of suitably selected performance measures for the researchers to empirically test the efficacy of various KM initiatives.

1.7 Thesis Layout

The study is organised into seven chapters as mentioned below.

Chapter 1: The current chapter provides a brief overview of the entire thesis. The background of the study and an overview of the organisation under study has been provided. Additionally, the chapter contains an explanation of the research problem, objectives and research question.

Chapter 2: The chapter provides a detailed review literature. The chapter has been categorised into six sections to explain various variables, concepts and gaps concerning the subject under review such as KM terminologies, KM in the military, enablers of the KM environment, KM tools, a measure of organisational performance and the gaps in the literature.

Chapter 3: Chapter three is dedicated to the research framework and hypotheses development. The chapter brings out various dependent and independent variables and develops the hypotheses that need to be tested to meet the research objectives.

Chapter 4: The chapter is dedicated to the research design and methodologies. The chapter discusses the sampling techniques, development of scale and research instruments, data collection and cleaning and statistical techniques used for data analysis.

Chapter 5: Chapter five explains the multistage data analysis used to analyse the theorised framework and proposed relationships. Various methods of reliability and validity tests are discussed here.

Chapter 6: Chapter six discusses the hypotheses and path analysis of the structural model and brings out the conclusion derived from each relationship.

Chapter 7: The seventh chapter provides the conclusion of the study and discusses the contribution of the research towards theory and practice.

Chapter 8: Finally, the eighth chapter discusses limitations and future scopes.

Chapter 9: List out the references

CHAPTER 2

LITERATURE REVIEW

A careful review of the literature depicts diverse approaches taken to investigate the topic to identify the research gaps. For this study, the endeavour was made to explore all the major scholarly journals and databases such as ProQuest, ShoadGanga, IEEE Xplore, ScienceDirect, Defence Science Journal, Military Journals and search tools like Google Scholars. To bring out various variables, concepts and gaps concerning the subject under review, the literature review has been arranged into four different sections:

Section-A: This section builds up the basic concepts and terminologies concerning knowledge and knowledge management.

Section-B: Section-B, explains KM in military parlance and brings out various literature on KM in military organisations.

Section-C: This section discusses a KM environment and various element which affects the building of a knowledge environment in an organisation.

Section-D: Section D explains the concept of KM tools and discusses a few of the most prominent KM tools that will be used in the study.

Section-E: This section lists various measures of an organisation's performance discussed in the literature.

Section-F: The last section brings out the gaps in the literature.

SECTION-A

2.1 Fundamentals of Knowledge Management (KM)

Malhotra, (2005) says “KM is getting the right knowledge to the right person at the right time”. The complete process requires a strong relationship with the organisational strategies, understanding its form and the location of knowledge. The goal is to make sure that it is accepted and reinforced by all the employees (Uriarte, 2008). Before proceeding further, understanding the hierarchy of data, information and knowledge as shown in Fig. 1 is important to grasp KM.

2.1.1 Data

Data is a set of distinct, objective facts about events. Gaviria-Marin et al. (2018) define data as “unstructured facts and figures that have the least impact on the typical manager”. Data is just several words or letters that do not provide detailed information regarding context or pattern. For example, random numbers like 2309, UP, and 1600 without any context are mere data without any meaning. In an organisational parlance, data is more usefully defined as structured transaction records. All establishments require data and some organisations rely heavily on it for example stock markets, banks, and government statistical and planning agencies. However, just gathering too much data may not lead to desired outcomes. Data does not allow for interpretation or judgement, nor does it offer a solid foundation for action. Data may be the starting point for making decisions, but it cannot direct you. Data does not communicate the essence or relevance of the data. Data conveys nothing about its essence or relevance. However, data is significant to organisations, in large part because it is vital for the conception of information (Becerra-Fernandez & Sabherwal, 2014).

2.1.2 Information

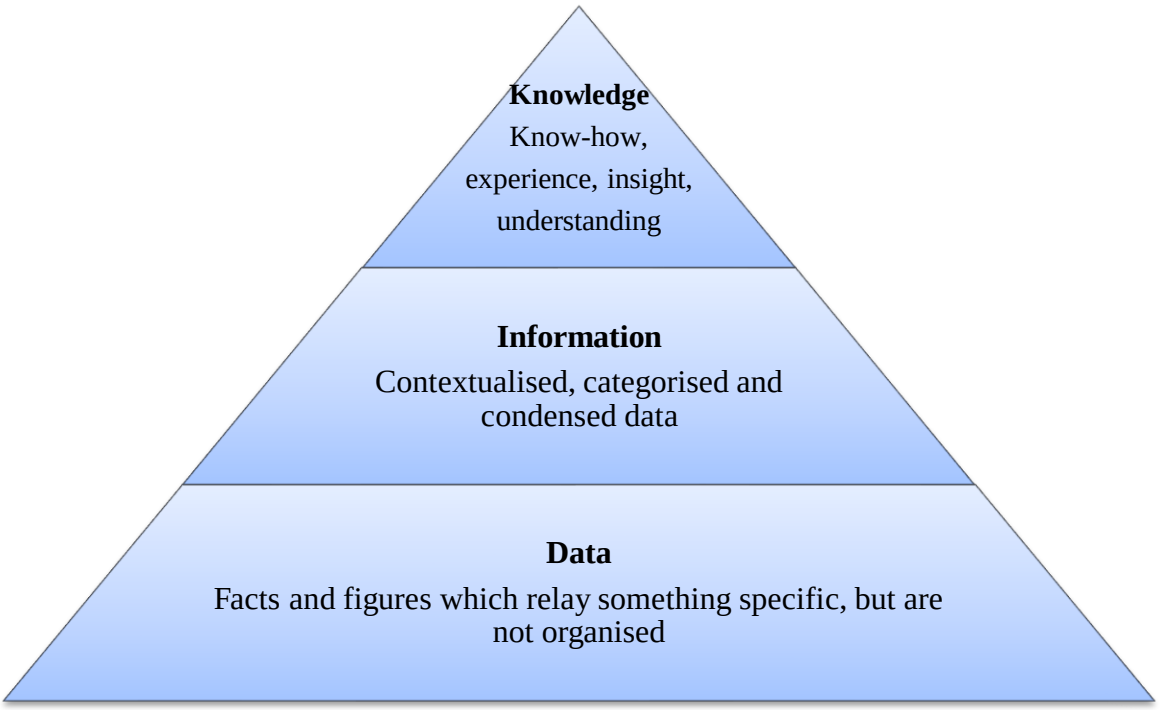
Data which is contextualised, categorised, calculated and condensed are called information (Davenport & Priska 2000). Information, therefore, presents a larger picture i.e., Data having significance and purpose (Bali et al 2009). A mere collection of data is not

information. For data to take the shape of information, the pieces of data must be related to one another. Information, as opposed to data, has a goal, meaning and relevance. Information can be created from data by adding value in various ways for instance: - the context of data is known (Contextualised), the key component of data or unit of analysis is known (Categorised), data is free from errors (Corrected), data has been analysed (Calculated), and data have been summarised (Condensed) (Dalkir, 2013).

2.1.3 Knowledge

Knowledge is defined as the facts, emotions, or experiences known by a person or group of people. Knowledge is a consequence of information, but it is affluent and extra significant than information. It incorporates understanding, consciousness and thoughtfulness acquired via experience and knowledge generated from making decisions, determining consequences and forming associations. Gamble and Blackwell (2001) defined knowledge as, a combination of framed experiences, values, pertinent data, master understanding and rooted institution that provides a framework and system for evaluating and integrating new information and experiences. In organisational terms, knowledge is generally considered as being "know-how, or "applied action". When data has pattern relation and advance handled, it has the potential to become information and when the patterns and the implication are contrived and the information is further processed, it has the potential to become knowledge. But unlike context-dependent information, knowledge tends to create its context. These patterns which represent knowledge have a characteristic of being complete, a feature absent in information. These patterns are dynamic and are continuously varying and evolving as they are completely understood (Edwards, 2019).

Knowledge in terms of military organisations can be explained as "the information that has been examined to provide meaning or value to consequence for the military operation". It is the understanding gained through study, experience, practice and human interaction that provides the basis for the expertise and skilled decision (Walsh, 2015). Today's organisation contains a vast amount of knowledge and military organisation like the IAF is no exception. What the IAF need to do is to use its collective knowledge to get better at doing what it does, i.e., maintain air superiority. The hierarchy of data, information and knowledge is depicted in Fig. 2.1 below: -



Source: Author

Fig. 2.1: Hierarchal representation of Data, Information and Knowledge

2.2 Types of Knowledge

Two basic types of knowledge defined in literature are explicit and tacit knowledge.

2.2.1 Explicit Knowledge

Explicit Knowledge is more formalised and codified and is sometimes also referred to as Know-What (Brown & Duguid, 1998). It is easier to identify, store and retrieve. It is stored in reports, documents, databases, emails, websites etc. This form of knowledge can be easily made available and shared in the form of formal languages. They comprise anything that can be codified, documented and archived. These include knowledge assets such as maps, drawings, reports, patents, methodologies, presentations etc (Wellman, 2009). Explicit knowledge represents organisation experience preserved in a form that can readily be

accessed when desired. Storage can be in the form of hard copy documents or digital form in computer storage. It is regarded as less important as it is simple and does not contain rich experience-based know-how. It lacks a competitive advantage as far as strategy is concerned. However, it's not isolated from the other form of knowledge called tacit knowledge. They both complement each other, as the understanding of explicit knowledge does require a certain degree of tacit knowledge and explicit knowledge gets created by sharing tacit knowledge (Cook, 1999).

2.2.2 Tacit Knowledge

Tacit Knowledge is referred to as Know-How. This knowledge is personal and stored in the heads of the individuals. It is also referred to as the knowledge between the ears. It is accrued through study and experience over some time. This is extremely context-specific and private in nature (Brown & Duguid, 1998). Tacit knowledge is context-specific and therefore difficult to formalise, record and communicate. It is also difficult to codify tacit knowledge as it would be difficult to convey intuitive understanding, skill, capabilities and expertise gathered over years of experience and practice. It grows through the process of trial and error and the experience of success and failure (Venkitachalam & Busch, 2012). Since tacit knowledge is highly personalised, the level to which it can be shared depends on the willingness and ability of the person possessing the knowledge. Various methodologies used by organisations to share tacit knowledge include informal interactions, coffee clubs, communities, workshops, on-job training, groupware etc. However, before sharing, the tacit knowledge which is unique and useful for the organisation needs to be identified (Smith, 2001). Tacit knowledge is highly valuable and a lack of focus on tacit knowledge could reduce the capability for innovation and sustained competitiveness. Accordingly, it becomes obligatory for organisations to realise, promulgate and exploit the tacit knowledge of their employees (Grant, 2007).

2.3 Knowledge Management (KM)

Fundamentally KM is about applying the collective knowledge of the entire workforce to accomplish specific organisational goals. It is about ensuring that individuals have the knowledge they need, where they need it, when they need it i.e., the right

knowledge, in the right place, at the right time (Edwards, 2019). The idea behind the KM is to create an atmosphere in which people are invigorated to create, learn, share and use knowledge together for the benefit of the establishment. This can be achieved by using various KM tools and forming KM policies and strategies. McInerney et al. (2011) say KM is the management of an organisational knowledge base to create value and meet its short-term and strategic objectives. It involves the initiative processes and system that enhances the creation, assessment, sharing, transfer, refinement and storage of knowledge. Rahmati, Eskandari, Sadr, Nouri, et al. (2014) say in a military environment, KM includes a deliberate approach to achieve strategic aims by using the power of collective knowledge infiltration into the processes of creating, gathering, organising, sharing and transferring knowledge (Aming'a, 2015). Various definitions of KM elucidated in textbooks are: -

> “The formation and management of an environment, which encourages knowledge to be created, shared, learned, enhanced, organised and utilised for the benefit of all the organisation” (Abell & Oxbrow, 2006).

> “The competencies by which communities within an organisation capture the knowledge that is crucial, continuously improve it, and make it available in the most prudent manner to those people who need it, so that they can exploit it creatively to add value as a normal part of their work” (Farmer, 2002).

> "Knowledge is the power and power come from spreading information to make it productive, not hiding it" (Drucker, 2006).

> “KM is not about data, but about getting the right-information to the right-people at the right-time for them to impact the bottom line” (Vorbeck et al., 2003).

> 'KM is the explicit and systematic management of vital knowledge and its associated process of creation, organizing, sharing, use and exploitation. It requires turning individual knowledge into company knowledge that can be broadly shared throughout an organisation and appropriately applied" (Skyrme & Amidon, 1997).

KM is the management of the organisational knowledge base to generate value and accomplish long-term goals. It involves the initiative system and processes that improve knowledge generation, evaluation, transfer and storage. KM involves the identification of the source and the form of knowledge and promoting a culture of learning, sharing and creating knowledge. Evidence exists that operative KM is advantageous to an organisation in saving time and money while also developing internal capabilities to increase competition. Studies by IBM substantiate that KM results enhanced efficiency, customer satisfaction, optimum utilisation use of resources and providing new business solutions (Huang et al., 1998). A comparative study by McKinsey between the companies practising and non-practicing KM indicates that the practice of KM reduces the amount of time it takes to generate and fulfil orders by approx. of 11% and reduces development time by 4.6% (Trent, 2003).

SECTION-B

2.4 KM in Military Organisation

Ariely (2011) says KM is not only pertinent to civil organisations but equally relevant to military organisations. KM in militaries can be considered similar to the large public and private sectors in some aspects but it also differs in many others. The key difference is mainly attributed to culture, mission, structure and operating environments. The culture in the military emphasises values, discipline and self-sacrifice, unlike the civil culture of individuality and liberty. The mission, objectives and dedication of the soldiers to achieve the results in the military are exclusive as well (Janiszewski, 2011). No other organisation has employees willing to sacrifice their lives to meet the objectives. Also, no other organisation is expected to respond swiftly, coherently and conclusively across the vast range of military operations from war to humanitarian relief (Babb, 2001). The operating environment for a military organisation is vast and diverse as compared to any civil sector organisation and may include from the minus temperature in the snow to extreme temperatures in desserts to hostile conditions in forests and seas. The command & control, and hierarchy of the military also make KM issues and actions unique to military organisations. The broadness of military missions in diverse areas such as operations, command and control, logistics and administrative services has made using KM in the

military a critical domain (Rahmati, Eskandari, et al., 2014). Due to the distinct structure and cultural characteristics, leadership and environmental elements, the KM in the armed forces is considered to be a more complex and underexplored area. Various definitions of KM in militaries as penned by researchers are:

> A field of study that promotes a coordinated strategy for locating, gathering, assessing and disseminating explicit and implicit knowledge inside an organisation to achieve mission goals (Ozturk, 2012).

> KM in armed forces comprises of practices that create knowledge; the technical infrastructure that captures, transfers, and uses knowledge; and the organisational culture that inspires knowledge sharing and treats information, knowledge as valuable assets (De Long, 1997; Lausin, Desouza, & Kraft, 2003).

> KM in the military is the techniques and process that are used to quickly transfer experiences and provide a common understanding from an experienced soldier to an inexperienced soldier (Manuri et al., 2011).

> Military KM is a strategy to translate into a knowledge-based and network-based organisation as one of the most significant steps in a military organisation (Rahmati, Eskandari, et al., 2014b).

> KM is a process for optimising the effective application of intellectual assets to accomplish organisational objectives (Schulte & Sample, 2006).

> KM is the art of creating, organising, applying, and transferring knowledge to facilitate situational understanding and decision-making (Sullivan, 2011).

It is broadly accepted that KM must become part of the basic structure of a successful organisation and military organisations are no exception. To achieve information and knowledge superiority over adversaries, KM must become a vital focus area of military organisations (Bartczak, 2002). KM in the armed forces has become much more vital and intricate than ever (Nunn & Wong, 2013). In the current era of complex operations, armed

forces are required to effectively comprehend billions of knowledge in respect of self and the adversary (Xu et al., 2011). Various types of knowledge exist in the military organisation like operational knowledge to fight a war, technical knowledge to maintain war fighting machines, locational knowledge of the geographic environment, etc. Effective management of all this knowledge is a prerequisite for any military organisation to gain knowledge dominance over its adversaries. The exodus of soldiers and reduced military spending because of the changing socio-economic environment have forced the military organisation to recognise the importance of human capital and use KM tools to capture and utilise this tacit knowledge acquired by experience (Sofat, 2016).

The revolution in military affairs in the 21st century is primarily characterised by an accelerated pace of technological changes. The advent of new technologies has increased the dynamics and complex operations requiring precise information from reliable sources. Strategic or tactical decision-making has become much more complex than ever before. In the current techno-intensive environment, the stride of decision-making has amplified, timelines are quicker and therefore, accurate and timely knowledge is the most fundamental need of the forces. KM augments this tactic by utilising a blend of people, process, culture, strategy, technology and KMT (Ariely, 2008). KM transforms the armed forces into a learning organisation. It enables the transfer of knowledge derived from experience and skills across the organisation starting from the generating force to operating forces till the last person to every level from lower staff to commanders and leaders (Knowledge Management Operations July 2012).

Today is the era of information warfare, and the forces which have information superiority will have an edge. Jewell (2003) advocates for the inclusion of KM concerning the threat and environment into the core functions of Military Intelligence. Therefore, the exchange and sharing of superior knowledge need to be figured out in the strategic KM plans. (Alberts et al., 2000). Military operations require rapid adaption to sophisticated technological advances and changes in warfare dynamics. An organisation will remain obsolete if it cannot keep up with the speed of change in the environment. Therefore, for a military organisation to adapt to a constantly changing environment, it needs to adapt to KM practices (Gauvin et al., 2005). Therefore, military organisations have no option other than to take cognizance of the fact and embrace KM in a big way to remain current and relevant.

2.4.1 KM in Militaries Across the World

Lausin, Desouza, Kraft, et al. (2003), says KM has long been a staple activity for the US Army. The U.S. military, like other civil organisations, understands the criticality of KM for the armed forces and has been consistently taking steps to address it, and therefore most of the literature on KM in the military pertains to the U.S., whereas only a few literatures are available on the topic from other militaries (Adkins et al., 2010). The highlights from the literatures on KM in militaries across the world are: -

- Recognising the potential of KM in military operations, the U.S. Army embraced KM in 2003 and started with the Army KM Qualification course to identify the skills and prepare soldiers for the complex challenges of KM. Col Jeffrey John Lepak of the U.S. Army War College emphasises that “the Army needs to endorse KM as the means to support its Army's strategies for the 21st century of transforming itself into a network-centric knowledge-based force and the best way to achieve this is to lay down the vision to shape the entire Army into a knowledge-based force for the next 20-30 years” (Lepak, 2009). U.S. Army manual on KM operations states, "KM is to enable the transformations of armed forces into a knowledge-based organisation; which integrate best practices, the most effective and competent method of achieving any objective or task, into operation or training"(Lis, 2015). DiGiacomo (2003) say that KM in the U.S. Army is based on four indispensable elements comprising of leadership, technology, organisation and learning.

- The Department of Air Force, USA in its Air Force Instructions spells out the significance of KM in the integration of knowledge workers and processes to ameliorate organisational performance. Emphasis has been given to the comprehensive process of KM involving creating, organising, applying and knowledge transfer for effective decision-making and knowledge superiority. The latent power of tacit knowledge, its capturing and translating into explicit knowledge has also been emphasised (Bender, 2014). The U.S Air Force (USAF) is working to develop and implement an enterprise-level KM strategy that emphasises building a

KM infrastructure and deploying software that acts as a "portal" for knowledge exchange and developing an Aeronautical Enterprise Knowledge Management (AEKM) (Trent, 2003).

- The U.S. Navy including the Marine Corps has also developed a service-wide KM vision and strategy (Martin, 2014). The Navy has formally incorporated KM into the Information Management Strategic Plan (Nissen, 2003).

- The Israeli Defence Forces (IDF) forecast knowledge as a crucial resource for existing and forthcoming battlefields (Ariely, 2008).

- Defence R&D Canada has also embattled KM as an area to support the futuristic military requirements in the 21st century (McIntyre, 2002).

- The KM strategies of the Canadian Forces emphasise the usage of knowledge creation, learning and collaboration as a key to achieving the desired end-state military capabilities (Boury-Brisset et al., 2002).

- The Slovak Republic Armed Forces also believe in vigorous KM to retain operational knowledge (Petrufova, 2015).

- The Norwegian Armed Forces have been employing KM in a tactic called the centre of gravity analysis to foresee and carry out military joint action (Boe, 2014).

- KARANET of the Turkish Army provides a platform to manage the knowledge base of its soldiers (Champoux et al., 2005, Orhan, 2005).

- The Australian Army has a formal learning and knowledge system strongly based on communication and information technology (O'Toole et al., 2011).

- North Atlantic Treaty Organisation (NATO) - Strategic Information and Knowledge Vision declare that “the NATO military structure will transform into a Knowledge Centric Organisation that consciously and methodically exploits NATO

information and expertise, and proactively manages its information and KM processes. The NATO strategic commands will promote an organisational culture that fosters information and knowledge sharing and treat information, expertise, experience, and best practice as valuable assets, as a fundamental capability required to achieve decision superiority" (Jabłoński & Lis, 2012).

- The United Nations (UN) has established a "Knowledge-Based System" to support the UN Military Observers in the deployment country (Marzukhi et al., 2018).

There are limited studies available in the public domain indicating insight into KM in a military organisation; some of the key points highlighted in various literature are presented in Table 2.1.

Table 2.1: Literature on KM in Military Organisations

Authors, Year	**Title**	**Organisation**	**Research Methods**
Horvath et al. (1994)	Tacit Knowledge in Military Leadership: A Review of the Literature	U.S. Army	Literature Review
Hedlund (1999)	Tacit Knowledge for Military Leaders: Company Commander Questionnaire	U.S. Army	Interview
Walker (2000)	Knowledge portal support to the Naval Postgraduate School's advanced distributed learning program for the Information Systems and Operations curriculum.	U.S. Navy postgraduate school	Literature Review
Bryant (2002)	Army knowledge management (AKM): challenges ahead	U.S. Army	Literature Review
Tefft (2002)	Army medical department knowledge management	Army Medical department, U.S.	Literature Review

Bartczak (2002)	Identifying barriers to knowledge management in the United States military	U.S. Military	Expert Opinion
McIntyre (2002)	Knowledge management in Defence R&D Canada	Defence R& D, Canada	Interview
McIntyre et al. (2003)	KM in the military context	Canadian Forces	Expert Opinion
Lausin et al. (2003)	Knowledge management in the US army	U.S. Army	Literature Review
Nissen (2003)	Knowledge Flow through a Military Joint Task Force Operation	U.S. Navy	Expert Opinion
DiGiacomo (2003)	Implementing Knowledge Management as a Strategic Initiative	Department of Defense, U.S.	Literature Review
Trent (2003)	Assessing Organisation Culture Readiness for KM Implementation: The Case of Aeronautical Systems Centre Directorate of Contracting.	Department of Defense, U.S.	Expert Opinion
Jewell (2003)	Transforming the Core Function of Military Intelligence to Knowledge Management	U.S. Army	Literature Review
Champoux et al. (2004)	A lesson learned knowledge warehouse to support the army knowledge management command-centric.	Canadian Forces	Expert Opinion
Sanders and Analysis (2004)	Knowledge management and potentially useful new hyperdidactic structures	British Army	Expert Opinion
Girard (2004)	Defence knowledge management: Just a passing fad?	Canadian Forces	Expert Opinion
Orhan (2005)	KM in Military Organisation: Applications of Knowledge Creation and Knowledge Transfer	Military Organisations in general	Literature Review

Champoux, Costello, & Bourget (2005)	The Canadian KM System within the Land Force Cmd and Control Info-Systems.	Canadian Forces	Expert Opinion
Gauvin et al. (2005)	Understanding the state of knowledge management with ontologies: The case of the Canadian military	Canadian Forces	Semi-structured interview
Merindol and analysis (2005)	Defense RDT&E and knowledge management: A new enquiry into public and public-private coordination	RDT&E, France	Expert Opinion
Lecocq and Gauvin (2006a)	Cross-analysis of data collected on knowledge management practices in Canadian forces environments.	Canadian Forces	Cross-Analysis
Booker (2006)	A comparative assessment of knowledge management programs across The United States armed services.	U.S. Armed forces	Expert Opinion
Schulte and Sample (2006)	Efficiencies from knowledge management technologies in a military enterprise	Department of the Navy, U.S.	Hypothesis testing using ANOVA
Palos (2007)	Communities of Practice: Towards Leveraging Knowledge in the Military	Department of Defense, U.S.	Expert Opinion
Fountain (2007)	Knowledge Management in an Information Age Army	U.S. Army	Expert Opinion
Marshall and Tommy (2007)	A comparative assessment of knowledge management leadership approaches within the department of defence	Department of Defense, U.S.	Expert Opinion
Kern et al. (2008)	Knowledge barriers in CD&E projects in the German Federal armed forces	German Federal Armed Forces	Interview

Hartline (2008)	KM officers: Necessary or redundant within army tactical units	U.S. Army	Interview
Lepak (2009)	Creating a Knowledge Management Strategy	U.S. Army	Expert Opinion
Pettersson (2009)	Success and Failure Factors for KM: The Utilisation of Knowledge in the Swedish Armed Forces	Swedish Armed Forces	Utilisation of KM
Bennet et al. (2010)	Exploring the military contribution to KBD through leadership and values	Singapore Armed Forces	Expert Opinion
Adkins et al. (2010)	Improving military competitiveness by enabling successful communities of practice: Lessons learned over 10 years with Air Force knowledge.	U.S. Air Force	Expert Opinion
Ariely (2011)	Operational knowledge management in the military	Military Organisations	Literature Review
Maule (2011)	Military knowledge management	Military Organisations	Literature Review
O'Toole et al. (2011)	Fighting for knowledge: Developing learning systems in the Australian army	Australian Army	Semi-structured discussions
Sullivan (2011)	The Difference that Makes a Difference: Distinguishing Between Knowledge Management and Information Management in the US Army	U.S. Army	Monograph
Mains and Ariely (2011)	Learning while fighting operational knowledge management that makes a difference.	U.S. Army	Expert Opinion
Janiszewski (2011)	Knowledge Management: A Model to Enhance Combatant Command Effectiveness	U.S. Army	Literature Review

Manuri et al. (2011)	Strategising knowledge management in the Malaysian armed forces: Towards the knowledge-centric organisation	Malaysian Armed Forces	Descriptive Statistics
Ismail et al. (2011)	Perception of knowledge creation, knowledge management processes, technology and application in military organisations	Malaysian Armed Forces	Descriptive Statistics
Jabłoński and Lis (2012)	Lessons Learned System as a tool of Managing Organisational Knowledge: The Case of Military Organisations	Military Organisations	Literature Review and Expert Opinion
Ozturk (2012)	Agile knowledge management; A review, reconceptualisation, and extension to military applications	Military Organisations in general	Expert Opinion
Nunn and Wong (2013)	Knowledge Management for Shared Awareness	U.S. Strategic Command	Expert Opinion
Buřita et al. (2013)	Knowledge management system based on lessons learned documents.	MoD, Czech Republic	Literature Review
Bender (2014)	Air Force Instructions 33-396	U.S. air force	Govt Instructions
VLĂSCEANU and DRĂGHICI (2013)	Knowledge based management in the Romanian military organisations.	Military Organisations in general	Expert Opinion
Boe (2014)	Changing knowledge management strategy in the Norwegian armed forces: a discussion of effects-based thinking as an alternative method in the planning and execution of military joint operations	Norwegian armed forces	Expert Opinion

Rahmati et al. (2014)	Providing an Applied Model for Knowledge Management Development Planning in Military Organisations: Providing Proposed Methodology for Naja	Military Organisations in general	Expert Opinion
Pandey and Kothari (2015)	Knowledge Management Through Transformational Leadership in Armed Forces–An IAF Perceptive	Indian Air Force	Descriptive Statistics
Lis (2015)	Knowledge Creation and Conversion in Military Organisation: How the SECI Model is Applied Within Armed Forces	NATO and the U.S. Army	Literature Review
Petrufova (2015)	Strategic Knowledge Management in the Armed Forces Academy of General Mr Štefánik in Liptovský Mikuláš, The Slovak Republic	Armed Forces of the Slovak Republic	Literature Review
Walsh (2015)	Information Sharing between the US Department of State and the US Army: Using Knowledge Management Technology and Tools to Bridge the Gap	U.S. Army	Literature Review
Pettersson (2016)	Experience-based knowledge from the Swedish Armed Forces: a comparison between groups and individuals	Swedish Armed Forces	Descriptive Statistics
Nagendra and Morappakkam (2016)	Knowledge management enablers and barriers in the army: an interpretive structural modelling approach	Indian Army	Interpretive Structural Modeling
Hasnain (2016)	A few good knowledge transfer mechanisms: Keys to successful military operations	Military Organisations	Literature Review
Hasnain (2017)	Military Knowledge Transfer Mechanisms: A Passage to Academic World	Military Organisations	Expert Opinion

Marzukhi et al. (2018)	Framework of Knowledge-Based System for United Nations Peacekeeping Operations Using Data Mining Technique	United Nations Peacekeeping Operations	Expert Opinion
Ouriques et al. (2019)	Analysing Knowledge Codification for Planning Military Operations	MoD, Brazil	Expert Opinion
Adnan et al. (2020)	Exploring Knowledge Management Practices in Military RnD Agency: An Indonesian Case Study	MoD, Republic of Indonesia	Literature Review and Semi-structured Interview
Van Laar et al. (2020)	Measuring knowledge management maturity in US Army headquarters	U.S. Army	ANOVA
Singh and Gupta (2020)	Critical types of knowledge loss in military organisations	Indian Air Force	Grounded Theory
(Reynolds, 2020)	Knowledge transfer challenges army leaders experience at a Southwestern United States Military Installation: A Case Study	U.S Military	Semi-structured interview
Koerner and Staller (2021)	From data to knowledge: Training of police and military special operations forces in a systemic perspective.	Germany, Military	Literature Review
Singh and Gupta (2021)	IAF Transition towards a Network-Centric-Knowledge Based Force	Indian Air Force	Descriptive Statistics
(Pirsoi, 2022)	Specific means and methods of KM within Romanian Military units	Romanian Military	Interview
Singh and Gupta (2022)	An empirical study of knowledge environment and suitability of performance measures of a civil organisation for a knowledge-based military force	Indian Air Force	Structure Equation Modelling
Boonchan et al. (2022)	Knowledge Management in the Royal Thai Army: ISO30401: 2018	Royal Thai Army	Literature Review

	Knowledge Management Systems Perspective		
De Angelis and Resolution (2023)	A model of cultural intelligence based on knowledge management practices and military intelligence: A comparative study between Moldova and Ukraine	Ukraine and Moldova	Structure Equation Modelling
(van Lamoen et al., 2023)	Collaborative innovation in a military organization: The importance of transactive memory, knowledge sharing, and learning from failure	NATO	Interview and CFA
(Van Laar, 2023)	Knowledge Management Implementation in US Army Headquarters: A Case Study	U.S Army	Case Study

Source: compiled by the author

2.4.2 Benefits of KM for Armed Forces / IAF

As the strategy of military operations inches nearer to the concepts of network-centric warfare and response and decision times are further shortened, the need to integrate information and knowledge base is becoming imperative. Some key benefits KM has for the armed forces include:

- KM achieves knowledge superiority which is one of the key characteristics that determines the victor in contemporary conflict (Bender, 2014).

- Two of the most important aspects influencing the current conflict are situational awareness and decision-making, and this enormously relies on knowledge (McIntyre et al., 2003).

- KM facilitates effectiveness in multinational operations and interoperability with the joint forces (Lis, 2014).

- Capturing know-how and domain expertise has become a primary need of the armed forces which can be fulfilled through active KM (Schulte & Sample, 2006).

- KM supports mission command that helps military leaders drive the operation process through improved understanding and visualisation (Alberts et al., 2000).

- KM helps soldiers and organisations to continuously learn and adapt as they operate (Manuri et al., 2011).

- KM facilitates organisational learning, innovation, and performance (Waltz, 2003).

- KM enhances association and interaction between the commanders and soldiers, which marks improved flexibility, adaption and integration of the warfighting functions as well as synchronisation of operations (Hedlund, 1999).

- Planning and carrying out air, space, and cyberspace operations within the Air Force requires knowledge that can be put into practice. KM can actively support this by combining people, technology and processes (Bender, 2014).

- The exodus of soldiers has forced the military organisation to recognise the importance of human capital and use KM tools to capture the tacit knowledge of these experienced soldiers (Sminchise, 2016).

- Various methods and tools of KM have been found effective in the armed forces are CoP, AAR, Gaming, Coaching, Mentoring, Professional Interviews, Lesson learnt and IT-based tools such as Portals, Wiki, Online CoP and Video Conferences (Jabłoński & Lis, 2012).

SECTION-C

2.5 KM Environment and Enablers

Petrufova (2015) says that building a conducive environment is a precondition for efficient KM. A worthy precondition of KM execution is the creation of a friendly, open and non-competitive environment where its people, culture, processes, strategies, tools and technologies are aligned towards the process of creation, sharing and application of knowledge. The atmosphere of the environment in which knowledge is used can be influenced by different preconditions, factors and facilitators labelled as enablers of the KM environment. The basic assumption of an efficient knowledge environment includes free flow of knowledge, information and knowledge system integration, knowledge as the basis of competitiveness, involvement of managers and employees in the exchange of knowledge and eradication of barriers of KM. Weightman and Curson (2018) developed a KM strategy and model to improve the execution of projects, business and people development by establishing a KM environment (KME), a knowledge-creating ecosystem achieved through structured processes, new technology and behavioural changes. KME approach was to integrate KM into the business operation and processes to improve the flow of knowledge so it is available at the point of execution. The KME aims to support the knowledge market of the organisation, wherein the demand and supply of knowledge are exposed, brokered by human and system facilitators and converted into value for the organisation. These values include finding and accessing knowledge for better execution of work and developing competencies at the staff level and developing, preserving and leveraging knowledge for competitive advantage at the managerial level (Van den Bosch et al., 1999). However, as compared to the civil environment, the atmosphere in the armed forces is comparatively volatile, ambiguous, complex, and uncertain. Ozturk (2012) says the military environment is dynamic and not repeatable, and there is no single or correct way to study KM implementations in such organisations.

KM is a complex process and many variables can affect its execution. These elements, often referred to as knowledge enablers, are essential for producing, disseminating and utilising knowledge and fostering a productive KM environment in an organisation (Yeh et al., 2006). These are the organisational processes that can encourage knowledge

development, safeguard knowledge and promote knowledge sharing in an organisation (Ichijo et al., 1998). Andersen and Center (1996) defined KM enablers as the main determinants of KM effectiveness within an organisation. They not only create knowledge in the organisation, but they also motivate the people to share their knowledge and experiences, allowing organisational knowledge to grow concurrently and systematically (Lee et al., 2012). Researchers have listed various enablers for a good KME. For instance, Davenport (1997) identified eight success factors that linked KM to economic performance, structure, culture, technical and organisational infrastructure. Similarly, Shah and Kant (2018) identified 46 enablers from 148 works and found IT infrastructure in 79 pieces, organisation culture in 78 literatures, and knowledge sharing in 57 articles as key enablers. Sanders (2004) listed four enablers of KME for the military comprising of culture, infrastructure, technology and measures. Adnan et al. (2020) suggested five components for enabling knowledge in a military environment organisation that includes organisational culture, structure and IT infrastructure. Schulte and Sample (2006) suggested organisational culture, leadership, commitment to resources and content management as the enablers to promote KM in the military. Similarly, an extensive range of knowledge enablers for a KM environment has been identified in the literature as presented in Table 2.2.

Table 2.2: Summary of enablers of KM environment

Authors, Year	Title	Key Words	Enablers
(Davenport & Prusak, 1998)	Working knowledge: How organizations manage what they know	Top management support Promotion of KM activities Multiple channels of knowledge transfer Motivational rewards Standard and flexible knowledge structure The strong technical and organisational infrastructure Knowledge culture	Leadership Strategy Processes Motivation Structure Infrastructure Culture
(Liebowitz, 1999)	Key ingredients to the success of an organization's knowledge management strategy	KM strategy KM infrastructure Knowledge repositories KM systems and tools	Strategy Infrastructure Processes

		Supportive culture.	Tools Culture
(Chait, 2000)	Creating a successful knowledge management system	Content Culture Processes Infrastructure	Others Culture Processes Infrastructure
(Gold et al., 2001)	Knowledge management: An organizational capabilities perspective	Technology Structure Culture KM processes	Technology Structure Culture Processes
(Forcadell & Guadamillas, 2002)	A case study on the implementation of a knowledge management strategy oriented to innovation	KM strategy Culture Structure Individual Leadership method KM tools	Strategy Culture Structure People Leadership Tools
(Bartczak, 2002)	Identifying barriers to knowledge management in the United States military	Culture Leadership Technology Organisational Adjustments Evaluation of KM activities Knowledge Resources Employee Motivation External Factors	Culture Leadership Technology Strategy Strategy Resource Motivation Others
(Allard & Holsapple, 2002)	Knowledge management as a key for e-business competitiveness: from the knowledge chain to KM Audits	Organisational Structure Technological infrastructure	Structure Technology
(Lee & Choi, 2003)	Knowledge management enablers, processes, and organizational performance: An integrative view and empirical examination	Collaboration Trust Learning Centralisation Formalisation Information technology	People Processes Technology
(Chourides et al., 2003)	Excellence in knowledge management: an empirical study to identify critical factors and performance measures	Strategy Human resource Information technology Quality	Strategy People Technology Others

(Gloet & Terziovski, 2004)	Exploring the relationship between knowledge management practices and innovation performance	Human resource management practices Information technology practices	People Technology
(Mathi, 2004)	Key success factors for knowledge management	People Processes Technology	People Processes Technology
(Wong, 2005)	Critical success factors for implementing knowledge management in small and medium enterprises	Management and leadership support Culture Information Technology Strategy Organisational infrastructure Processes Training HRM	Leadership Culture Technology Strategy Infrastructure Processes Others People
(Marques & Simón, 2006)	The effect of knowledge management practices on firm performance	Continuous learning Understanding of organisation R&D Individual	Processes Strategy Others People
(Schulte & Sample, 2006)	Efficiencies from knowledge management technologies in a military enterprise	Culture Leadership Commitment of resources Content management	Culture Leadership Resource Strategy
(Han & Anantatmula, 2007)	Knowledge sharing in large IT organizations: a case study	Organisation culture Practice Trust Technology Learning Leadership	Culture Strategy People Technology Processes Leadership
(Zack et al., 2009)	Knowledge management and organizational performance: an exploratory analysis	Customer intimacy Product leadership Operational excellence	Others Leadership Others
(Zheng et al., 2010)	Linking organizational culture, structure, strategy, and organizational effectiveness: Mediating	Culture Structure Strategic	Culture Structure Strategy

	role of knowledge management		
(Theriou et al., 2011)	Knowledge Management Enabler Factors and Firm Performance: An empirical research of the Greek medium and large firms	Leadership Culture Technology Strategy People	Leadership Culture Technology Strategy People
(Mills & Smith, 2011)	Knowledge management and organizational performance: a decomposed view	Organisational structure Knowledge application Technology Knowledge conversion Processes	Structure People Technology Strategy Processes
(Manuri et al., 2011)	Strategizing knowledge management in the Malaysian armed forces: Towards knowledge-centric organization	People Culture Processes Technology	People Culture Processes Technology
(Janiszewski, 2011)	Knowledge Management: A Model to Enhance Combatant Command Effectiveness	People Culture Processes Technology	People Culture Processes Technology
(Wang et al., 2012)	Integrating human resource management and knowledge management: From the viewpoint of core employees and organizational performance	Core employee- value and uniqueness Core competence-organisational capabilities	People Strategy
(Walsh, 2015)	Information Sharing between the US Department State and the US Army: Using Knowledge Management Technology and Tools to Bridge the Gap	People Process Technology	People Processes Technology
(Chiu & Chen, 2016)	The study of knowledge management capability and organizational effectiveness in Taiwanese public utility: the mediator role of	knowledge Infrastructure knowledge process organizational effectiveness	Infrastructure Processes Other

	organizational commitment	organizational commitment	
(Novak, 2017)	Knowledge management and organizational performance–Literature review	Technology Culture Structure	Technology Culture Structure
(Nagendra & Morappakkam, 2016)	Knowledge management enablers and barriers in the army: an interpretive structural modeling approach	People Technology Culture Leadership	People Technology Culture Leadership
(Gupta & Chopra, 2018)	Gauging the impact of knowledge management practices on organizational performance–a balanced scorecard perspective	Technology Structure Culture Knowledge processes People Knowledge strategy KM leadership Resource for KM	Technology Structure Culture Processes People Strategy Leadership Resource
(Agrawal, 2020)	Modeling enablers of knowledge management process using multi criteria decision making approach	Knowledge creation Knowledge capture Knowledge organisation Knowledge application	Strategy Processes Culture Structure Infrastructure
(Adnan et al., 2020)		Organisation culture Organisation structure IT Infrastructure	People Technology Culture Structure Infrastructure
(Van Laar et al., 2020)	Measuring knowledge management maturity in US Army headquarters	People Process Tools Culture	People Process Tools Culture
(Agrawal et al., 2021)	Role of Information and Communication Technology (ICT) to Enhance the Success of Knowledge Management (KM): a Study in a Steel Plant	Information Technology Communication Network	Technology

(Sahibzada et al., 2022)	Symmetric and asymmetric modeling of knowledge management enablers to knowledge management processes and knowledge worker productivity in higher education institutes	Trust Knowledge-Oriented Leadership Environmental Uncertainty KM Processes	Processes Leadership Others
(Abualwafa et al., 2023)	A conceptual framework for knowledge management implementation in organizations	Source identification Strategy Infrastructure Processes	Strategy Infrastructure Processes

Source: Compiled by Authors

KM in the military thrives to align people, processes and tools within the organisation to capture, transfer and reuse its key knowledge and lessons learned to help the organisation learn, adapt and improve mission success. It boosts the organisations' capability to spot and eliminate impediments to knowledge flow, thereby promoting mission success (Knowledge Management Operations, July 2012). Based on the literature review, the key KM elements that have been frequently referred to in military organisations are people, culture, processes, strategy and information technology and therefore chosen for the study as discussed below.

Knowledge has meaning only in the human context. Of all the elements of the knowledge environment, people are the most crucial for the success of KM as the knowledge can be transferred between the people and not the war-fighting machines. These include all the people who create, transfer and apply knowledge for the military leader who acts upon it. The knowledge provided by the staff facilitates the military leaders to accomplish situational awareness and shared understanding to undertake informed decisions (Yahya & Goh, 2002). Tacit knowledge gained by the soldiers equips the commanders and decision-makers and proves to be a major tactical advantage on the battlefield (Manuri et al., 2011). KM is about people and human interaction and has evolved critical component of an active KM. Davenport (1999), established KM activities and organisation’s performance and the

significance of the human element required for creating a successful KM strategy. People are the foundation of organisational knowledge creation because they are the ones that generate and share knowledge, thus managing those who are willing to do so is essential (Nonaka & Takeuchi, 1995). Therefore, an essential element for an establishment to be successful in driving a conducive KM environment is to encourage people to communicate and share their knowledge with others (Wiig, 2012).

Al Saifi (2015) defines organisational culture as a multifaceted entity of values, beliefs, behavioural norms, meaning and practises shared by personnel within the organisation. Culture has multi-level characteristics comprising artefacts, espoused beliefs and values and basic underlying assumptions. KM cannot be effective without addressing organisational culture. The culture of the organisations evolves and adapts to the impediments and changes in the environment (Fong & Kwok, 2009). Knowledge-sharing culture is a preliminary requirement of an effective KM. The organisational culture affects how individuals interact, the environment in which knowledge is produced, their willingness to accept certain changes and ultimately, how they share knowledge (Del Giudice et al., 2012). Organisational culture is the combination of shared values, norms, beliefs, assumptions, and attitudes mainly implicit that are possessed by the members of an organisation. Organisational culture, according to many academicians, has a substantial impact on the KM environment and is directly related to organisational performance (Davenport, 1997; Gold et al., 2001; Holsapple & Joshi, 2002; Sin & Alan, 2000). Ajmal and Koskinen (2008) state that, the success of KM in an organisation is accomplished by developing an aiding culture. Therefore, the culture of the company plays a crucial role in its capacity to maximise the value of its intellectual assets (Chang & Lin, 2015). Shaping an organisation's culture is of utmost significance in nurturing a knowledge environment, where the acquisition of knowledge is regarded as a significant duty of each individual and backed by the organisation and its members (Ashkanasy et al., 2000). Military organisations are a legion of myriad cultures where people from diverse cultures across the country joining the organisation bring their own culture with them which gets amalgamated and shaped with the culture of the organisation. Therefore, building a culture with easily accessible knowledge is necessary for management in establishing a positive KM environment.

The KM process are the actions or efforts that support and facilitate the production, exchange, and application of knowledge for the benefit of the organisation. These are interconnected groups of different business processes that have been built within an organisation and they mostly involve the gathering, conversion, application, storage and preservation of knowledge (Chiu & Chen, 2016). The KM Process facilitates appropriate processes and systems that support a KM environment (King, 2009). The complete KM process can be broadly classified into four components comprising of knowledge identification and creation, knowledge capture storage, knowledge transfer and application. Knowledge creation involves the conception of new content or replacing existing content of tacit or explicit knowledge within the organisation through the social, collaborative and individual cognitive process (Norman, 2004). Knowledge storage refers to a constant process of maintaining and managing knowledge in the organisational memory or knowledge database (Chiravuri et al., 2011). The stored knowledge needs to be updated, arranged and structured such that it is easily distributed and recovered by the user as and when required at the same time redundancy is reduced and efficiency can be improved (Alavi et al., 2005). Sharing of knowledge is the most vital process of KM. Knowledge sharing can be defined as the process of disseminating, transferring and exchanging knowledge among employees and at the location where it can be utilised. This process helps employees to exchange explicit knowledge and more importantly, tacit knowledge to generate new knowledge before the tacit knowledge is lost (Yang, 2004). The accomplishment of any KM programme initiative depends on how the knowledge is applied in the organisation, especially for solving the problems arising in the organisation. Knowledge application is defined as transforming knowledge into practical application. The actualised knowledge can be used to improve efficiency, reduce costs, solve problems and make the activities of the organisations more appropriate for use (Santos et al., 2021). Literature indicates that knowledge process enhance organisational functions including innovation, teamwork in decision-making and individual and collective learning. They are also seen as a crucial prerequisite for creating a positive KM environment in an organisation. (Argote et al., 2000; Chiravuri et al., 2011; Lee Endres et al., 2007; Navimipour & Charband, 2016; Patrick & Dotsika, 2007). The KM process of identification, creation, capture, storage, sharing and application needs to be integrated into the staff and organisational processes used in the preparation and conduct of the military operation. This integration facilitates the transfer of knowledge at all levels which can be applied across all the soldiers, teams and units. For military leaders and decision-makers, the

KM process in the armed forces ensures that knowledge products and services are accurate, pertinent, timely, and usable (Knowledge Management Operations July 2012). Through the KM process, the knowledge executives support military bosses and the staff in following comprehensive KM practices.

Theriou et al. (2011), say that an effective KM begins with an appropriate strategy. Knowledge strategy is a vital enabler that affects the direct application of KM. M. Zack (1999), defined KM strategy as the approaches an organisation employs to align its knowledge resources and capabilities to the rational requirement of its organisation's strategy. KM strategy determines the needs, means, and activities for building a comprehensive KM environment to accomplish organisational objectives. The objective is to manage, share and create relevant knowledge assets that will help meet tactical and strategic requirements (Gamble & Blackwell, 2001). Fong & Kwok, (2009) says, the KM strategy of an organisation should reflect the organisation's competitive strategy as decided by the top management. McInerney et al. (2011) defined two types of KM strategy namely codification and personalisation strategy. The codification strategy represents the knowledge that is stored in the organisation's database. Codification formalises an organisation's knowledge for a wide-ranging scale of utilisation so that any employee can access and use the knowledge without any difficulty. Codification connects people with information and is generally appropriate for managing explicit knowledge. Whereas, the personalisation strategy focuses on knowledge that is mainly stored in the brains of employees and sharing relies profoundly on human interaction i.e., connecting person-to-person transfer of implicit knowledge. Literature states that KM strategy should be integrated with the organisational business strategy to develop a positive knowledge environment to enhance organisational performance (Cook, 1999; Liebowitz, 1999; Maier & Remus, 2002; Zack et al., 2009). The KM strategy should include the implementation of KM initiatives through the use of various KM tools like collaborations, conferences, personal interaction, job rotation etc. Browning & Magazine (2002), observed that the KM strategy is the core of the military knowledge uprising, which will be a key element for military operations, knowledge creation, information delivery and technology innovation.

Initial research on KM focused on information technology (IT) as the key enabler of information and knowledge transfer. Most of the organisations made substantial investments

in IT comprising both hardware and software to augment their KM initiatives (Benbya, 2006). The implication of IT on the performance of the organisation has been a continuing research theme in the literature. While some studies have discovered a strong correlation between IT and company performance, others have not (Devaraj & Kohli, 2003; Davenport & Prusak, 1998; Holsapple & Joshi, 2002). Tanriverdi (2005) says, that IT may not directly influence the firm performance, but it enables KM and KM improves firm performance. Alavi and Leidner (2001) say IT support KM in sundry ways like searching database, directories, and expert and virtual collaborations. Malhotra (1999) substantiates this view and claims that the mechanistic and rigid character of IT-based KM prevents it from keeping up with the dynamic demands of knowledge development, hence IT only plays a limited role in knowledge creation. Similarly, Starns and Odom (2006) say technology performs a supportive role in KM in an organisation, as an organisation is a purposeful human activity system comprising people who make up the organisation, and the technologies enable or facilitate these activities. Lee and Choi (2003) state that technology as an enabler is debatable as it can offer a great advantage in certain areas of KM, but can sabotage the KM process. Emadzade et al. (2012) examined that the presence of proper IT is a basic need for KM; however, the relationship between IT and organisation performance has remained inconclusive. Maule (2011) says for a military organisation, integration of systems, technologies and information resources under the umbrella of KM is the only means to maximise productivity in the military. Military organisations have been early adopters of IT; however, it is still in the early stages of using IT as a strategic tool to filter information into knowledge. Also, the threat of information security is much more critical for defence organisations like IAF, considering the sensitivity of the information handled by the defence forces (Ali & Tang, 2022; Joshi & Singh, 2017). Therefore, just deployment of IT tools for the management of organisational knowledge would not be adequate and impetus is to be given to information and knowledge security as well. Under such conditions, the relationship between IT, KM, and organisation performance in a military organisation like IAF needs further exploration.

SECTION-D

2.6 Knowledge Management Tools

The KM tools are methods, systems, processes and software used to put individual and organisational knowledge into organised frameworks. These tools could be anything used to exchange and maintain information and knowledge as determined by the objective and mission. KM tools can range from collaboration tools like communities of practices, expert location tools, data analysis tools, after-action reviews etc. Ghani (2009) says KM tools are necessary to gather, classify, organise, communicate, and transmit knowledge or information that is embedded in a variety of formats and types of documents and media. These tools are focused on the adaptation, conception and erudition of data and information by people who will then transform data and information into knowledge. The KM tools have also found their place in various KM initiatives by certain militaries across the world. The Department of Navy of the U.S. claims that through increased effectiveness, productivity, quality, and innovation, KM tools support improved performance. By utilising human capital, KM tools also boost the financial value of the company (Schulte & Sample, 2006). Some of the KM tools being used by various military organisations across the world include Knowledge Portals (e.g. Army Knowledge Online -U.S. Army, Battle Command Knowledge System- Defence Force U.S., KARANET-Turkish Army), Communities of Practice, Expertise Yellow Pages, After Action Review (e.g. Army Lesson Learned Knowledge Warehouse of Land Force Command and Control Information System of Canadian Forces) Coaching, mentoring, professional interviews, lesson learnt and video conferences, with all focused towards improving organisational learning, innovation, performance, and providing military decision-makers with timely, accurate and relevant knowledge (Adkins et al., 2010; Bryant, 2002; Champoux et al., 2004; Lausin et al., 2003; Walsh, 2015).

An ample number of KM tools are specified in the literature or available on the internet for example, the KS Toolkit website (http://kstoolkit.org) and the website for the United Nations Development Programme (UNDP) (http://practices.undp.org/cpr/) has a wealth of tools to choose. Bheenick and Bionyi (2017) say there are more than 180 KM methods and tools available. Though lists are comprehensive, however, selecting the desired tools or categorising the tools as per the user's context could be a daunting task for KM

practitioners. Therefore, to facilitate KM practitioners to identify a narrow range of the most optimal KM methods and tools, various practitioners and scholars have shortlisted these tools into various categories. For instance: Ghani (2009) has categorised KM tools as per the functioning and processes of KM like (i) Tools to access knowledge, for example, Conversion and retrieval for indexing and classification of experts, (ii) Tools for knowledge mapping for quick support of information, examination and decision making, (iii) Tools for knowledge extraction that support structured queries and responses, (iv) Tools for expertise localisation to quickly locate domain experts in the organisation and (v) Collaboration tool to provide dedicated shared space for organising discussion and interactions, categorising, organising and managing information and knowledge for example Anacuis and Quick Place. Surve et al. (2015) classified KM tools as per various KM variables comprising of (i) Internal and external intellect, (ii) Creating, culturing and capturing, (iii) Organising, storing and accessing, sharing and transferring, (iv) Facilitating, motivating and synergising, (v) Tracking, monitoring, and measuring (vi) Using and reusing. The Asian Productivity Organisation selected the KM tools and techniques based on the best KM practices across the world and suggested KM and tools for each five-step KM process comprising knowledge identification, creation, storing, sharing and application (Young, 2010). KM tools have also been classified based on IT applications like artificial intelligence tools, document and content management systems, intranets, search engines, database management systems and knowledge mapping tools. Surve et al. (2015) classified KM tools based on the types of knowledge for example data warehousing for managing explicit knowledge and tools like video conferencing, groupware, social networks and collaboration tools for sharing tacit knowledge. KM tools have also been categorised by researchers as web-based technologies like traditional database tools, process-modelling tools, workflow-management tools, enterprise-resource-management tools, agent tools, search engines, visualising tools and collaborative tools. The UNDP formulated a comprehensive list of KM toolkits to assist UNDP KM workers in crisis and post-crisis situations (Lattimer et al., 2007).

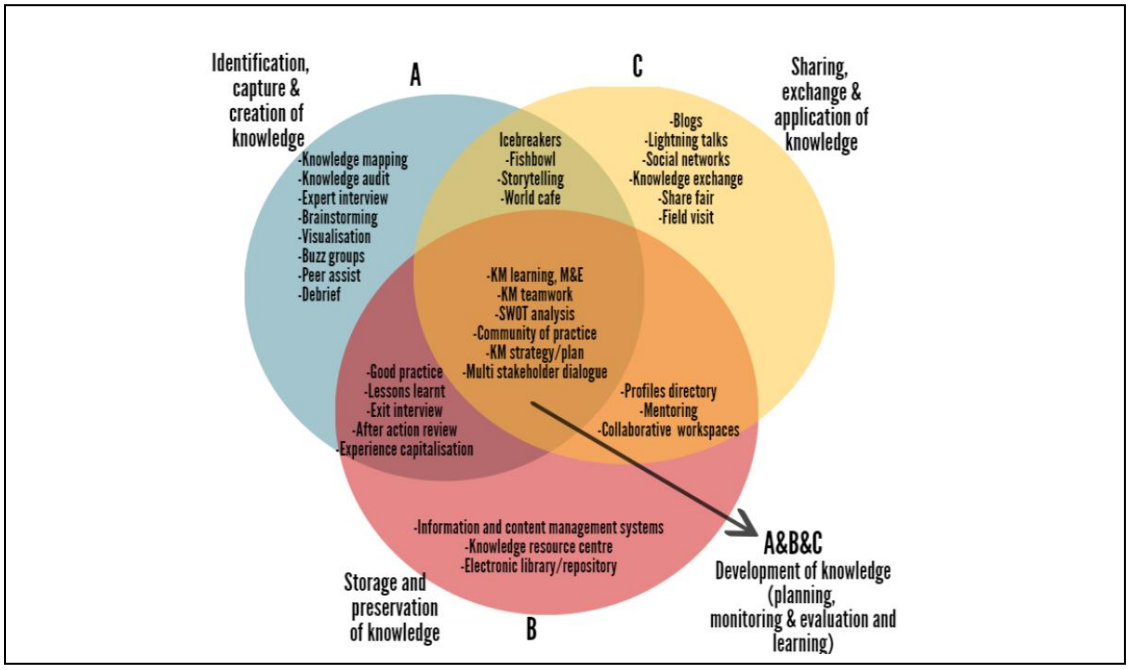
Various stages of the KM process involving identification, creation, storage, sharing and application of knowledge through listed and discussed separately, they are interconnected and overlapping to enable learning. Bheenick and Bionyi (2017) explained this approach of KM comprising of overlapping stages rather than a linear process as mentioned below: -

(A) Identification, capture and creation of knowledge,

(B) Storage and preservation of knowledge and

(C) Sharing, exchange and application of knowledge.

The intersection of A, B & C indicates the KM process that is at the centre of KM and which may not be evident from an external perspective like the development of knowledge through planning, monitoring, evaluation and learning. Bheenick and Bionyi (2017) shortlisted a cluster of 35 KM methods and tools after removing the dubious, duplicate or similar tools and ranked them as per the frequency of their use. These tools were further categorised and associated with the stages of the KM process described above. Fig. 2.2 below combines the perspective of the overlapped KM process with various KM methods and tools associated with each stage.



Source: (Bheenick & Bionyi, 2017)

Fig. 2.2: Categorisation of KM Tools as per KM Process

This categorisation offers a better understanding of the process and tools and at the same time facilitate KM practitioner to discover a variety of techniques and tool clusters that

they might use, based on their needs for reinforcing a particular stage of the KM process or applying holistically. This gives flexibility to KM practitioners to identify the process steps they wish to deal with while implementing KM initiatives in an organisation and accordingly choose the relevant tool applicable for that step. This provides a very useful method to achieve an immediate victory within the organisation embracing KM. For the current study, the KM tools were further shortlisted to identify 15 KM tools after discussion with the experts considering their relevance for the IAF and comparing the list with tools and techniques that the world's most successful organisations have used in KM initiatives as specified by Ghomi and Barzinpour (2018) and worlds best practices mentioned by Young (2010). These tools were then categorised in the KM process framework specified by Bheenick and Bionyi (2017). The KM tools used for the study are as follows: -

2.6.1 KM Tools for Identification and Creation of Knowledge

After Action Reviews (AAR): Knowledge transfer tools need to focus on linking people and developing social networks as the tacit knowledge gained based on experience and expertise can be transferred principally through conversation and feedback on direct observation of activity. AAR is one such technique to transfer tacit knowledge (Ramalingam, 2006). AAR is an expert discussion (verbal) of actions posts a training event, combat operation or mission. AAR aims to discover answers to questions like what happened, why happened, what should have happened, what went wrong, what went well and what lessons can be learned from the experience (Orhan, 2005). AARs are an excellent way to convert tacit knowledge into explicit. In military organisations, lessons learned from wars and operations are one of the most valuable knowledge areas, which steer further change in strategies and tactics to improve structures and efficiency. From ancient times, the lesson learned from the successes and failures in warfare has guided the militaries around the world to mend the ways of doing things to improve their performance in case of conflict (Army, 2005). The essence of an AAR is one of open learning and not about problem-fixing or allocating blame. Therefore, all the participants are required to be provided with an equal opportunity to share their experiences. The U.S. Army and Israeli Defence Forces are known to use KM in the process of AAR (Ouriques et al., 2019).

Celebrating Knowledge: Celebrating knowledge is rewarding and recognising the individual and team members for sharing their knowledge and adding value to the organisation. Van Gelder (2011) says "People will forget what you said. People will even forget what you did. But people will never forget how you made them feel". If the individuals and team members are rewarded for sharing rather than hoarding their knowledge, it will increase members' satisfaction as well as progress organisational worth. In the armed forces, soldiers are rewarded for their bravery and their exceptional performance and achievements (Serrat, 2017). Though this motivates individuals to excel, however, if the accolade is granted for sharing knowledge, then this will increase the knowledge base of the organisation. For instance, if an individual is awarded for sharing his expertise and knowledge with ten individuals to bring them to his expertise level, then this would expand the expertise level of the organisation in the long run and also reduce the dependency on the individual (Ghani, 2009).

Communities of Practice (CoP): A CoP is a group of committed individuals who share a common desire or concern for something they do and learn to do it better as they interact regularly (Vaccaro et al., 2010). In the context of KM, CoPs are formed internally or instantly to share and develop shared skills, information, and expertise among the community members. Members of CoP collaborate in an unstructured manner while aligning their interests with an open mandate from their organisation (Ruggles, 2009). An institution that aims to be a learning organisation needs to empower people in their work and CoP is a convincing way of doing so. The concept of CoPs was conceived in the U.S. Army in 1990 to facilitate young knowledge workers to learn from each other. Realising the potential of knowledge sharing CoPs were formalised in 2000 and a dedicated forum on the website was launched in the U.S. Army (Adkins et al., 2010). Instead of importing knowledge into the organization, a CoP aims to foster the development of the knowledge that is required internally. The basic aim of CoPs was to provide a mechanism to communicate, share knowledge, strengthen volume, solve problems and share practical knowledge between those facing similar issues which no doctrine can document most rapidly and effectively. Adkins et al. (2010) narrate how CoP turned out to be a blessing for successful mission accomplishment during the Afghan War.

Knowledge Audits: A knowledge audit is a review to understand the standing of an organisation concerning its KM systems and knowledge assets. It is a methodical and composed evaluation of the adequacy and integrity of significant organisations' assets and systems. A.J.L.H.A. Hylton (2002) defines “A knowledge audit is a scientific investigation and evaluation of the knowledge resource of the organisation. It aims to measure the knowledge risk and knowledge opportunities, investigate and analyse the knowledge environment and knowledge health of the company and provide evidence as to whether the organisations’ knowledge value potential is being enhanced. The audit process encompasses thorough investigation, examination and analysis of the complete life-cycle of organisations' knowledge: where knowledge exists and who owns it, who produces and uses it, how frequently is the knowledge used, and where is the knowledge stored." (Liebowitz et al., 2000). A KM initiative fails if it does not include a proper KM audit, therefore a knowledge audit is a mandatory primary step in a KM process. It offers identification, measurement, quantification, and evaluation of all implicit and explicit knowledge held by the organisation. A knowledge audit intends to find the answers to questions like What knowledge exists in my organisation and where is it housed? What expertise exists in my organisation and who knows what? What applicable expertise exists outside my organisation and how to gain its access? (Liebowitz, 1999). Different methods can be used to gather relevant data for a knowledge audit like interviews, online surveys, focused group discussions, business process and workflow analysis, IT system analysis and content analysis (Ramalingam, 2006).

Wall of Ideas: A Wall of Ideas can help team members to share ideas, gather suggestions or even discuss problems. People are encouraged to write comments, share thoughts, quotes, put pictures and so on, related to a certain problem or topic on a whiteboard or pinboard set up at a prominent spot in the workplace. The topic could be general, such as: "What all good practices you observed this week" or specific such as "How to improve the knowledge environment?" (Bagavathi & Computation, 2019). Wall of Ideas inspires individuals to think creatively. It also deters people from giving up ideas too soon. Whims and inspirations are shared with others, possibly inspiring them in turn (Rachapaettayakom et al., 2018). Wall of Ideas can be placed prominently everywhere, including workplaces, workshops and others. It helps in discussing a subject that requires a new perspective or has to be examined from several viewpoints. The meeting can be held informally in front of the Wall of Ideas. This encourages discussion of the subject matter (Tiwana, 2008).

2.6.2 KM Tools for Capture and Storage of Knowledge

Exit Interviews: A KM tool for capturing knowledge from those who are leaving the organisation to harness the vital knowledge of these experienced personnel and shorten the learning curve of the incumbents. Traditionally exit interview was to collect feedback from the leaving employees along with the satisfaction survey. Exit interviews have, however, been built upon and reintroduced as a KM tool. The interview now seeks to capture the understanding of what is needed to accomplish the job, rather than just HR information. Exit interviews can benefit the organisation as well as the departing employees in equal measure. The company benefits by keeping some of the retiring employee's expertise and making it accessible to others, while the departing employee gets to describe their special contribution to the company and feels proud to have made a difference in the organisation he has served (Perjanik, 2016). The exit interviews find more relevance in the armed forces, as to keep the force young and fighting fit, the organisation by the policy itself encourage its soldiers to retire by 15-20 years of service. These soldiers take with their wealth of experience and knowledge accumulated over many battlefields, deployments, practices, exercises etc (Singh, 2020).

Experience Capitalisation: In Experience Capitalisation, with the ultimate goal of changing institutional practice, essential stakeholders turn institutional and individual experience and knowledge into capital that can be used in the future. Experience capitalisation is future-focused since it uses the lessons learned from the past to adapt future practices. When there is a need for change and when there are prospects to bring about change, capitalising on experience is a worthwhile procedure since it consists of learning processes that get people ready for change (Lattimer et al., 2007). Experience Capitalisations can be brief, straightforward discussions among a small group of people or they can be more in-depth and last for a longer time. The focus can be strategic orientation, operational activities or basic concepts. Lessons-Learned and Good-Practices are the outcomes of experience capitalisation. Only when a practice has been changed can experience capitalisation achieve its goal (Bagavathi & Computation, 2019). The process of capitalising experience is not standardised. For a result that is practical and straightforward to implement, it is necessary to have clear objectives, concise questions, and a conscious willingness to

change. Knowledge Capitalisation is an intricate process involving information and communication management and includes various stages such as identification of innovative practices and relevant information and knowledge, documentation of information and knowledge gathered, a transformation of the practices into a wide range of materials like brochures, manual and video so that can be used by the target audience, exchange and dissemination of practices to the desired users and finally appropriation of knowledge so that newly adopted knowledge is put into practice (Al-Ghassani et al., 2005).

Experts Directory: An organisational expert directory is a tool to assist people in locating others within their organisation who have the knowledge and experience they require for a specific activity or project. It is similar to an electronic employee directory but with information about each person's knowledge, ability, competence, experience, interest, and hobbies instead of just names and contact information. It is also sometimes referred to as the Yellow-Pages, Skill-Directories or Capabilities-Catalogue (Caruso, 2017). As they are in electronic form, expert directories are highly advantageous in an organisation like the military which is of a sizable amount and scattered across different locations, as the people don't get an opportunity to interact across the spectrum. An expert directory has the potential to systematically encourage relationships that could otherwise occur randomly, opening up fruitful new chances for collaboration. A regular, efficient exert directory enables and enhances the rapid, fluid connections across an organisation that are at the heart of the learning organisation. It would help identify the experts to avail of their services as and when required. At the same time, this would serve as recognition and motivation for knowledge experts to have their names in the domain expert list. Online blogs or forums could be formed where any query from an individual is replied to by these knowledge experts from anywhere in the organisation (Lattimer et al., 2007).

Knowledge Portal: A Knowledge Portal offers users a one-stop shop for all the knowledge and information they need to complete a task. Van Baalen et al. (2005) say, that capturing knowledge and expertise produced by knowledge workers and making it accessible to others within the organisation is a core function of a knowledge portal. Knowledge Portals can help with these objectives by serving as a single point of access software system, facilitating quick and simple information access and assisting communities of knowledge workers with shared objectives. A Knowledge Portal offers access to much more than just

distributed online information, such as papers returned by searches, news feeds and links to specialised websites (Detlor, 2004). Murray (1999) identified four discrete types of portals: (i) enterprise knowledge portals, which combine all the aforementioned features, (ii) enterprise information-portals to connect people with information, (iii) enterprise collaborative-portals to provide a variety of collaborative features for people to connect, (iv) enterprise expertise-portals to connect people based on their experiences, abilities, and interests. Mack et al. (2001) defines a knowledge portal as an information portal which aims to facilitate the task executed by knowledge workers. This entails obtaining pertinent information organising it, compressing it, analysing it and communicating to other knowledge workers what has been learned. Creation and sharing of knowledge are practised in some of the world's prominent militaries using various IT platforms. For instance, 'Land Force Command and Control Information System (LFC2IS)' by the Canadian Force (Champoux et al., 2005), 'KARANET' used by the Turkish Army, and the Knowledge home portal, a Virtual program office by US Navy (Bouthillier & Shearer, 2002).

2.6.3 KM Tools for Sharing and Application of Knowledge

Best Practices: One of the initial steps in a KM strategy is to identify and share good practices. To find and communicating the best or good practices, frequently starts with common practices like instruction manuals or how-to recommendations. A best practice is just a system or process that reflects an efficient way to accomplish a particular goal, or simply a productive practice and yields positive outcomes. Best practices as a KM tool combine two complementary components comprising a good practice database, which connects people with information, and communities of practice, which facilitate the exchange of tacit knowledge by bringing people together (Serrat, 2017). A database can include sufficient details so that a desired user can locate of the needed best practices and assess its value. The best way to share best practices, however, is on the job, thus communities and direct interaction with others who have employed the good practices are essential for success. Learning from others and reusing information is at the heart of identifying and sharing best practices. The most significant advantage is the presence of thoroughly developed procedures built on years of expertise. For armed forces which are scattered at dispersed locations, sharing of best practices followed at one place with others

performing a similar task at a widely dispersed location can be highly advantageous in eliminating bad practices or re-inventing the wheel (Schulte & Sample, 2006).

Knowledge Fairs: Knowledge fairs are conducted to share exchange and disseminate knowledge and expertise across the organisation. It is an event created to disseminate a substantial amount of knowledge from various professional sources at a central location using speakers, exhibit booths, demonstrations, displays and visual aids. A face-to-face method for sharing experiences, encouraging exchange and promoting new ideas and concepts. A knowledge fair facilitates the dissemination of a large amount of information and visitors can focus on specific interests and interact directly with the presenter to clarify their queries. The visitors can establish contacts and often network with developers for further exploration of topics and reinforce their teamwork. Knowledge fairs also offer opportunities to highlight best practices and accolade individual and team accomplishments. A knowledge fair is suggested when there is a lot of information to communicate with a broad audience and participants need a wider viewpoint as well as a chance to individually interact on specific issues. It is a substitute for outdated presentations when a more collaborative experience is desired. If the organisation wants to adopt and maintain a horizontal mode of operation and cooperation, a knowledge fair is also important. Such a strategy could encourage a new organisational dynamic (Young, 2010).

Peer Assist: Peer Assist is a KM tool which advocates for 'learning before doing' processes. It is a process whereby a group of people who are starting a project or activity call for a meeting or workshop to learn and gain insight from those who have already completed a task. The necessity to start from scratch is evaded, and the likelihood of making the same mistakes is decreased by utilising the knowledge of professionals. This is particularly significant in military organisations where work is generally in an emergency or post-emergency environment, time for strategic planning is often inadequate and errors may have severe consequences (Orhan, 2015). Peer Assist means utilising previously acquired knowledge and experience. To apply peer assist, a team or group must first choose the appropriate individuals, and they must then follow a methodical procedure to gain from their wisdom and experience (Tsui, 2003). Peer assist is a planning method that entails obtaining information before starting a project. It is also helpful when working through a particular issue or situation. Peer help learning is immediately applicable because it is narrowly focused

on a single job or issue. Peer Assist encourages learning between teams and fosters the growth of solid interpersonal relationships. Peer help can improve the mutual learning between individuals and groups within an organisation if they are carried out successfully.

Storytelling: An ancient art of sharing knowledge more expressively and interestingly, especially tacit knowledge and also an effective way to build high-performance work teams. Storytelling is the simplest term is the use of stories as a communiqué tool to share knowledge in an organisation. Since ancient times, people have used stories to exchange knowledge and foster understanding. The deliberate use of it as a tool for knowledge sharing, on the other hand, is relatively new and expanding quickly, to the point where it is turning into a preferred method among an expanding number of KM consultants (Serrat, 2008). Comparing storytelling to conventional organisational methods, there are several benefits. A traditional means of communication is generally dry and lacks inspiration, whereas storytelling employs a variety of strategies to enthral, involve, and inspire audiences while employing language that is more reliable and a narrative format that people find intriguing and entertaining (Henriques et al., 2009; Ngai & Chan, 2005). Simple stories can reveal intricate patterns and more profound realities. It makes it possible to represent both factual and emotional information, making it possible to articulate tacit knowledge that might otherwise be impossible to transmit. The difference in relationship and trust, as well as insight, is made through being moved by other people's tales. By grounding facts in a narrative structure, learning becomes easy and simple. In the armed forces various accidents/incidents, the court of inquiries and the lessons learned could be disseminated in the form of stories during training lectures, informal gatherings, and flight safety meetings for better appreciation and assimilation (Perjanik, 2016).

Mentoring: Henriques et al. (2009) defined mentoring as an interpersonal connection in which a senior or more experienced individual supports a junior or inexperienced employee to learn the traits of the job, help in securing a position within the company and prepare for a higher role. A mentor is typically an older, more seasoned someone who holds a higher position in the organisation or profession. A mentor offers career advice, offers personal support, and helps the co-socialisation process in the organisation (McManus & Russell, 1997). A mentor job is intense and long-lasting, Bryant and Management (2005) say a mentor role generally includes: teaching (doing the work,

laying out the organisation's road map, and providing career counselling), organisational interventions (protection, marketing, and granting access to resources), and sponsorship. Studies indicate that mentoring accrues benefits to all those involved in the process including the individual, mentor and organisation. The organisation gains from improved information sharing among staff members as well as increased output and performance. Bello et al. (2013) say mentoring can enhance better organisational commitments, knowledge retention, managerial succession and productivity. Early professional success, career accomplishment, and greater job satisfaction are positive outcomes for people. In exchange, the mentor can earn advantages by gaining prestige and developing relationships, he has the chance to put the junior protégé's knowledge, ability, and abilities to use while also learning fresh perspectives or skills from them (Wasburn & Crispo, 2006). Mentoring also improves efficient information transmission and gives people a way to receive in-depth training and socialisation over longer periods. Additionally, mentoring promotes professional development through the exchange of knowledge, values, and behaviours, as well as improving job satisfaction for all parties involved (Hedlund, 1999).

SECTION-E

2.7 Organisational Performance

Gold et al. (2001) determined that managing knowledge assets had a good impact on innovation, spotting opportunities, coordinating the activities of several departments, adjusting to unforeseen changes, and meeting new customer expectations. Organisational performance can be defined as company performance compared to goals and objectives. Organisations have realised that to succeed, they must effectively manage knowledge and regard it as an advantage (Massingham, 2018). Most organisations are willing to engage in KM to improve organisational performance to acquire a competitive edge. KM facilitates an organisation to be faster, more efficient, and more innovative; therefore, effective KM is considered a valuable activity due to its consequences on firm performance (Jyoti & Rani, 2017). Continuous performance-related measure measurement is crucial to determining whether KM techniques have been implemented successfully. The measures of organisational performance are the means to gauge the achievement of organisational goals and outcomes resulting from KM efforts. Tseng and Lee (2014) say that for an organisation

to enhance its performance, it is crucial to establish a comprehensive measurement index that provides managers and staff with clear directions and goals set by the enterprise. Traditionally, the measures of organisational performance were typically limited to financial measures like income, share and sales; however, over a while, other non-financial measures have gained equal traction. This takes into account a variety of factors such as customer satisfaction, innovation, and operational effectiveness (Zaied et al., 2012). Many researchers have analysed the outcome of KM using various measures of organisational performance; some of them are mentioned in Table 2.3.

Table 2.3: Measures of Organisational Performance

Authors, Year	**Title**	**Measures of Organisation Performance**
(Deshpandé et al., 1993)	Corporate culture, customer orientation, and innovativeness in Japanese firms: a quadrad analysis	Sales growth Market share Profitability
(Davenport, 1997)	Ten principles of knowledge management and four case studies	Organisational effectiveness Survival Improvement Innovation
(Baker & Sinkula, 1999)	Learning orientation, market orientation, and innovation: Integrating and extending models of organizational performance	Overall performance New product success Change in relative market share.
(Gold, Malhotra, & Segars, 2001)	Knowledge management: An organizational capabilities perspective	Ability to innovate Coordination of efforts Commercialisation of new products Ability to anticipate surprises Responsiveness to market change Reduced redundancy of information/ knowledge
(Thomas & Keithley, 2002)	Knowledge management improves performance	Improved ability to attract, train, develop, and retain an employee.

(Sher & Lee, 2004)	Information technology as a facilitator for enhancing dynamic capabilities through knowledge management	Operating costs, shorten lead time, and differentiate products.
(Marques & Simón, 2006),	The effect of knowledge management practices on firm performance	Continuous learning Understanding of organisation Innovative culture Competence development
Lecocq and Gauvin (2006a)		Knowledge-creation (efficiency, resource optimization improved decision, improved focus and vision, mission success, and good communication), Learning (motivation, adaptability, problem-solving, satisfaction and recognition) Collaboration (trust, leadership, common goal, achieving objectives, reduced duplication, knowledge sharing, and efficiency)
Schulte and Sample (2006)		Saving time and money Quality and efficiency Reduced training time or learning curve Customer satisfaction Faster response Improved employee satisfaction
(Wu & Lin, 2009)	Case study of knowledge creation facilitated by Six Sigma	Improving coordination efforts
(Ho, 2009).	The relationship between knowledge management enablers and performance	Factor strategy Leadership
(Esper *et al.*, 2010)	Demand and supply integration: a conceptual framework of value creation through knowledge management	Profitability Sales growth Overall customer satisfaction
(Vaccaro, Parente, & Veloso, 2010)	Knowledge management tools, inter-organizational relationships, innovation and firm performance	Cost and profitability

(Storey & Kahn, 2010)	The role of knowledge management strategies and task knowledge in stimulating service innovation	Developing new services.
(López-Nicolás & Meroño-Cerdán, 2011)	Strategic knowledge management, innovation and performance	Financial/market performance (profitability, growth and customer satisfaction); Process performance (quality and efficiency); Internal performance Individual capabilities (employees' qualification, satisfaction/creativity)
(Alwis, 2011)	Knowledge management and organizational performance	Financial measures (return on equity, return on investment) Operational measures (market share, sales growth, and, profit growth)
(Mills & Smith, 2011)	Knowledge management and organizational performance: a decomposed view	Organisational structure Knowledge application
(Zaied *et al.*, 2012)	The role of knowledge management in enhancing organizational performance	Market share Profitability & growth rate Innovativeness Customer satisfaction Sales growth Efficiency & Effectiveness Return on investment Productivity Competitiveness
(Gholami *et al.*, 2013)	Investigating the influence of knowledge management practices on organizational performance: an empirical study	Productivity Financial performance Innovation Work relationships Customer satisfaction.
(Nunn & Wong, 2013)	Critical success factors for implementing knowledge management in small and medium enterprises	Problem Solving Customer Satisfaction Professional Development Employee Satisfaction Improved Skills

(Becerra-Fernandez *et al.*, 2014)	On knowledge, knowledge management, and knowledge management systems: an introduction	Innovation
(Kaur, 2014)	Knowledge Management and Firm Performance: A Descriptive Study	Effectiveness Competitive advantage.
(Sarkindaji et al., 2014)	Knowledge management and organizational performance of mobile service firms in Nigeria: A proposed framework	Return on assets Sales growth New product success.
(Tseng & Lee, 2014)	The effect of knowledge management capability and dynamic capability on organizational performance	Corporate performance Supplier-relationship management.
(Amir & Parvar, 2014)	Harnessing knowledge management to improve organisational performance	Customer intimacy Leadership Operational excellence Financial performance Competitive advantage Learning curve Commitment and loyalty Decision making Sustaining mission-critical knowledge Learning lessons Solving problems Benchmarking Efficiency
(Bender, 2014)		Decision Superiority Information Superiority Improved Awareness Constant Evolving Learning Optimised Knowledge Process Knowledge Prioritisation
(AL-ARIMI et al., 2016)	The moderating effect of Islamic work ethics on the relationship between knowledge management capabilities and organizational performance at the private higher education institutions in Oman	Organisational structure Knowledge application.

(Novak, 2017)	Knowledge management and organizational performance– Literature review	Financial performance Innovation performance Growth performance Operational performance Competitive advantage Value creation
(Abuaddous *et al*., 2018)	The impact of knowledge management on organizational performance	Well-constructed culture
(Saqib et al., 2018)	Integrating knowledge management and business intelligence practices to improve organizational performance	Productivity Awareness Profit Reputation Wealth.
(Gupta & Chopra, 2018)	Gauging the impact of knowledge management practices on organizational performance–a balanced scorecard perspective	Learning and Growth Internal process Customer satisfaction Financial performance
(Meher & Mishra, 2019)	Assessing the influence of knowledge management practices on organizational performance	Organisation structure Organisation culture Innovative capabilities Organisation learning Knowledge integration Knowledge sharing Employee commitment
Van Laar et al. (2020)	Measuring knowledge management maturity in US Army headquarters	People (KM terms and reference, KM responsibilities, Subject Matter Experts) Process (Operational process, Community of Practice) Tools (Collaboration, learning, virtual communities) Culture (Trust, Learning environment, SOP)
(Rezaei *et al*., 2021)	Factors Affecting Knowledge Management and Its Effect on Organizational Performance: Mediating the Role of Human Capital	Structure Strategy Technology Culture Leadership Trust

(Delshab et al., 2022)	The impact of knowledge management on performance in nonprofit sports clubs: The mediating role of attitude toward innovation, open innovation, and innovativeness	Finance Sport Member Strategy

Source: Compiled by the authors

SECTION-F

2.8 Research Gaps

The literature available in various domains of KM such as knowledge process, knowledge strategies, knowledge cycle and knowledge tools are voluminous (Farooq & Systems, 2024). These studies are dominated by sectors such as private and public sector industries, educational institutions and IT organisations (Farooq & Systems, 2024). In these organisations, knowledge enablers and KM tools are used by the managers to enhance productivity and thereby profit, growth and turnover (Novak, 2017). Therefore, some definite dividend is visible in undertaking studies at any such organisation (Chase, 1997; Gupta & Chopra, 2018). However, the IAF or any other armed forces are not profit-making organisations. The yardstick for assessing any military organisation is the level of its operational preparedness than parameters like profit, growth and turnover. Therefore, undertaking a dedicated study in a military organisation with a climate and work culture different from civilian organisations without any linked incentive requires sheer dedication to fill the existing research gaps. For, the same reasons very limited research papers are available on the subject and these limited papers are only restricted to military organisations of developed countries like the USA/ Canada/NATO (Boe, 2014; Jabłoński & Lis, 2012; Lepak, 2009; Martin, 2014; Marzukhi et al., 2018; Singh & Gupta, 2020). Scarcity exists in empirical research on KM and its applicability to any of the Indian Military organisations (Layton, 2013). These limitations could also be attributed to the classified nature of military organisations and researchers' lack of understanding of knowledge prominence in a military context which requires awareness and visualisation of the military environment (Ozturk, 2012). Unlike any other public or private industry, a military organisation is known to have a distinctive quality that affects the maximum publication. The military has concerns

about the confidentiality of information, and their ethical code inhibits them from publishing their work freely as compared to civil researchers who have more liberty to publish (Adnan et al., 2020). Also, there lacks an empirical study on the cause and effect of the knowledge environment comprising various knowledge enablers or the effect of various KM tools on the organisation's performance in a military backdrop (Singh & Gupta, 2021). Even such studies in civic organisations have been carried out in isolation like measuring the relationship between knowledge enablers and organisation performance or the relationship between KM tools and organisational performance and therefore, the integrated approach used in the current study to wholistically examine the relationship between KM environment and KM tools with organisation performances would be a unique effort. Therefore, the current study would be a path-breaking attempt to fill the existing research gaps.

CHAPTER 3

RESEARCH FRAMEWORK AND HYPOTHESES DEVELOPMENT

This chapter addresses a variety of dependent and independent variables and produces the hypotheses that have to be tested to achieve the goals of the research based on the literature review in the previous chapter.

3.1 Measures of Organisational Performance (Dependent Variable)

To evaluate the effectiveness of organisations due to KM efforts, several scholars have employed a variety of techniques and instruments, including measurement indices, balanced scorecards and maturity models (Gupta & Chopra, 2018; Miller et al., 2014; Sinha et al., 2009; Tseng & Lee, 2014; Vanini & Bochert, 2015). Sabherwal and Sabherwal (2005) say that, due to the intangible nature of the benefits and the difficulties in attributing performance improvement to KM and assessing the impact of KM is challenging. Zaied et al. (2012) say that, due to a lack of consensus on the factors and indices to measure the performance of an organisation, different researchers have considered varied indices for the assessment of performance. There is a dearth of literature that identifies any specific measures of KM performance for any military organisation or a military force of a developing country to be specific. Siong Choy et al. (2006) say that, to-date no study has offered a set of generally acknowledged standards for gauging the performance effects of KM activities. Motsenigos and Young (2002) also claim an absence of suitable measures for the importance and success of KM. Vanini and Bochert (2015) described various maturity models used in industries to examine the effectiveness of KM. Along similar lines, the U.S. Army developed a tailored KM Maturity Model with unique components, area, methodology, delivery and metrics for organisation performance to measure its use of KM practices and techniques for optimal knowledge flown increased efficiency and enhanced decision-making (Van Laar et al., 2020). Lecocq and Gauvin (2006b) studied KM in the Canadian Armed Forces Environment and listed various KM benefits to the organisation under the three categories comprising of knowledge-creation (efficiency, resource

optimisation improved decision, improved focus and vision, mission success and good communication), learning (motivation, adaptability, problem-solving, satisfaction and recognition), and collaboration (trust, leadership, common goal, achieving objectives, reduced duplication, knowledge sharing, and efficiency). Siong Choy et al. (2006) identified 38 measures for measuring the performance outcomes resulting from the KM efforts and grouped them into five categories. Vanini and Bochert (2015) say KM measurement parameters should be tailored to the type of organisation. Similarly, Van Laar et al. (2020) state that a one-size-fits-all approach to KM would not work for the armed forces, as the military organisation has unique processes and procedures that are unparalleled outside the military. The militaries need to develop models to account for these differences. Therefore, in the absence of any specific measures of performance for the IAF, the study developed scale by adopting some items from civil organisations (Aujirapongpan et al., 2010; Gholami et al., 2013; Gold et al., 2001; Grosbois, 2013; Sarkindaji et al., 2014) and military organisations (Bender, 2014; Lecocq & Gauvin, 2006b; Schulte & Sample, 2006; Van Laar et al., 2020). The key measures used in the study were competitive advantage, information superiority, innovation, expertise, efficiency, cost, learning curve, and morale.

Armed forces are all about operations, they heavily rely on the knowledge required to fight a war and support operations and therefore the operational performance is at the core of all knowledge activities that exist in the forces. All other activities and knowledge that exist in the armed forces are there to support the operations. Maintenance knowledge is required to maintain the war-fighting machines in a fit and operational-ready state. It is the main confluent for operations. A military operation will be severely affected if it is not supported by maintained war-fighting equipment and machines. Therefore, maintenance performance is key for the sustenance of operations and the overall organisational performance of the armed forces. Good administrative knowledge helps in better living conditions and boosts the morale of the soldiers. Its loss may impact the availability of basic amenities and a conducive environment for the conduct of operation as well as maintenance and therefore administrative performance can be considered the third pillar of performance of a military organisation. Considering these three main domains of the IAF's functioning (Force, 2012) and after thorough discussions with the senior officers of the IAF, these selected measures of organisational performance were further categorised into three verticals comprising Operational Performance (competitive advantage, flight safety, decision

superiority, situational awareness), Maintenance Performance (creativity, expertise, equipment downtime) and Administrative Performance (cost, learning curve, morale).

3.2 Enablers of a KM Environment (KME)

Any KM tool or technique is unlikely to be effective on its own unless it is backed by the proper environment. The key enablers or factors of that environment comprise People, Culture, Processes, Strategy, and Information Technology. These elements always serve as either facilitator or impediments to efficient KM. The organisation needs to build upon enablers and eliminate the impediments (Weightman & Curson, 2018). An organisation's knowledge landscape is defined and energised by the KME. A KM environment in an organisation indicates a conducive atmosphere for creating, transferring, sharing and using knowledge (Yeh et al., 2006). A supportive KM environment is created by enablers which encourages group members to contribute their knowledge and experiences. This allows organisational knowledge to develop concurrently and systematically (Ichijo et al., 1998). The purpose of KME is to engage individuals and groups to develop the organisational knowledge capital so that KM occurs in the flow of work rather than as an additional overhead activity. A broad range of literature indicates a significant direct relationship between various enablers of a KM environment like people, process, strategy, culture, etc., and measures of organisational performance like organisational achievability, market share, profitability, growth rate, effectiveness and innovation. In a complex and uncertain environment, soldiers are required to be swift to access information and transfer the knowledge to win over their adversaries (Ismail et al., 2011). The leaders, therefore, need to synchronise people, processes, strategies and technology with the organisational structure and culture to foster shared understanding.

3.2.1 People

KM is about people and exists only because of people. Del Giudice et al. (2013) say the right knowledge can be created by sharing tacit knowledge among people. People are the core of creating organisational knowledge because it is the people who create and share knowledge, and therefore it is crucial to manage those who are willing to create and share their knowledge (Thomas et al., 2020; Thomas & Gupta, 2021). Davenport (1999) highlights

the relevance of the human dimension necessary for developing an effective knowledge environment. Through proper management of human resources, a culture that encourages the free flow of knowledge for meeting organisational needs can be created. Therefore, an essential element for an enterprise to successfully push for a conducive knowledge environment is to encourage people to communicate and share their knowledge with others (Mathi, 2004). Similarly, the role of the human element in creating a sustainable knowledge environment in a military organisation cannot be undermined. Bryant (2002) says the armed forces are about soldiers or people and it is the skill and competencies of these soldiers which govern the outcome of the war. Militaries need to provide a proper environment for the soldiers to hone their skills and knowledge so that they improve their value to the forces and the Nation. Orhan (2015) emphasises the importance of human capital in a military organisation as they have a considerable amount of tacit knowledge acquired by experience. Situational awareness and decision-making by the soldiers are the two most fundamental factors that affect modern warfare and they rely heavily on knowledge more than ever. Walsh (2015) states that people in the military are trained to deal with stressful and unpredictable situations. Their experience, competence, and skills to handle stress, work with people, develop strategies and deal with uncertainties, each of which requires knowledge that applies in many areas of individual and organisational life. The military environment is volatile, uncertain, complex and ambiguous. It is therefore essential that in this environment war-fighters share and exploit the knowledge contained within their organisation (Walsh, 2015). Soldiers are the core of the human element in a military organisation, in the IAF the general term ‘air warriors’ is used to address the soldiers and therefore the term ‘air warriors’ has been used in the paper instead of people or human element to evoke the specificities of the military environment and avoid any generalisation with the non-combatant staff of the military organisation.

3.2.2 Culture

Del Giudice et al. (2012) define culture as the combination of shared values, norms, beliefs, assumptions, and implicit attitudes that the members of an organisation possess. Rubenstein-Montano et al. (2001) believe that culture plays a key role in shaping assumptions about knowledge and creating the context for the social interaction associated with knowledge sharing and influencing the creation of new knowledge. Many researchers

believe organisational culture is a crucial influence on the knowledge environment and is significantly related to organisational performance (Davenport, 1999; Gaur & Gupta, 2021a; Holsapple & Joshi, 2002; Sin & Alan, 2000; Zheng et al., 2010). Schein (2010) defined organisation culture in the military organisation as three-level comprising of artefacts (visual dimensions of culture like structure, process, and practice), espoused beliefs and values (strategic goals and philosophies) and the underlying assumptions (unconscious elements that comprise of perceptions, thought and feelings). Gupta and Govindarajan (2000) say that in an organisation like the police and armed forces, culture and its associated beliefs, values and attitudes can be viewed as either facilitators or barriers to the success of KM initiatives and commitment to knowledge-sharing tactics. Tefft (2002) advocates transforming armed forces culture so that the identification, collection, dissemination and use of knowledge is a strategic priority and universally shared value. Fountain (2007) states that, while armed forces have always prioritised teamwork, a profound culture shift must be realised from traditional information sharing to knowledge sharing. An efficient strategic KM requires the creation of a suitable organisational environment and culture. A precondition for KM in the military organisation is the creation of a friendly, open and non-competitive environment (Rhem, 2016). Therefore, building a culture with easily accessible knowledge is necessary for management to establish a positive knowledge environment.

3.2.3 Process

KM process are interrelated sets of various business processes developed in an organisation and primarily consist of acquisition, collecting, conversion, application, storage and protection of knowledge (Mills & Smith, 2011). Literature suggests knowledge process improves organisational processes such as innovation, collaborative decision-making, individual and collective learning and is considered an imperative antecedent for building an overall positive knowledge environment in an organisation (Chait, 2000; Forcadell & Guadamillas, 2002). In the case of a military organisation, Bryant (2002) emphasises armed forces set a goal to integrate the KM and best business practices into the military routine process. A process that facilitates information sharing across boundaries and innovative thinking to achieve greater performance and enterprise cohesion in army activities. Considering the sensitive operations of the military organisation, the KM process should not only embed knowledge assets in standard operating procedures and provide access to the

needy across the enterprise but also protect and secure information and knowledge assets (Lepak, 2009). Van Laar et al. (2020) list the five-step KM process and its activities that are integrated into various staff and organisational processes used in the preparation and conduct of military operations. This integration facilitates the transfer and exchange of knowledge both formally through established processes and procedures, and informally through collaboration and dialogue between and among individuals and organisations. Similarly, Wiig (1997) emphasises value-creating processes such as organisation structure, management practices, system procedures, and the information technology infrastructure in the military setup. Bryant (2002) states that to form an environment of knowledge creation and sharing, the military organisation needs to overcome the process challenges that fall into the areas of abilities, tools, connectivity, geographical separation, access to knowledge and trust. For instance, if abilities or tools are not readily available to share knowledge, the process becomes too difficult to function smoothly. It would be hard to capture or codify the knowledge if it is perceived as an additional burden instead of a by-product or normal process. KM Process provides the right processes and systems that enable a knowledge environment (Wong, 2005).

3.2.4 Strategy

Theriou et al. (2011), say that an effective KM begins with a proper strategy. Knowledge strategy is a crucial element that affects the successful implementation of KM. Rezaei et al. (2021), defined KM strategy as the approaches an organisation employs to align its knowledge resources and capabilities to the rational requirement of its organisation's strategy. KM strategy determines the needs, means and activities for building a comprehensive knowledge environment to accomplish organisational objectives. The objective is to manage, share and create relevant knowledge assets that will help meet tactical and strategic requirements (Gamble and Blackwell, 2001). Wiig (1997) states that most organisations pursue five basic knowledge-centred strategies to achieve the best business values from their existing knowledge-based asset or create new competitive knowledge-related assets. These strategies include creating a knowledge strategy as a business strategy to provide the best possible available knowledge, an intellectual asset management strategy to manage assets such as patent technologies, operational and management practices, a personal knowledge strategy that emphasises on effective use and sharing of knowledge, and

encouraging innovations and competitiveness, knowledge creation strategy that promotes organisational learning and the knowledge transfer strategy to promote a systematic approach to transfer knowledge to those in need. Literature states that KM strategy should be integrated with the organisational business strategy to develop a positive knowledge environment to enhance organisational performance (Zack et al., 2009, Cook, 1999, Maier and Remus, 2002). In a military organisation, Nagendra and Morappakkam (2016) say that the primary strategy for KM is to evolve into a knowledge and network-based organisation. A wisely articulated KM strategy in the military environment would result in a rational decision in operations and logistics including aid to civil authorities. Militaries need to develop KM strategies wherein they need to train KM leaders, reward people for knowledge sharing and make every interaction an opportunity to acquire and share knowledge (Elder, 2008). The organisational environment in the military must provide acceptance of and the opportunity for the exchange, use and reuse of knowledge (Pettersson, 2009).

3.2.5 Information Technology

The prevalence of information technology (IT) has transformed the way the military conducts war on the battlefield (Bryant, 2002). However, the role of IT in KM has been a topic of debate among scholars. For example, various researchers claim that technology is not making organisations more knowledgeable (Agrawal et al., 2021; Davenport & Prusak, 1998). Blackler (1995) emphasised that the implicit parts of knowledge are often ignored by IT-focused KM, which primarily supports codified or explicit knowledge. Zack (1999) says the one-way focus of technology in KM may hinder collaboration, trust and an environment conducive to creativity. Starns and Odom (2006) say technology performs a supportive role in KM in an organisation, as an organisation is a purposeful human activity system comprising people who make up the organisation and the technologies enable or facilitate these activities. Emadzade et al. (2012) examined that the existence of proper technology is a necessity for KM; however, the link between technology and organisation performance has remained inconclusive and has failed to explain a direct relationship between them. Many researchers claim that technology is an indispensable part of KM and supports knowledge-sharing, quality decisions and internal organisational links (Hayes, 2011; Mohamed et al., 2010). The usage of IT increases the effectiveness of the organisation and enables better inter-firm collaborations by improving the quality, easiness and degree of

knowledge exchange (Choi et al., 2008; Lawton, 2001). Agrawal et al. (2021) found that Technology has a significant beneficial influence on how well KM is implemented in an organisation. One of an organisation's most valuable resources is knowledge and information, which should be safeguarded against security flaws. (Ali & Tang, 2022). Rapid changes in technologies and their applications lead to the creation of new security threats (Joshi & Singh, 2017). Given the present trend of information flow in the open and vulnerable world, information security has become a contentious subject. Authors feel that the threat of information security is much more critical for military organisations like IAF, considering the sensitivity of the information handled by the military forces. Therefore, just deployment of IT tools for the management of organisational knowledge would not be adequate and impetus is to be given to information and knowledge security as well. Under such conditions the relation between the technology, KM, and organisation performance in a military organisation needs exploration.

3.3 KM Process and KM Tools

The KM process is defined as the degree to which an institution develops, disseminates and uses knowledge resources across functional boundaries. Kaur (2014) defines KM as "a method that aids organisations in locating, picking, organising, disseminating, and transferring crucial information and knowledge required for tasks". KM literature has focused mostly on three broad dimensions of the KM process namely identification and creation of knowledge, capture, and storage of knowledge, and application and use of knowledge (Gholami et al., 2013; Gold et al., 2001; Lee & Choi, 2003; Liao et al., 2010). Gold et al. (2001) state that a company can become more innovative, better synchronise its activities, quickly commercialise new goods, anticipate surprises and respond more quickly to market change with the help of the KM process. Due to its impact on business success, effective KM is a valued activity. Scholars have unanimously established the presence of a positive link between a KM process and organisational performance (De Long, 1997; Fugate et al., 2009; Gaur & Gupta, 2021a; Gupta & Thomas, 2019). Gaur and Gupta (2021b) state that organisations need to select appropriate tools when implementing the KM strategy. Ngai and Chan (2005) say for a KMT to be operative; it should perform each part of the KM process; that is, the tool should be able to capture, store, organise, index, and share the information.

The KMT used for managing knowledge in the organisation are various techniques and methods to support the organisation's identification, creation, capturing, storage, and application of individual and organisational knowledge (Young, 2010a). Tsui (2003) refers to KMT as an enabler of organisations processes that create, store, preserve and distribute knowledge. Studies indicate that KM tools can impact the financial as well as the overall organisations' performance by reducing the cost of information transfer and loss, risk of reinventing the wheel, learning curve, and times and cost for operation of new procedures and processes (Vaccaro et al., 2010). KM tools facilitate an organisation to be swift, proficient, responsive, and more innovative; therefore, they have a direct relation to the firm performance (Gupta & Jain, 2017). Evwierhurhoma and Onouha (2020) say that the application of KMT significantly and positively affects the organisation's performance. This is because a worker using the right KMT can quickly access the required and relevant information to carry out an assigned job in a better way that will improve firm performance. The adoption and application of KMT bring about quick access to valuable knowledge and information required for good decision-making and improved processes and the organisation's performance (Mete & Belgin, 2021). Uriarte (2008) observed that through the use of KMT, the organisation can turn knowledge into a strategic asset that will boost its performance. There are an ample number of tools available in the literature to support the KM process. Researchers have categorised KMT as per various elements of the KM process or knowledge life cycle (Chiu & Chen, 2016; Gold et al., 2001; Gupta, 2020; Lee & Choi, 2003). The study shortlisted KMT from the list specified by Bheenick and Bionyi (2017), Lattimer et al. (2007b) and Young, (2010a), and categorised it as per the KM process of identification and creation of knowledge, capture and storage of knowledge, and sharing and application of knowledge.

Researchers have acknowledged the positive impact of the KM process and KMT on organisational performance. Literature, especially in civic society, has established that the KM process performed using various KM tools contributes to organisational performance by strengthening product quality, shortening time to market, utilising core corporate skills, improving employee job performance and so on. Therefore, the authors expect that the extensive use of KMT in the IAF for performing various KM processes to identify, create,

capture, store, share and use individual and organisational knowledge will also result in better organisational performance.

3.3.1 KM Tools for Identification and Creation of Knowledge (TICK)

The existing knowledge needs to be identified, or new knowledge to be created to meet the organisation's knowledge requirement. Kim and Lee (2010) list two primary means for gathering knowledge in an organisation which include; the quest and gathering of new knowledge or the creation of new knowledge from existing knowledge. Identification and creation of knowledge is the first step in a KM cycle when a knowledge request is triggered to achieve the operational or strategic requirements of the organisation. The identification stage involves eliciting codified and encapsulated knowledge assets. Tow et al. (2015) defines knowledge identification as the KM process whereby firms take steps to find the pertinent and necessary knowledge that is present inside their borders. Once this knowledge is identified, the knowledge can then be acquired, developed and shared. Knowledge creation comprises the entire process of an organisation producing and acquiring implicit and explicit information. Hislop et al. (2018) define knowledge creation as the capacity to seek and gather new knowledge, apply current knowledge to novel situations, comprehend and assimilate foreign knowledge, and synthesise various banks of knowledge. Literature has specified various knowledge acquisition tools including a knowledge audit, a wall of ideas, a community of practice, an after-action review, celebrating knowledge, experts' systems, text analysis, metadata and visualisation (Bheenick & Bionyi, 2017; Lattimer et al., 2007b; Ramalingam, 2006; Ruggles, 2009). From the literature, some of the key tools used in the process of identification and creation of knowledge for this study are after-action reviews, communities of practice, knowledge audits and a wall of ideas. Scholars state that acquiring knowledge through the identification and creation of new knowledge is a crucial activity for intellectual growth and has a constructive impact on other KM processes and ultimately impacts KM positively (Cepeda-Carrion et al., 2022; Kaba & Ramaiah, 2020; Merali & Davies, 2001; Tiwana, 2008; Tow et al., 2015). The tools used in this stage of the KM process are therefore believed to have a significant effect on the performance of the IAF.

3.3.2 KM Tools for Capture and Storage of Knowledge (TCSK)

Dzekashu and McCollum (2014) say that individual knowledge must first be collected and stored in a knowledge base before institutional knowledge can be built. Upon acquiring and creating knowledge, the knowledge needs to be refined, reviewed, validated, captured and stored in the knowledge base for subsequent use. Hari et al. (2005) defined knowledge capture and storage as an iterative process where knowledge is recognised from its source, reviewed and then in accordance with organisational strategy, appropriate tools and techniques are adopted to store, filter, disseminate and update the knowledge. Capturing and storage of knowledge find more significance to the defence organisations as they have an option for early retirement of their employees to maintain the organisation sturdy and fit. At the acme of their skill and experiences, the retiring soldier detracts from the most precious tacit knowledge they have acquired throughout their personal and professional lives (Singh & Gupta, 2021). Once the knowledge has been assessed as valuable for the institution, it is required to be captured and stored in a structured way as an organisation's asset using different KM tools. Various tools specified in literature for knowledge capture and storage include exit interviews, protocol analysis, card sorting, brainstorming, knowledge taxonomy, expert directory, experience capitalisation, knowledge portal and subject matter experts (Bheenick & Bionyi, 2017; Lattimer et al., 2007b; Ramalingam, 2006; Ruggles, 2009; Serrat, 2017; Tang et al., 2010; Wagner & Zubey, 2005). Based on the literature, the tools for capturing and storing knowledge used in this study were exit interviews, experience capitalisation, experts' directories, knowledge portals, and knowledge taxonomy. Aming'a (2015) argues knowledge capture and storage enhance organisational memory and performance. It facilitates informed and efficient decision-making by ensuring the availability of the right-knowledge to the right-people at the right-time. Stored knowledge can effectively safeguard organisations from the destruction caused by turnovers; facilitate problem solving and serve as important consequences for their performance. The tools used in this stage of the KM process are therefore believed to have a significant effect on the defence force.

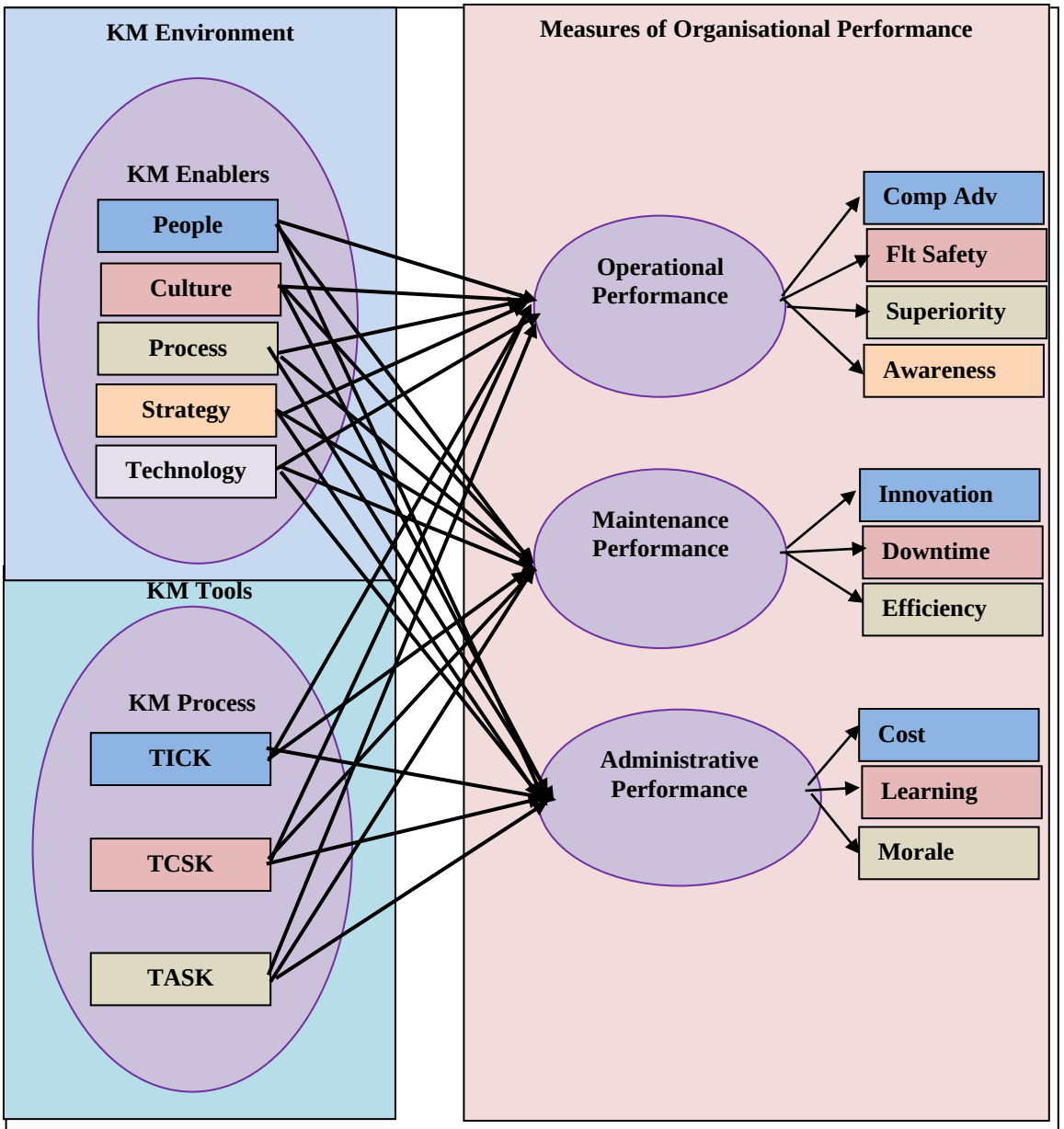
3.3.3 KM Tools for Sharing and Application of Knowledge (TSAK)

Jasimuddin (2005) defines knowledge sharing as the process through which knowledge is transferred from one person or group to another, while knowledge application processes are those that are focused on actually using knowledge. Scholars argue that the earlier process of knowledge identification, creation, capture, and storage of knowledge may not essentially lead to improved organisational performance, but affecting knowledge share and use does (Gold et al., 2001; Thomas & Gupta, 2021a). Thomas and Paul (2019) say if stored knowledge is not transported for further use within the organisation, it is simply a waste of organisational resources. Shared knowledge assets must be applied across the organisation to make decisions, solve problems, progress competence, or support innovation. Effective use of the knowledge is to ensure the achievement of the organisation's objectives efficiently and effectively (Han & Anantatmula, 2007; Rodríguez-Aceves et al., 2022). Evwierhurhoma and Onouha (2020) say organisational knowledge must be capitalised on using suitable tools that facilitate the sharing and use of information and knowledge. Literature suggests various KM tools that play a central role in the transfer and use of organisational knowledge, such as best practices, group support systems, knowledge fairs, peer assistance, storytelling, internet, intranet, video conference and electronic bulletin boards (Lattimer et al., 2007a; Ramalingam, 2006; Serrat, 2008; Vaccaro et al., 2010; Young, 2010a). Based on the literature, some of the most common KM tools for sharing and applying knowledge used in this study were best practices, knowledge fairs, peer assistance and storytelling (Eslamkhah & Seno, 2019). Charband and Navimipour (2018) say success in any organisation depends on promoting knowledge sharing and use. This has been recognised as a positive force for the existence of an organisation and the transfer or dissemination of knowledge among organisations, groups, or individuals enabling new ideas and sustaining competition. Sharing and use of knowledge are critical factors in rapidly responding to change, innovating, reducing cost, increasing efficiency, and achieving superior organisational performance (Argote et al., 2000; Bender & Fish, 2000; Kuusinen et al., 2017; Lind & Persborn, 2000; Prihadyanti et al., 2021; Thomas et al., 2021; Woodfield & Husted, 2017). Defence organisations can gain significantly from the wealth of knowledge acquired by soldiers during various operations, deployments, exercises and training only if they are effectively shared throughout the organisation and put to use by others. The tools

used in this stage of the KM process are therefore believed to have a significant effect on the armed forces.

3.4 Conceptual Model

The study argues that various KM enablers comprising people, culture, process, strategy and IT are significantly related to a KM environment in the IAF and the KM environment is significantly related to the measures of organisation's performance. Also, the extensive use of KM tools in the defence organisation for performing various KM processes of identifying and creating knowledge, capturing and storing knowledge, and sharing and applying knowledge is significantly related to the measures of the organisation's performance. In the absence of any specified measures of performance for the Indian defence organisation, the study adopted the measures of civil organisations to ascertain their suitability for the defence organisation. Based on the discussions above and the model specified by Chiu & Chen, (2016); Gholami et al., (20130; Gold et al., (2001); Rezaei et al., (2021) and Sarkindaji et al., (2014), the study constructed the research framework shown in Fig. 3.1. These studies have mostly taken knowledge processes and infrastructures as the construct to examine the relationship with organisational performance indices. Certain modifications were carried out to build a comprehensive model involving both enablers of KM environment and KM tools to study their relationship with the measures of performance suitable for a military organisation.



Source: Author

Fig. 3.1: Research Framework

Based on the discussion presented above, the proposed hypotheses are as follows:

H1: KM by air warriors has a significant effect on the Organisational Performance in the IAF comprising of:

H1a: Operational Performance

H1b: Maintenance Performance

H1c: Administrative Performance

H2: Culture has a significant effect on the Organisational Performance in the IAF comprising of:

H2a: Operational Performance

H2b: Maintenance Performance

H2c: Administrative Performance

H3: Process has a significant effect on the Organisational Performance in the IAF comprising of:

H3a: Operational Performance

H3b: Maintenance Performance

H3c: Administrative Performance

H4: Strategy has a significant effect on the Organisational Performance in the IAF comprising of:

H4a: Operational Performance

H4b: Maintenance Performance

H4c: Administrative Performance

H5: Information Technology has a significant effect on the Organisational Performance in the IAF comprising of:

H5a: Operational Performance

H5b: Maintenance Performance

H5c: Administrative Performance

H6: The tools used for the identification and creation of knowledge have a significant effect on the Organisational Performance in the IAF comprising of:

H6a: Operational Performance

H6b: Maintenance Performance

H6c: Administrative Performance

H7: The tools used for the capture and storage of knowledge have a significant effect on the Organisational Performance in the IAF comprising of:

H7a: Operational Performance

H7b: Maintenance Performance

H7c: Administrative Performance

H8: The tools used for the sharing and application of knowledge have a significant effect on the Organisational Performance in the IAF comprising of:

H8a: Operational Performance

H8b: Maintenance Performance

H8c: Administrative Performance

CHAPTER 4

RESEARCH DESIGN AND METHODOLOGIES

The chapter on the research methodology provides a thorough understanding of how a study is carried out. The proper and sound approach used to accomplish the study's goal and objective is what gives a study its soul. The research commenced by identifying the problem and framing hypotheses in the previous three chapters; the present chapter explains the research design and methodologies used for investigation as depicted in Fig. 4.1 below: -

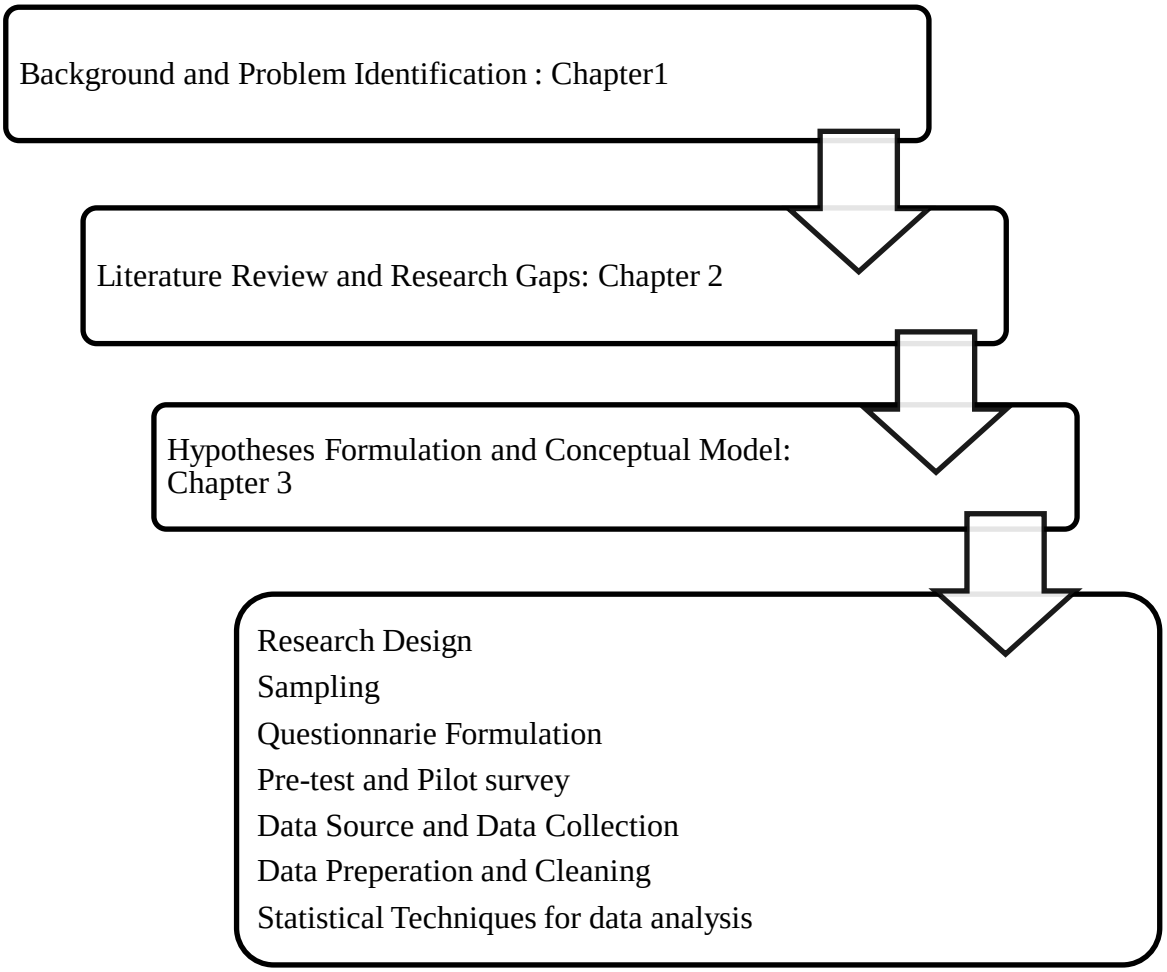


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Fig. 4.1: Research Design

4.1 Research Design

De Vaus (2001) defines the main goal of a research design as making sure that the data gathered allows the researcher to respond to the research question as clearly as feasible. The research design can be primarily categorised as exploratory and descriptive (Malhotra et al., 2006). An exploratory study is carried out to shed light on and comprehend the issue. It is utilised when designing a strategy that requires further understanding of the issue and improved problem identification generally involving secondary data and qualitative research (Malhotra & Dash, 2012). Whereas, descriptive research is conducted to describe something, usually the features of a population or a sample generally using observation methods and surveys.

From the literature review it is avowed that to have an effective edge over their competitors, the organisation must take deliberate action to effectively tap the knowledge of their intellectuals by creating a positive KM environment and effectively use KM tools to identify, capture, store, transfer and apply knowledge for the improvement of the organisational performance. The research aims to understand the effect of KM tools and the KM environment on the performance of the IAF. This research initially utilised exploratory research designed to develop a theoretical model by identifying the KM tools used in the IAF and categorising them as per various KM processes for ease of understanding; and identifying various enablers of a KM environment and studying the effects of these KM tools and KM enablers of the performance of the IAF. An exhaustive review of the literature was undertaken to identify and understand these KM tools and KM enablers and measures of organisation performance. Emphasis was made on developing insight into these variables in the parlance of Indian military organisations. During the second phase of this research, a descriptive research design was involved to explore various dimensions of identified factors, collect the data and develop the scale for the measurement of these constructs. Since there is a dearth of literature on the research subject, the current research, therefore, tends towards a qualitative approach to forming an understanding of a phenomenon, unearthing new insight about KM in IAF based on the opinion of knowledge workers and experts. However statistical analysis of the questionnaire on the Likert scale would provide a more meaningful analysis than in quantitative studies. Therefore, the current research study proposes to use a

mixed method for the data analysis to make it more useful as well as aid in overcoming the intrinsic bias that comes with using single methods and single observers.

4.2 Sampling and Data Collection

4.2.1 Target Population

The Indian Air Force is the fourth largest air force in the world with a strength of approximately 1.5 lakh combatant uniform personnel (air warriors). The IAF being a techno incentive force with state of art aircraft and weapons in its inventory and a large number of qualified and trained air warriors to operate and maintain these warfighting machines, the organisation can be considered as a storehouse of knowledge (Cordesman et al., 2006). The study chose, the IAF as the subject to analyse the effect of various KM tools and KM environments on the measures of performance of IAF. The desired survey participants for the study were those air warriors who had adequate experience in the IAF and could provide adequate insight into the complex issues and a better understanding of the subject. Considering the difficulty in access to the serving air warriors of the IAF, the study targeted the air warriors who have just retired or are on the verge of retirement after completing 15-20 years or more of service in the IAF. Soldiers also called air warriors in IAF are deployed as workers during the initial 8 to 10 years of their service and then graduate to supervisors (Indianairforce.nic.in, 2020). By 15 years of service, a soldier is at the peak of his ability with vast experience and organisational knowledge. He is one of the most informed personnel and is generally deployed on supervisory and managerial jobs including policy and decision makings. Therefore, to include the most information-rich samples; respondents who recently retired from IAF from middle and top-level leadership with more than 20 years of service were selected to meet the analytical needs. These air warriors were considered to be more apt for the study as they had adequate experience and had worked in different sections and parts of the IAF. The participants were willing to express their opinion freely considering the benefits the study may lead to the organisation as parting gratitude. Though, the estimation of parameters of the complete population based on a sample of airmen proceeding on discharge would not be realistic. However, it could provide an insight into the complex issue and a better understanding of the subject as perceived by airmen who

have served the organisation for more than 15-20 years thereby helping in filling the research gaps.

4.2.2 Sample Size and Technique

The sample size was calculated using the formula suggested by Israel (1992). With a 95% confidence interval and 5 % precision, the minimum sample size for the study was estimated to be 318 respondents. The calculation is placed in Appendix 'B'. Sofat (2016) anticipated that approximately 5000 air warriors proceed on retirement every year. Considering the given population size and using the online sample size calculator provided by 'http://www.kck.usm.my/ppsg/stats_resources.htm', a sample size of 419 was calculated. The same size was also computed from the tables published by Naing et al. (2006) for the given population and found to be 370. Therefore, considering all the calculations discussed, the study adopted a minimum sample size of 400 respondents. Probability and non-probability are the two methods of performing sampling. The principles of probability are used in probability sampling methods, and each sample has a chance of being chosen as one of them. The researcher can extrapolate the results to the entire population because the chosen sample is representative of the population. On the other hand, nonprobability sampling methods make use of samples that the researcher has either chosen or been provided with. When utilising these methods, it is uncertain who will be part of the final sample, and not everyone has an equal chance of being selected. Purposeful, convenience, snowball and quota sampling are a few of the methods of nonprobability sampling (Naderifar et al., 2017). The air warriors who proceed on release from the service, visit the IAF, headquarters in Delhi for pre-discharge formalities. For the conduct of the survey, it was planned to contact the target population of air warriors personally on their arrival at Delhi and choose the samples randomly. However, the maximum part of the survey was conducted during the first wave of COVID-19 between Jun 20 to Dec 20. Due to the COVID-19 restriction and lockdown imposed, the movement of personnel was restricted and it became extremely difficult to contact the target population. Personnel in military organisations generally have low visibility due to their nature of the job, location and the sensitive nature of operations and organisation structure, therefore, finding adequate respondents was a serious challenge. Reaching out to such respondents during the

COVID-19 times was indeed a grave concern. Under such conditions, it was decided to adopt a non-probability convenience-based snowball sampling method.

Bryman and Bell (2015) say, non-probability sampling is more frequently used and is most likely suitable in fieldwork research. Polit and Beck (2010) say random samples are less frequently used in studies involving humans. Results from a carefully planned non-probability sampling can be more reliable and significant. Snowball sampling is a convenience non-probability sampling method. It is also known as chain referral sampling and is widely used to locate uncommon or difficult-to-find populations (Johnson, 2005). Parker et al. (2019) say snowball sampling is a popular and most effective means of selecting a sample population when looking for hidden or hard-to-reach populations. Their relative inaccessibility may be caused by a variety of factors, such as their socio-political standing (e.g., high-ranking government officials), administrative or technical barriers (e.g., prisoners), closed social groups (e.g., gangs), or sensitive organisations (e.g., the armed forces). Biernacki et al. (1981) say snowball sampling is most apt where the focus of the study is on such type of samples and requires the knowledge of insiders to locate people for the study. These potentially unreachable populations could be small, dispersed geographically, highly sensitive, and require trust to voluntarily engage. Woodley and Lockard (2016) remain firm advocates for such sampling due to its capability to contact hard-to-reach groups. Cohen and Arieli (2011) say it is possible to conduct both qualitative and quantitative research via snowball sampling. In the former, it is utilised to gain access to potential interviewees, whereas in the latter, it is utilised to identify survey respondents. When random sampling is not possible, snowball sampling can be employed in the quantitative technique as a way of sampling in a more formalised and statistical sense. Literature indicates the wide acceptability of snowball sampling in analysis using SEM (Farhadi et al., 2023; Hussain et al., 2020; Kaur et al., 2023; Luo & Sato, 2021). For the study, the initial set of respondents was selected using random sampling. Subsequent eligible samples were selected through referrals by the samples in previous iterations. The referral process continued until an acceptable sample size was obtained. Illenberger et al. (2008) say that snowball sampling when used with sound measures and methods can produce valid results. For the study, adequate precaution was taken to reduce the selection bias and external and internal validity limitations. To reduce the selection bias methods suggested by Petersen et al. (2005) were adopted like avoiding institutional references,

maintaining frequent social contact with the target population and using a trustworthy gatekeeper or informant. Also, since the target population was almost homogenous with all the soldiers being men over 20 years of experience in IAF, sample representation may not be a major concern (Petersen et al., 2005).

4.2.3 Research Instrument and Survey

A survey questionnaire was designed to collect data concerning various aspects of knowledge in IAF to address the research questions. Babbie, (1973) says survey research is a viable form of scientific investigation for social researchers since it is rational, deterministic, economical, general (for understanding a larger population) and specific (specific replies, questions, coding, and scoring). Questionnaires can help collect data quickly and comprehensively in a most inexpensive manner and most importantly respondents can be anonymous. Among the different social science research methodologies, this one is thought to be the most suited. It also makes it possible to create a database that may be utilised for follow-up analysis in the future (Babbie, 1990; Bartczak, 2002). Such data bank could be beneficial for subsequent research on KM in a military organisation.

For the study, to gather primary information from the intended respondents, a questionnaire with five distinct sections was created. The initial section contained generic questions about the understanding of KM to use as an ideal marker to identify common Method Bias (CMB). The second and third sections were used to measure six independent variables with three each from the KM environment and KM tools. The fourth section consisted of three dependent variables on the measures of organisational performance. The last section was designed for the collection of demographic information such as experience, education, positions etc. While formulating the survey instruments, the general design considerations adhered to presentations, question sequencing, and avoiding misleading, biased and double-barrelled questions, form and layout to keep it simple, unambiguous and less time-consuming. A brief introduction to the area of study was presented at the beginning of the instrument. Respondents were also assured of confidentiality. It comprised five sections, with the last section having questions related to demographics like posting, qualification, experience etc. The questionnaire statements were framed after an extensive literature review and according to the research objective. The process specified by Dörnyei

and Taguchi (2009) was followed to produce an instrument that yields reliable and valid data. The questionnaire was mostly drawn from De Grosbois (2011); Gold et al. (2001); Liao et al. (2010); Rasula et al. (2012), Grosbois (2013), icasit.org, kstoolkit.org and SDC-KM-Toolkit. Some modifications have been made to fit the current research, as most studies from where questionnaires are drawn are primarily restricted to civil organisations. The questionnaires are placed in Appendix 'A'.

Weijters et al. (2010) say a 5-point scale with all the response categories labelled and the inclusion of midpoint results provides an optimum result. Revilla et al. (2014) say 5-point agree-disagree rating scales yield better quality data. Drawing from the literature and recommendations of Weijters et al. (2021), the variables were measured using a 5-point Likert scale, with 1= strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 denoting strongly agree (Baumgartner & Steenkamp, 2001; Nemoto & Beglar, 2014; Revilla et al., 2014; Weijters et al., 2010). Data were collected by administering questionnaires in offline and online modes. For randomly selected 30 air warriors settled in the Delhi-NCR who agreed to meet in person with all the COVID-19 precautions, data was gathered by making personal visits with scheduled appointments. For other participants invites for a web-based survey designed through the Google Form were sent via e-mail and WhatsApp through referrals by the samples in previous iterations. The referral process continued until an acceptable sample size was obtained. Data for the final questionnaire were collected from Jun 2020 to December 2020. 584 responses were received against the distribution of approximately 1120 questionnaires at a response rate of 52.14%.

The majority of the chosen sample includes veterans with more than 20 years of service length (84%), indicating adequate seniority. The education level of the majority of respondents was graduation and above (91 %). The demographic distribution of respondents does not affect the study as all have served across the country throughout their service life and no distinction in job profile exists in IAF based on the individual demographic profile (Singh and Gupta, 2020). Perez and Strizhko (2018) say there are no differences in the desired outcome due to the demographic variables of soldiers in a military organisation. The culture in the military organisation emphasises group unity and prioritises the mission above individual characteristics and goals. The armed forces depend on cohesion, organisational identification and group commitment and the soldiers who have internalised this culture see

past individual differences such as minority and majority, gender and race and identify others in the unit as fellow soldiers primarily.

4.3 Reliability and Validity Factors

The study adopted multiple methods to boost response reliability and content validity and reduce various biases. Content and expert validity were conducted to measure the adequacy, inclusiveness and richness of measurement tools. The study invited 12 experts with over 30 years of experience in IAF to review and revise the questionnaire item by item to ascertain appropriate content validity. The experts had adequate experience in policymaking, projects, HR and management. They were requested to examine the validity of the questionnaires and their readability, clarity and comprehensiveness and ascertain if participants understood the questions and could provide informed responses. The experts reviewed the questionnaires and accordingly, the items were modified to incorporate the suggestions. Terminologies, jargon and language better understood by the armed forces personnel were included as suggested by the experts. Discussions and interviews were also carried out with the experts and a few respondents to make the study more comprehensive. To obviate the issue of CMB, respondents were assured of the anonymity and confidentiality of the study and reverse items were also added. However, since questionnaires were self-reported and data was collected from the same participants, there could be CMB due to emotions, personality styles, attitudes, consistency motifs, transient mood, etc. (Podsakoff & Organ, 1986). Therefore, a comprehensive marker technique was employed to study CMB (Podsakoff & Organ, 1986).

4.4 Pre-test and Pilot Survey

Sekaran and Bougie (2016) say it is essential to pre-test a survey questionnaire to ensure that there are no ambiguities and that respondents can comprehend the questions as they are meant. Before giving the instrument to respondents orally or through a questionnaire, the pre-testing process fixes any inadequacies and minimises bias (Sekaran & Bougie, 2016). Therefore, a pre-test was conducted using 30 respondents to determine from them whether the phrasing is appropriate, the order of the questions is appropriate, whether the respondents fully comprehended all of the questions, whether more questions

are required or some should be omitted and whether the instructions are acceptable and clear (Hunt et al., 1982). A few minor changes were incorporated in the post-pre-test like the number of questions being reduced as most of the respondents expressed concern about more than 30 minutes required for filling the response.

A pilot study can be denoted as a small-scale feasibility study before the main study to determine any shortcomings in the data collection and eliminate any issues encountered by the respondents in filling out the questionnaire (Moser & Kalton, 2017). Any potential flaws in the main study can be detected by the pilot test. Without a pilot, significant resources, money, time and effort on the part of both the researchers and the respondents may be wasted and precise findings may not be reached. Accordingly, a pilot survey was undertaken on 50 samples in Feb 2020.

4.5 Statistical Tools for Data Analysis

Multi-staged data analysis was used to test the research framework. In the initial stages, MS Excel was employed for data compilation and data cleaning, subsequently, IBM, SPSS and IBM AMOS software were used for the exploratory and confirmatory factor analysis as discussed below.

4.5.1 Data Cleaning

After collecting responses, data cleaning was done using MS Excel 19 to check for data consistency and identify missing responses. Standard deviation was employed to identify unengaged responses. Case-by-case deletions were made from the questionnaires that had missing, unengaged or inconsistent responses (Gaskin, 2018).

4.5.2 Exploratory Factor Analysis

Exploratory Factor Analysis (EFA) aids in extracting key constructs from enormous raw data and identifying underlying components for meaningful analysis and interpretation (Hair, 2011). EFA is a statistical technique for reducing data to a more comprehensible set of summary variables and for examining the phenomenon's underlying theoretical

underpinnings. It is employed to ascertain the type of relationship between the respondent and the variable. Malhotra (2004) described factor analysis as a form of analysis used to identify the regularities or underlying dimensions of phenomena. Its main objective is to condense the data from a lot of different variables into a few key factors. For the present study, EFA was chosen since the questionnaire was heavily adjusted to the study's goals. According to the advice of the experts, these alterations were necessary to investigate essential constructs and the components that converge in them. The highly linked variables were combined to create a factor and achieve summarisation with the help of IBM, SPSS software (Field, 2013).

4.5.3 Structural Equation Modelling

Structural Equation Modelling (SEM) is a multivariate technique for testing and estimating causal links using a combination of statistical data and qualitative causal assumptions. It can model constructs as latent variables and enables the researcher to precisely estimate the structural links between the latent variables. SEM uses both confirmatory factor analysis (CFA) and regression. It is recognised as a theory-testing method that facilitates the examination of the theoretical connections between constructs (Malhotra & Dash, 2012). When at least one Dependent Variable (DV) or Independent Variable (IDV) is on the Likert scale, SEM is applied. Since a Likert scale was required for measuring opinions, SEM was used in the study. SEM comprises of Measurement Model also called CFA and the Structural model also called as causal model. The Measurement Model allows for the correlation of its indicators and latent variables. It aids in determining whether the variables load as predicted and is also used to check convergent and discriminant validity. Whereas, the Structural Model shows the relation between the variables. It is also used to check the fitness level between the proposed model and collected data (Field, 2013; Hair, 2011; Malhotra & Dash, 2012). For analysis, IBM-AMOS version 23 software is used.

CHAPTER 5

DATA ANALYSIS AND RESULTS

The multistage data analysis was undertaken to analyse the theorised framework and proposed relationships. Exploratory Factor Analysis (EFA) was used to explore the possible underlying factor structure of a set of observed variables without imposing a preconceived structure on the outcome. Whereas, Confirmatory Factor Analysis (CFA) was used to verify the factor structure of a set of observed variables based on prior theories (Suhr, 2006). Few researchers have suggested using both EFA and CFA to assess construct validity (Chiu & Chen, 2016; Farrell, 2010; Marsh et al., 2014). All the theoretical concepts used in the present research were taken from prior studies, which provided a theoretical rationale for the existence of these concepts. However, since each construct's measurement, the items were used from multiple studies restricted to civic society and testing concepts for a military organisation. Before using CFA to evaluate the hypotheses, the study initially employed EFA to redefine the theoretical constructs. Various processes for data analysis employed in the study are presented in Fig. 5.1 below.

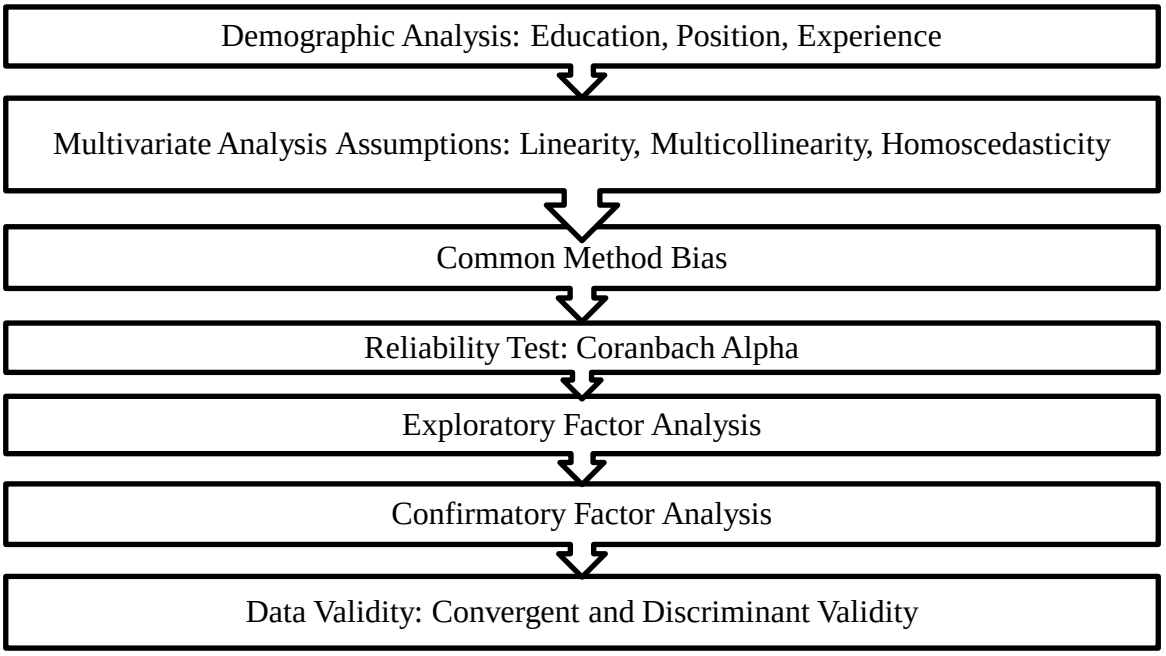

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Fig. 5.1: Process of data analysis

5.1 Demographic Profile of the Respondents

The culture in the military organisation emphasises group unity and the prioritizing of the mission above individual characteristics and goals. The armed forces depend on cohesion, organisational identification, and group commitment and the soldiers who have internalised this culture see past individual differences such as minority and majority, gender, and race and identify others in the unit as fellow soldiers primarily. Therefore, the demographic distribution of respondents may not affect the study as all have served across the country throughout their service life and no distinction in job profile exists in IAF based on the individual demographic profile (Singh and Gupta, 2020). Perez and Strizhko (2018) say, there are no difference in the desired outcome due to the demographic variation of soldiers in a military organisation. However, to comprehend a basic understanding of the respondents' certain demographic variables were captured as discussed below.

5.1.1 Gender

All the respondents were male only. No females in the rank of soldiers are available in the IAF, and the number of females in the rank of officers is much less as compared to the males therefore adequate female respondents could be found with the desired characteristics.

5.1.2 Education

Since the study aims to gauge the effect of KM environment and tools on an organisation's performance, the respondents with higher qualifications would have a better appreciation of the problem and aptitude to provide better information. The education profile of respondents shows that approx. 90% of the respondents are graduates or have higher qualifications. This indicates the richness of the sample for the study. The educational profile of the respondents is specified in Table 5.1 and represented graphically in Fig. 5.2 below.

Table 5.1: Educational Profile of the Respondents

Educational Qualification	Frequency	Percent	Cumulative Percent
Doctorate	13	2.9	2.9
Post Graduate	211	46.8	49.7
Graduate	185	41.0	90.7
Intermediate	42	9.3	100.0
Total	451	100.0	

(Source: Created by authors)

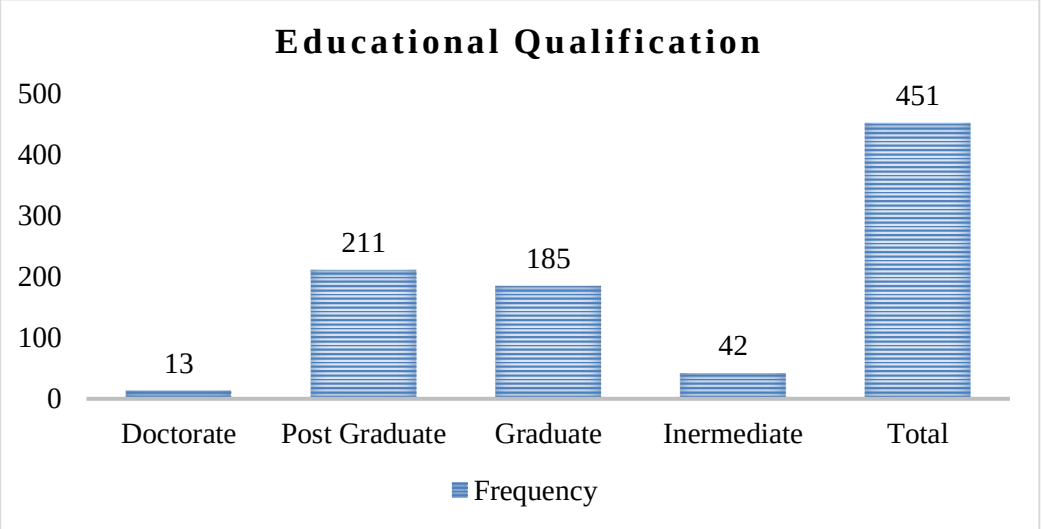

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Fig. 5.2: Graphical Representation of Educational Profile

5.1.3 Experience

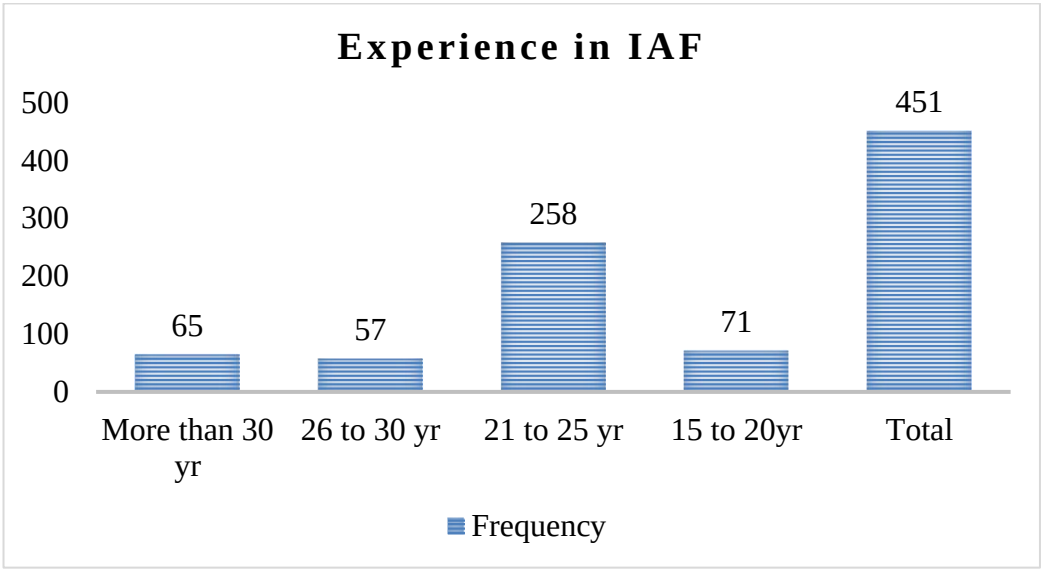
An individual's career-long experience will have an impact on how he views KM and its use in the workplace. Although the younger group of employees would have fresh ideas and more flexibility, experience has its own set of lessons to teach. Higher-level managers are in charge of developing a learning culture where knowledge is appreciated and exchanged without friction. The data indicate that approx. 85 % of respondents had an

experience of more than 20 years in IAF including 15 % with more than 30 years of experience. 15 % of the sample also had experience of 15 to 20 years indicating a young and medium experience. The experience profile of the respondents is specified in Table 5.2 and represented graphically in Fig. 5.3 below.

Table 5.2: Experience Profile of the Respondents

Experience in IAF	Frequency	Percent	Cumulative Percent
More than 30 yr.	65	14.4	14.4
26 to 30 yr.	57	12.6	27.1
21 to 25 yr.	258	57.2	84.3
15 to 20yr	71	15.7	100.0
Total	451	100.0	

(Source: Created by authors)



(Source: Created by authors)

Fig 5.3: Graphical Representation of Experience Profile

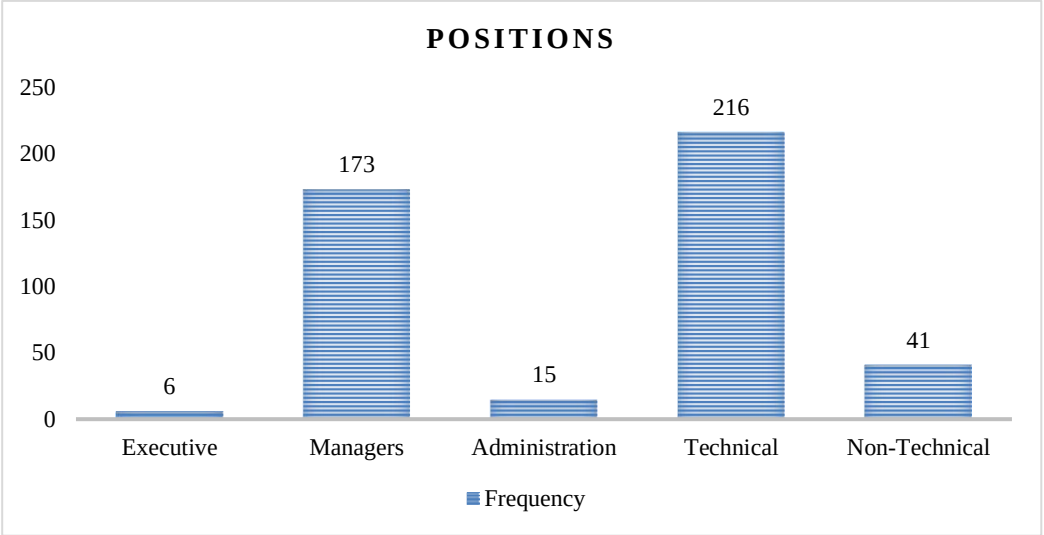
5.1.4 Position

The position that a person holds inside an organisation is important for numerous aspects that could affect the study. The number and quality of resources that an employee has access to depend on his or her position, and those who hold positions higher up the organisational ladder also have a say in how those resources are distributed to others within the company. The data indicate that the sample constitutes a mix of experts from all facets of the IAF including top executives, managers, administrators, and technical and non-technical staff. The position profile of the respondents is specified in Table 5.3 and represented graphically in Fig. 5.4 below.

Table 5.3: Positions of the Respondents

Positions	Frequency	Percent	Valid Percent	Cumulative Percent
Executive	6	1.3	1.3	1.3
Managers	173	38.4	38.4	39.7
Administration	15	3.3	3.3	43.0
Technical	216	47.9	47.9	90.9
Non-Technical	41	9.1	9.1	100.0
Total	451	100.0	100.0	

(Source: Created by authors)



(Source: Created by authors)

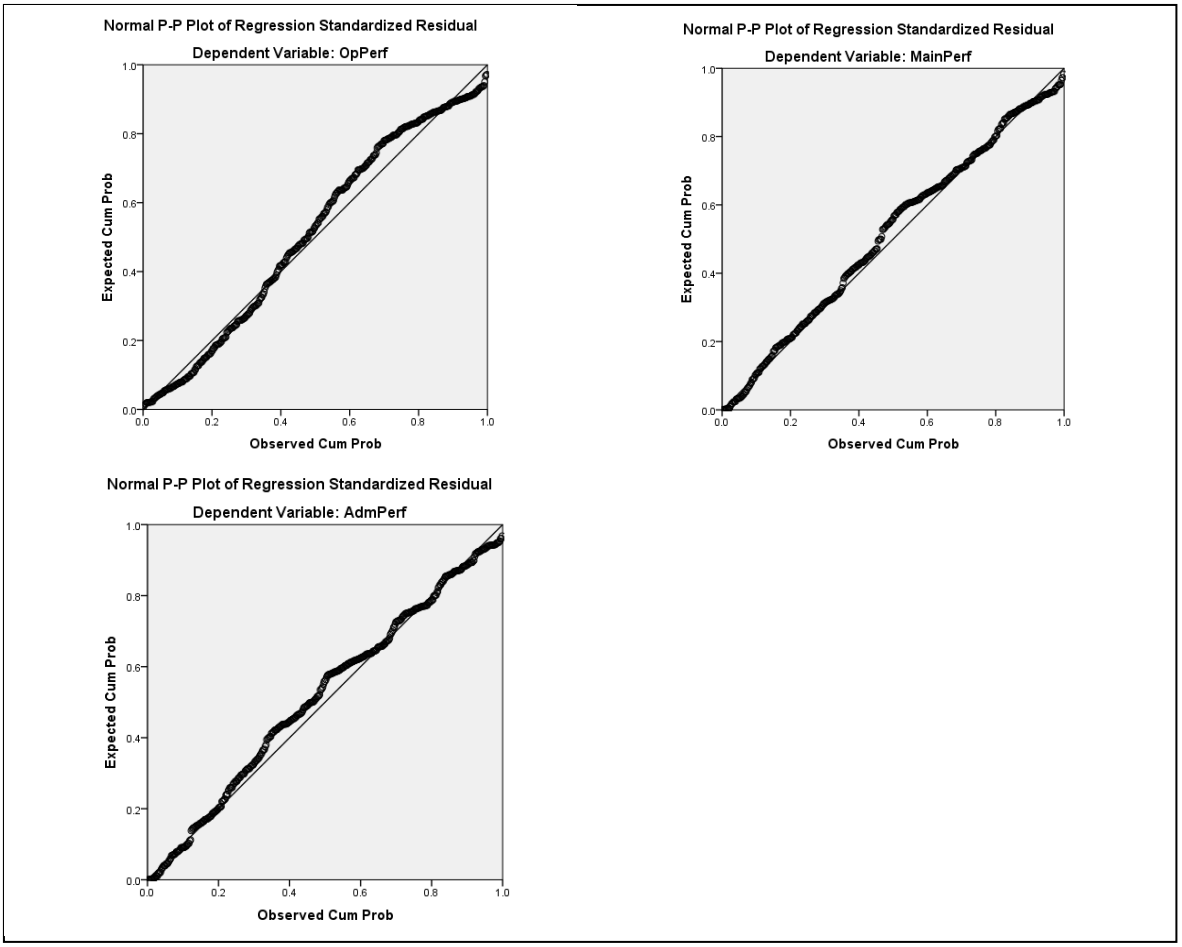
Fig. 5.4: Graphical Representation of Respondents Position

5.2 Assumptions of Multivariate Analysis

Multivariate techniques will be employed to test the hypotheses, therefore before the same is applied, it is essential to check if the assumptions of linearity, homoscedasticity and absence of multicollinearity are fulfilled (Hair, 2011).

5.2.1 Linearity

Linearity indicates that the predictor variables have a straight-line relationship with the outcome variable. The SEM can measure linear relationships only, so it is assumed that DV and IDV variables are linearly correlated. This assumption has been checked using the P-P plot (probability plot). A plot was drawn for all the possible combinations using all the independent constructs and the three dependent constructs comprising operational performance (OpPerf), maintenance performance (MaintPerf) and administrative performance (AdmPerf). The plots obtained from the data depicted in Fig. 5.5 below indicate a linear relationship (Kothari, 2004).



(Source: Created by authors)

Fig. 5.5: Assumption of linearity

5.2.2 Homoscedasticity

Homoscedasticity refers to whether the random errors, also known as residuals are distributed evenly from the regression line across all values of the independent variable or if they tend to bunch up at some values and spread out at other values (Tabachnick & Fidell, 2001). Scatter plots for each IDV concerning all the three DV i.e., OpPerf, MaintPerf and AdmPerf were plotted separately with residues on the y-axis and predicted values on the x-axis. Figures 5.6 to 5.8 show the scatter plots for all the variables. It is evident from all the plots for different dependent variables that residues are distributed at equidistance from the regression line and there is no explicit pattern visible in any of the plots thereby meeting the conditions of homoscedasticity.

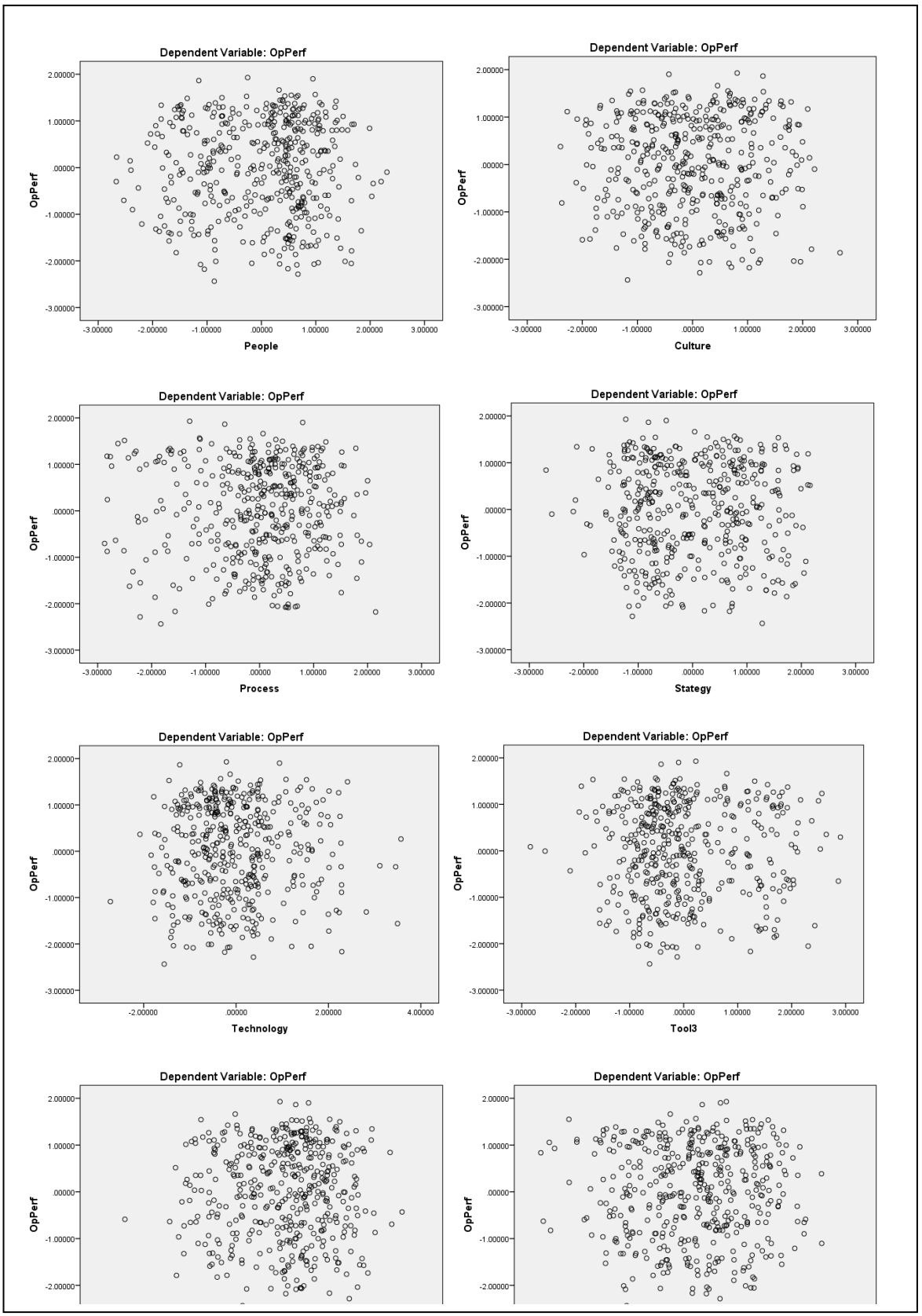


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Fig. 5.6: Assumption of homoscedasticity with OrgPerf as dependent

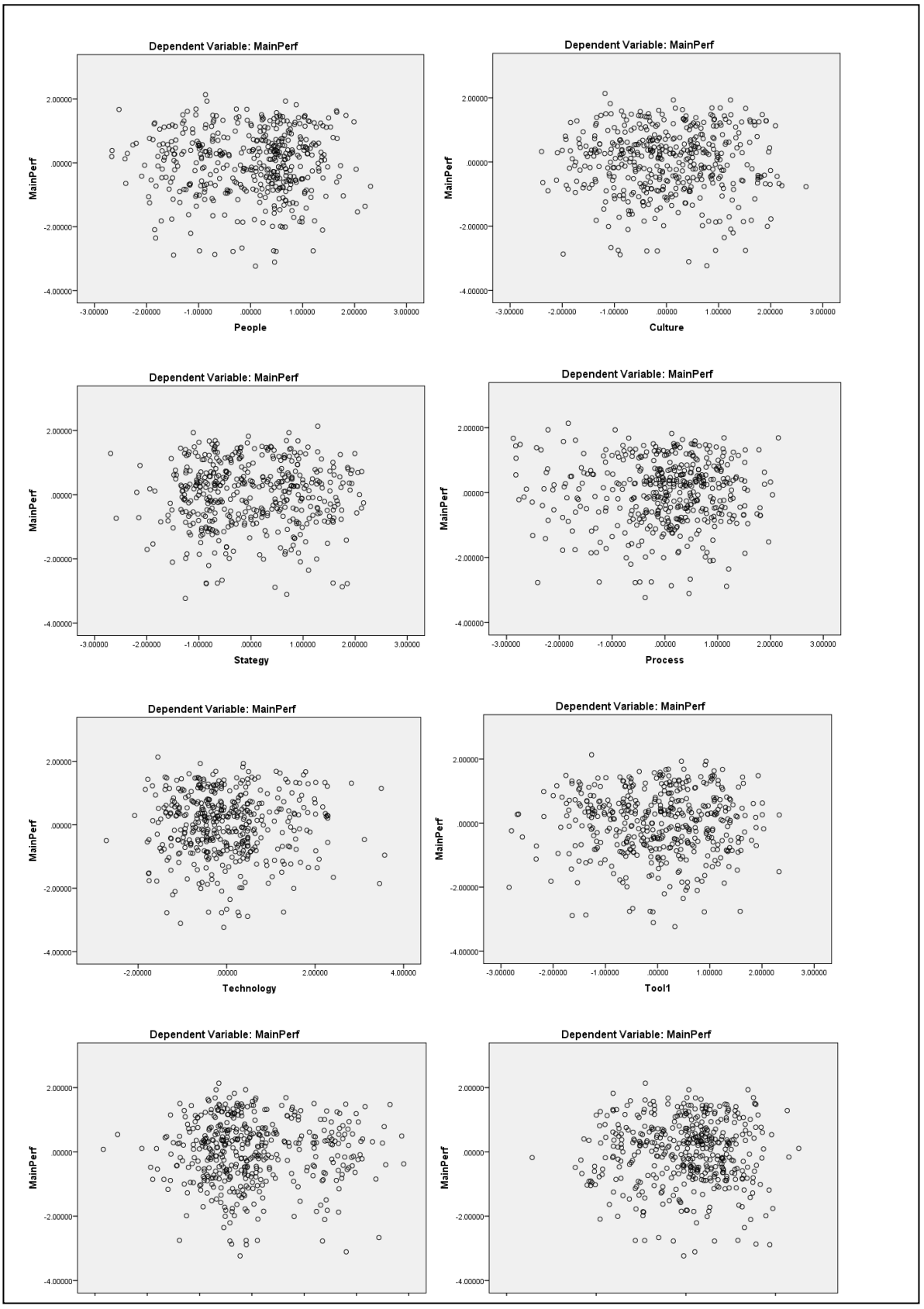

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Fig. 5.7: Assumption of homoscedasticity with MaintPerf as dependent

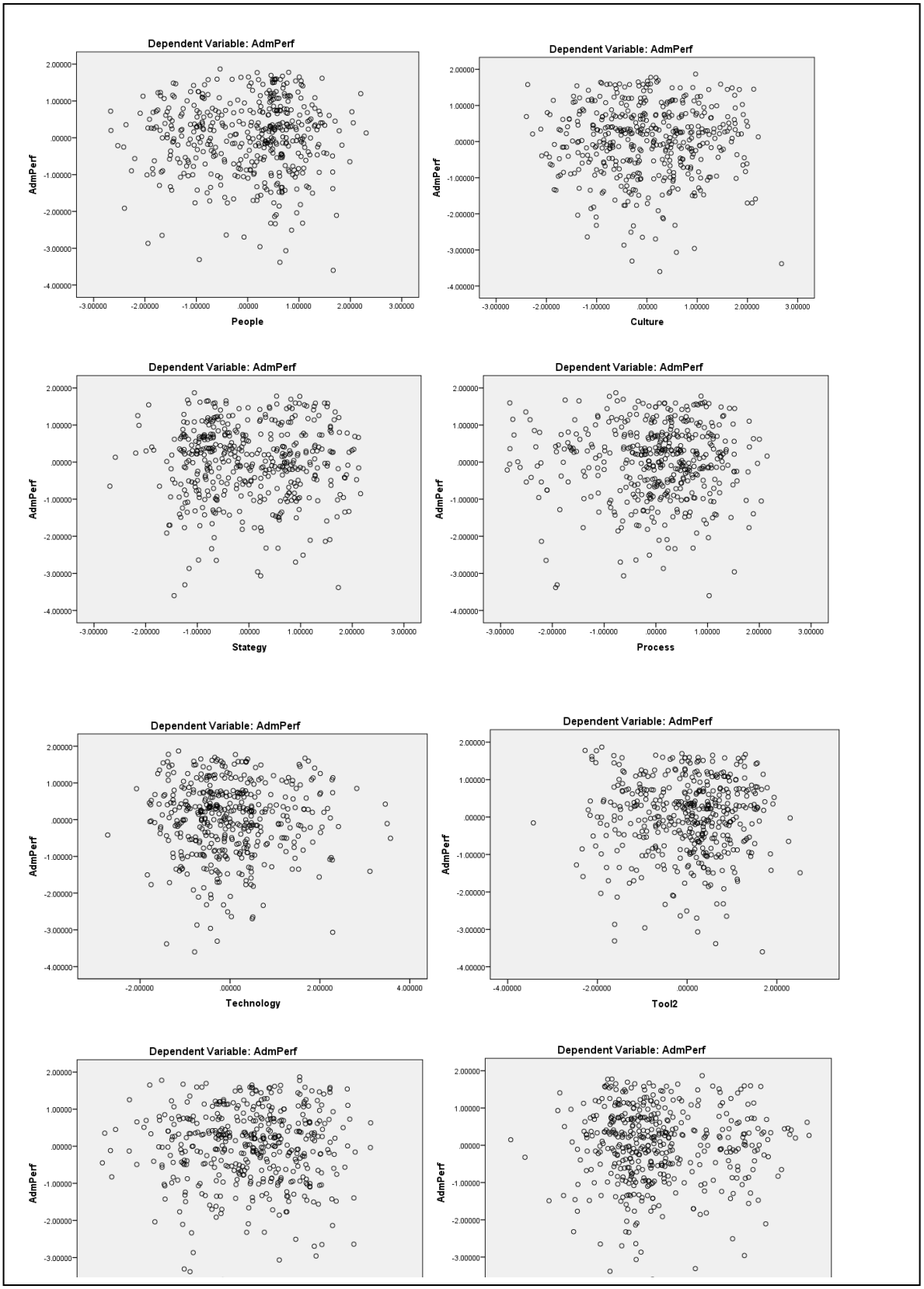

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Fig. 5.8: Assumption of homoscedasticity with AdmPerf as dependent

5.2.3 Multicollinearity

Multicollinearity denotes that predictor variables are highly correlated with each other. High multicollinearity is an issue because the regression model won't be able to accurately link variance in the result variable with the proper predictor variable. Multicollinearity can be gauged using variance inflation factors (VIF) values. VIF identifies the correlation between individual variables and the strength of that correlation. A VIF value of less than three is considered good, indicating the absence of multicollinearity, whereas a value greater than 10 indicates a definite existence of multicollinearity. The VIF values were generated using OpPerf, MaintPerf and AdmPerf as DV and all other variables as independent. The results depicted in Table 5.4 below indicate all the VIF values are less than the reference range, thereby confirming assumptions of the absence of multicollinearity (Field, 2013).

Table 5.4: Assumption of the absence of multi-collinearity (VIF values)

Coefficients		
Model	**Collinearity Statistics**	
	Tolerance	**VIF**
KMS1	.340	2.939
KMS2	.442	2.261
KMS3	.458	2.185
KMS4	.543	1.841
PPL1	.341	2.931
PPL2	.468	2.138
PPL3_Rev	.465	2.152
PPL4	.488	2.048
PPL5_REV	.461	2.169
OC1	.490	2.041
OC2	.455	2.198
OC3	.544	1.839

OC4	.382	2.616
OSP1	.644	1.552
OSP2	.466	2.145
OSP3_REV	.567	1.762
OSP4_REV	.622	1.607
TECH1	.499	2.006
TECH2	.503	1.987
TECH3_REV	.509	1.963
TECH4_REV	.605	1.653
TOOL1A	.474	2.111
TOOL1B	.370	2.700
TOOL1C	.486	2.056
TOOL1D	.423	2.367
TOOL1E	.518	1.929
TOOL2A	.513	1.949
TOOL2B	.489	2.043
TOOL2C	.426	2.349
TOOL2D	.415	2.411
TOOL2E	.471	2.121
TOOL3A	.483	2.070
TOOL3B	.518	1.930
TOOL3C	.477	2.098
TOOL3D	.555	1.802
TOOL3E	.403	2.479

a. Dependent Variable: OpPerf

(Source: Created by authors)

5.3 Sample Adequacy

The Kaiser-Meyer-Olkin (KMO) test is done to measure the adequacy of samples. A minimum KMO value of 0.6 is desirable (Hutcheson & Sofroniou, 1999). A KMO value of 0.838 was obtained, which indicates the adequacy of the data. Bartlett's Test of

Sphericity was found to be significant for <.05, indicating a good correlation between the variables (Kaiser et al., 1974). The values of the test are depicted in Table 5.5.

Table 5.5: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.838
Bartlett's Test of Sphericity	Approx. Chi-Square	9661.250
	Df	990
	Sig.	.000

(Source: Created by authors)

5.4 Common Method Bias (CMB)

There could be multiple sources of method bias such as (i) respondent issues like his transient mood, acquiescence bias, social desirability and consistent motif, (ii) scale issues like item ambiguity, positive and negative item wordings, scale length etc., and (iii) measurement issues like both dependent and independent variables measured at same point and location and using the same medium. Adequate precautions were taken to reduce the biases such as assuring respondent secrecy and evaluation anxiety, refining the scale by avoiding ambiguous terms, keeping simple and concise questions, evading double-barrelled questions and complicated syntax and adding reverse items. However, since questionnaires were self-reported and data was collected from the same participants using a non-probability sampling method, there could be method biases CMB (Podsakoff & Organ, 1986). Therefore, a check of method bias is required. Various statistical approaches have been specified in literature for testing CMB like Harman Single Factor, Correlation Marker Approach, Partial Correlation Approach, Measurement Latent Marker Variable and CFA Marker Approach. Of all the approaches, the CFA marker approach is the most comprehensive, integrated, current and best approach to test the CMB using the SEM and therefore same was applied to the study (Simmering et al., 2015; Williams et al., 2010).

For a CFA marker approach, a priori variables referred to as 'Ideal Marker' are required which are similar to a substantive variable in content and format but theoretically related to them. Therefore, the questionnaires for IM were formulated as suggested by Richardson, Simmering and Sturman (2009) and data was collected along with the main research instruments. The CFA marker technique employs three phases for testing of CMB: (a) Phase I (Model comparison) includes analyses using five different models intended to examine the presence and equality of method effects associated with the ideal marker latent variable (IM) (Simmering et al., 2015). Models used in Phase I comprises (i) the Initial Model which is the same as the CFA model containing a priori IM, (ii) the Baseline Model obtained by fixing the correlation parameters from IM to zero and measurement parameters of IM to values obtained from the initial model as shown in Fig. 5.9, (iii) Model-C is used to check the equal effect (non-congeneric) of IM on loadings. It is obtained by constraining all the loadings from IM to items as shown in Fig. 5.10, (iv) Model-U is used to check whether there is a different impact (congeneric) of IM on all items. It is obtained by unrestricting the loadings from IM to items, and finally (v) Model-R is used to check the effect of IM on the correlation among constructs. It is obtained by restricting correlation from substantial variables to that in the initial model. Model fit parameters (Cmin/Df, CFI, GFI and RMSEA) of all the models are obtained and compared to obtain p-values and establish if method bias is present as per the null hypotheses depicted in Table 5.4. In case $p<.05$ indicating the presence of method bias other two phases are checked for reliability and sensitivity. (b) Phase-II (Reliability Decomposition): Once the effect of IM has been identified, in phase-II, a latent variable (LV) approach is employed to calculate how much method variance is involved in the measurement of LV. With the help of this approach, it is possible to calculate the amount of reliability estimate inflation attributed to the IM under investigation for each LV. (c) Phase-III (Sensitivity Analysis): Phase III uses the sixth Model-S obtained by fixing the marker method factor loading obtained from the confidence interval of the method factor loading parameter estimates from the Model-U method. We can use the model to calculate the sensitivity of the IM measurement to sampling error (Williams et al., 2010).

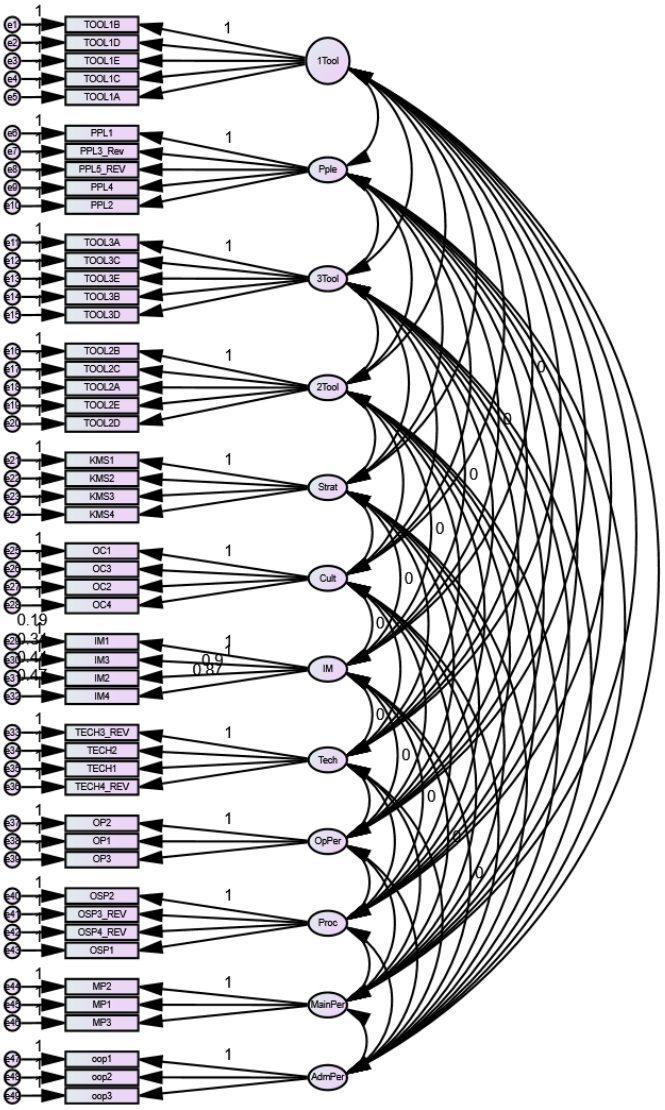

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Fig. 5.9: Baseline Model for testing of CMB

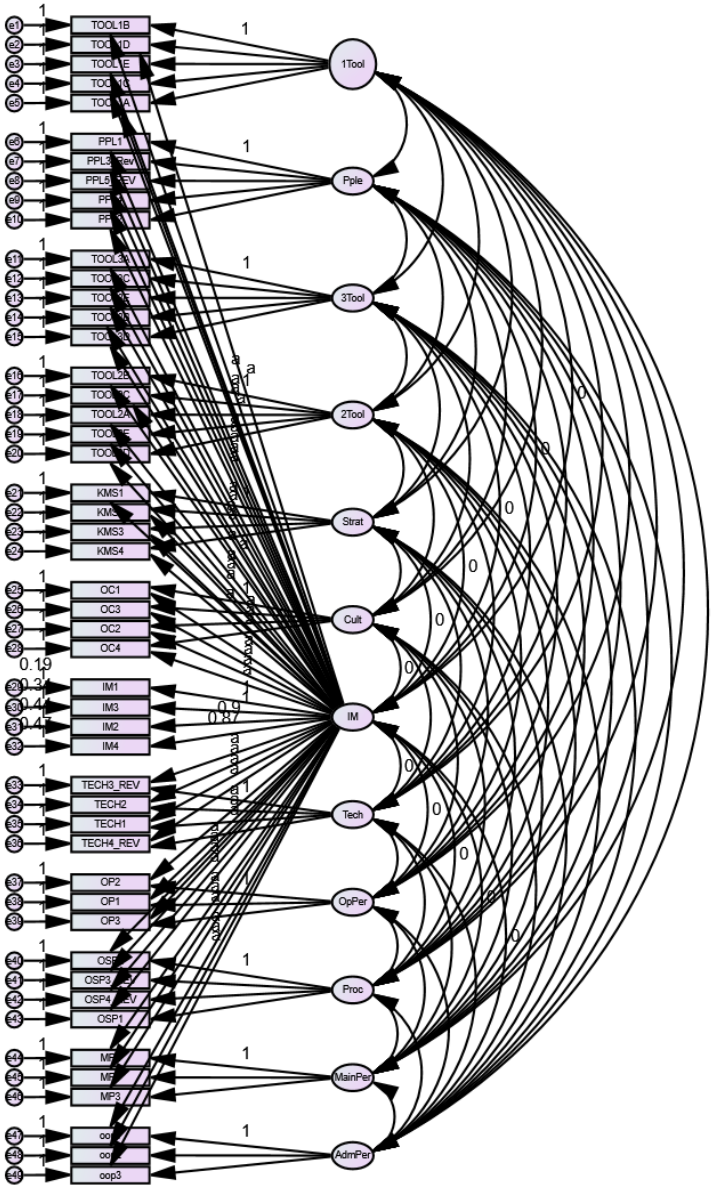

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Fig. 5.10: Model-C for testing of CMB

The comparison data between Baseline vs. Model-C to check the effect of IM on loadings concludes that *Method Biasness is not present* (p>.05) and therefore further check is not required. The results of the test are presented in Table 5.6 below.

Table 5.6: Goodness of Fit and Model comparison test

Model	CMIN	DF	CFI	GFI	RMSEA	Comparison	Purpose	Null Hypothesis	p-value	Conclusion
Initial Model	1826.998	1061	0.921	0.859	0.040					
Baseline Model	1841.863	1079	0.922	0.859	0.040					
Model-C	1840.858	1077	0.922	0.859	0.040	Baseline vs Model-C	To check the effect of Marker Var on Loadings	There is no Impact of MV on Items	.986	Method Biasness Not Present

(Source: Created by authors)

5.5 Exploratory Factor Analysis

Exploratory Factor Analysis was executed in SPSS to identify uncorrelated factors from the variables, using Principal Component Analysis (PCA) with Varimax rotation. Varimax is employed for rotation because it is considered to be a better approach for loading variables into factors, maximizing the dispersion of loadings within factors, and providing interpretable clusters for streamlined exploration and analysis (Field, 2009). Eleven factors were identified as shown in the Rotated Component Matrix in Table 5.7. Variable OS4 was dropped because of cross loading and factor loading was less than 0.5 (Reio Jr & Shuck, 2015; Suhr, 2006; Treiblmaier & Filzmoser, 2010).

5.5.1 Communalities

Communalities are used to estimate the variance in each variable contributed by all the components or factors. These are examined to assess how well each variable is explained by the factors. The extracted value of commonalities from the data was greater than 0.5, which indicates variables are better explained by the factors. The communalities values are depicted in Table 5.8.

Table 5.7: Results of Exploratory Factor Analysis (Rotated Component Matrix)

Factors	Variables	Component										
		1	2	3	4	5	6	7	8	9	10	11
Capture Tools	TOOL1B	.776										
	TOOL1D	.760										
	TOOL1E	.721										
	TOOL1C	.698										
	TOOL1A	.653										
People	PPL1		.777									
	PPL3_Rev		.771									
	PPL5_REV		.771									
	PPL4		.764									
	PPL2		.740									
Sharing Tools	TOOL3A			.807								
	TOOL3C			.792								
	TOOL3E			.767								
	TOOL3B			.713								
	TOOL3D			.678								
Storage Tools	TOOL2B				.757							
	TOOL2C				.725							
	TOOL2A				.724							
	TOOL2E				.719							
	TOOL2D				.664							
Strategy	KMS1					.848						
	KMS2					.807						
	KMS3					.779						
	KMS4					.754						
Culture	OC1						.814					
	OC3						.781					
	OC2						.753					
	OC4						.721					
Technology	TECH3_REV							.784				
	TECH1							.767				
	TECH2							.756				
	TECH4_REV							.713				
Operational Performance	OP2								.912			
	OP1								.878			
	OP3								.860			
Process	OSP2									.829		
	OSP3_REV									.780		
	OSP4_REV									.723		
	OSP1									.673		
Maintenance Performance	MP2										.886	
	MP1										.884	
	MP3										.838	
Administrative Performance	oop1											.841
	oop2											.822
	oop3											.805

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

(Source: Created by authors)

Table 5.8: Communalities

Variables	Initial	Extraction
KMS1	1.000	.793
KMS2	1.000	.714
KMS3	1.000	.688
KMS4	1.000	.582
PPL1	1.000	.743
PPL2	1.000	.639
PPL3_Rev	1.000	.657
PPL4	1.000	.620
PPL5_REV	1.000	.657
OC1	1.000	.699
OC2	1.000	.680
OC3	1.000	.652
OC4	1.000	.697
OSP1	1.000	.523
OSP2	1.000	.742
OSP3_REV	1.000	.666
OSP4_REV	1.000	.543
TECH1	1.000	.659
TECH2	1.000	.614
TECH3_REV	1.000	.655
TECH4_REV	1.000	.564
TOOL1A	1.000	.561
TOOL1B	1.000	.734
TOOL1C	1.000	.598
TOOL1D	1.000	.713
TOOL1E	1.000	.609
TOOL2A	1.000	.628
TOOL2B	1.000	.650
TOOL2C	1.000	.690
TOOL2D	1.000	.669
TOOL2E	1.000	.618
TOOL3A	1.000	.682
TOOL3B	1.000	.592
TOOL3C	1.000	.679
TOOL3D	1.000	.541
TOOL3	1.000	.702
OP1	1.000	.802
OP2	1.000	.854
OP3	1.000	.782
MP1	1.000	.808
MP2	1.000	.797
MP3	1.000	.773
oop1	1.000	.729
oop2	1.000	.699
oop3	1.000	.661

Extraction Method: Principal Component Analysis.

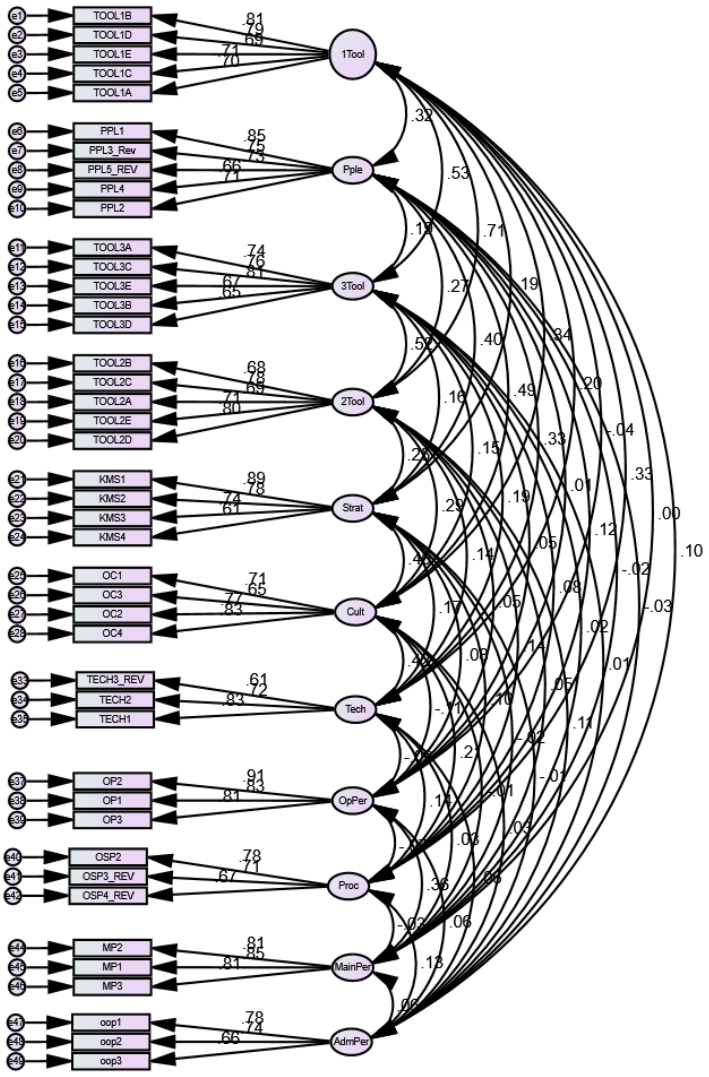
(Source: Created by authors)

5.5.2 Total Variance Explained.

The Total Variance Explained is used to quantify the discrepancy between the model and actual data. It indicates the variance explained by the existing factors. The explained variance greater than 60% indicates that the model can explain the variance in the data adequately. The Total Variance Explained obtained was found to be good at 67.463 % (Reio Jr. & Shuck, 2015; Suhr, 2006; Treiblmaier & Filzmoser, 2010).

5.6 Measurement Model Testing or Confirmatory Factor Analysis (CFA)

The measurement model or CFA is part of the overall SEM process used to estimate latent variables based on observed indicator variables. It is used to verify the factor structure of a set of observed variables based on prior theories (Suhr, 2006). The measurement model used in the study is indicated in Fig. 5.11.



(Source: Created by authors)

Fig. 5.11: Measurement model

The first step in CFA is the evaluation of reliability and validity aspects and then proceeding to check the fitness of the model (Fornell & Larcker, 1981; Hair et al., 2006).

5.6.1 Reliability

The degree to which the measurement model correctly captures the desired latent component is known as reliability. This can be evaluated using the following criteria:

(a) **Internal Reliability:** The Instrument's reliability can be used to evaluate the questionnaire's consistency. Reproducibility or repeatability is a crucial aspect of reliability. An accurate instrument yields consistent results throughout time and in various contexts. Cronbach's Alpha is the most common measure of reliability or internal consistency, that indicates how closely items are related as a group. It is typically used to check the validity of a scale when there are several questions in a survey. A Cronbach Alpha value above 0.7 indicates a reliable scale (Bagozzi & Yi, 1988; Cronbach, 1951). The reliability statistics obtained are depicted in Table 5.9.

Table 5.9: Reliability Statistics: Cronbach's Alpha

Sl No	Factors	Cronbach's Alpha
1	People	.859
2	Process	.762
3	Culture	.832
4	Strategy	.842
5	Technology	.787
6	Tool1	.858
7	Tool2	.852
8	Tool3	.846
9	OpPerf	.818
10	MaintPerf	.862
11	AdmPerf	.767

(Source: Created by authors)

(b) **Composite Reliability**: The internal consistency or reliability of latent constructs can be determined using Composite Reliability (CR). For a construct to

attain composite reliability, a value of CR > 0.6 is required (Hair et al., 2006). The CR for the data was computed using AMOS and was found to be in the range of .766 to .886, above the recommended limit, indicating an adequate relationship between the statements.

5.6.2 Validity

The ability of an instrument to measure a latent component as intended is referred to as validity. Various validity tests required for each measurement model are:

(a) **Convergent Validity.** The convergent validity indicates that variables correlate with each other and their factors. It can be verified by computing the Average Variance Extracted (AVE) for all the constructs. The AVE indicates the relationships between the statement and constructs and therefore the value of AVE should be equal to or greater than 0.5 (i.e., 50% of variables should be explained) to achieve this validity. Retaining low-factor loading items in a model can cause the failure of convergent validity. From the data, all standardised factor loading was found to be significant ($p<0.01$). The Average Variance Extracted (AVE) values for all the constructs as indicated in Table 5.10, exceed the suggested threshold value of 0.50, thereby confirming the convergent validity of the scale (Fornell & Larcker, 1981; Hair et al., 2006).

(b) **Discriminant Validity.** The discriminant validity indicates variables better correlate within their parent factors, than with other factors. This can be ascertained if the value of AVE (relationship between a statement and parent construct) is greater than the Maximum Shared Variance (MSV-square of the correlation coefficient between the constructs). Table 5.10 indicates, that the square root of the AVE from the various dimensions in this study was found to be greater than the correlation between each pair of latent variables (MSV). Hence, the discrimination validity was also found to be adequate (Fornell & Larcker, 1981; Hair et al., 2006).

Table 5.10: Composite Reliability, Convergent and Discriminant Validity

	CR	AVE	MSV	MaxR(H)	MainPer	1Tool	Pple	3Tool	2Tool	Strat	Cult	Tech	OpPer	Proc	AdmPer
MainPer	0.863	0.677	0.128	0.864	**0.823**										
1Tool	0.859	0.551	0.500	0.866	0.003	**0.742**									
Pple	0.860	0.552	0.235	0.873	-0.019	0.324	**0.743**								
3Tool	0.849	0.531	0.281	0.857	0.019	0.530	0.189	**0.728**							
2Tool	0.852	0.537	0.500	0.858	0.050	0.707	0.265	0.520	**0.733**						
Strat	0.844	0.579	0.163	0.879	-0.019	0.194	0.404	0.159	0.245	**0.761**					
Cult	0.830	0.552	0.235	0.843	-0.011	0.341	0.485	0.152	0.285	0.400	**0.743**				
Tech	0.766	0.526	0.174	0.796	0.034	0.202	0.333	0.192	0.142	0.175	0.417	**0.725**			
OpPer	0.886	0.721	0.128	0.897	0.358	-0.039	0.008	0.047	0.048	0.080	-0.106	-0.030	**0.849**		
Proc	0.763	0.519	0.108	0.771	-0.035	0.328	0.120	0.081	0.140	0.104	0.207	0.141	-0.070	**0.720**	
AdmPer	0.771	0.530	0.018	0.779	0.055	0.104	-0.031	0.007	0.108	-0.012	0.026	0.059	0.060	0.134	**0.728**

IT- Information Technology, OP-Organisation Performance, TCSK- Tools for creation and storage of knowledge, TICK – Tools for identification and capture of knowledge, TSAK- Tools for sharing and application of knowledge, IM- Ideal Marker for testing method bias.

Cronbach alpha (Ideal >.7), CR- Composite Reliability (Ideal>.5), AVE- Average Variance Extracted (Ideal>.5), MSV-Maximum Shared Variance (Ideal<AVE).

Source: Author; Ref-(Gaskin & Lim, 2016; Hu & Bentler, 1999)

5.6.3 Model Fit

Model Fit indicates the level of consistency of the data and hypothesised model. In SEM various indexes of fitness indicate how fit is the model to the given data. Hair et al. (1995,2010) recommends computing at least one fitness index from each category of Model Fit comprising of (i) Absolute Fit (Chi-square, RMSEA-root mean square of error approximation and GFI-goodness of the fit index), (ii) Incremental Fit (CFI-comparative fit index, TLI- trucker-lewis index, NFI-normed fit index) and (iii) Parsimonious Fit (Chi-square/degree of freedom). The study calculated five Absolute fit measures suggested by Byrne (2008); Hu and Bentler (1999); and Tabachnick and Fidell (2007) and the value of all measures were within the permissible threshold specified for each Model Fit measure, thereby indicating good fit for the sample data. The GFI index was excluded as suggested by Sharma et al. (2005). The analysis of the Measurement Model is shown in Table 5.11.

Table 5.11: Model Fit Measures for Measurement Model

Measures	**Threshold**	**References**	**Measurement Model Estimate**	**Interpretation**
CMIN			1354.851	
DF			805	
χ 2/df	Between 1 and 3	(Byrne, 2008; Hu & Bentler, 1999; Tabachnick & Fidell, 2007)	1.683	Excellent
CFI	>0.90		0.937	Excellent
SRMR	<0.08		0.040	Excellent
RMSEA	<0.06		0.039	Excellent
PClose	>0.05		1.000	Excellent

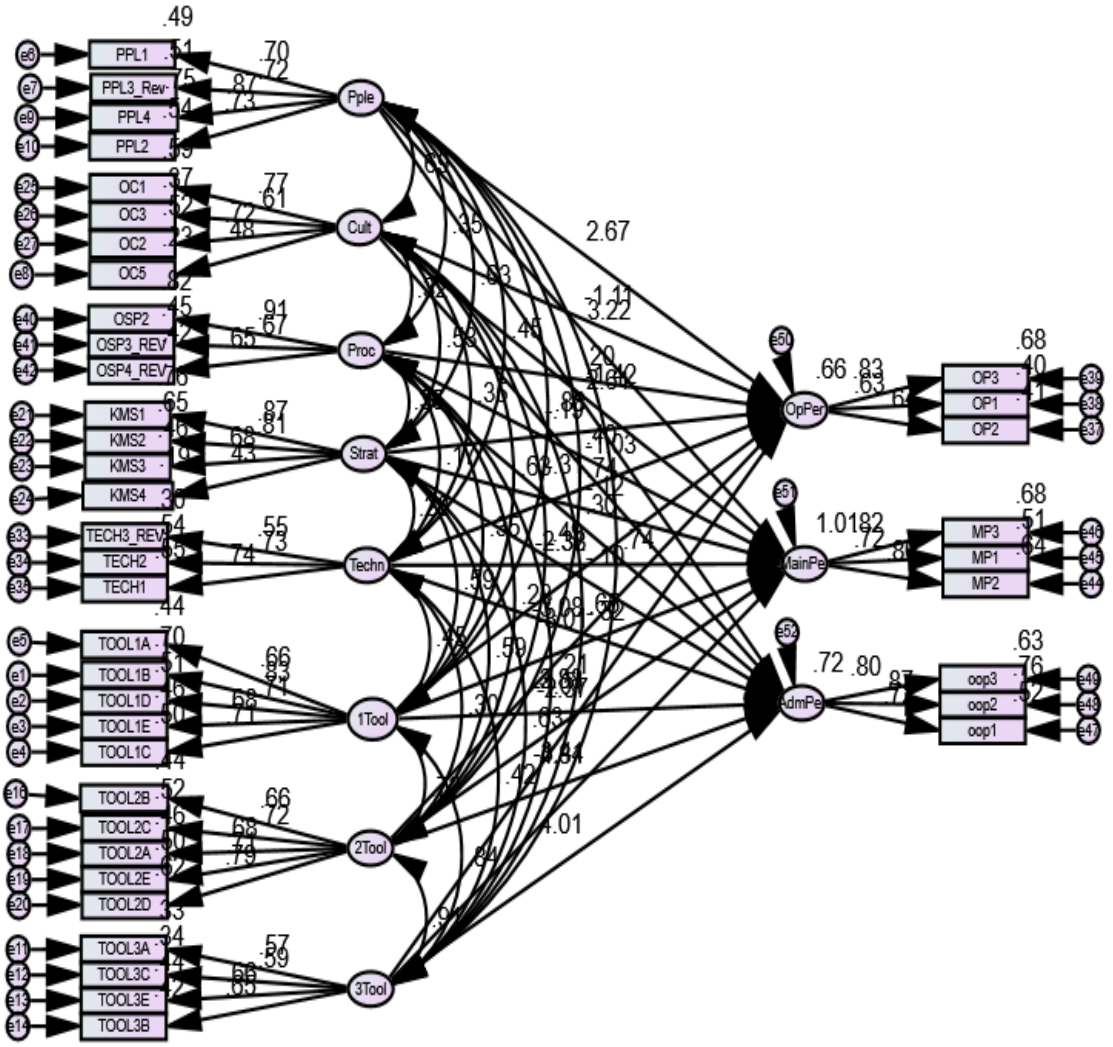
χ2 / df – Chi-squared (CMIN) / degree of freedom, CFI- Comparative Fit Index, SRMR- Standardised Root Mean Square Residual, RMSEA- Root Mean Square Error of Approximation

(Source: Created by authors)

Since all the reliability and validity checks of the measurement model were satisfactory, further study was undertaken to check the path coefficients of the structural model.

5.7 Structural Model and Hypotheses Testing

The measurement model was examined in the previous section to verify the accuracy and validity of the data; the next logical step is to move on to the structural model to examine the dependent relationship between the constructs. The structural model displays the interrelation among latent constructs and observable variables in the proposed model as a series of structural equations which is similar to executing multiple regression equations. The structural model aids in testing the hypotheses because it not only provides the significance level but also the coefficient for the magnitude of the impact of the independent variable on the dependent variable (Kaiser et al., 1974). The structural model drawn for the study using AMOS is depicted in Fig. 5.12.



(Source: Created by authors)

Fig. 5.12: Structural Model

5.7.1 Model fit of Structural Model

The structural model was also checked for fitness, prior to conducting path analysis for testing of hypotheses. Similar to the measurement model, the structural model was also found to be a good fit for the specified indexes, as shown in Table 5.12.

Table 5.12: Model Fit Measures for Structural Model

Measures	Threshold	Reference	Structural Model Estimate	Interpretation
CMIN			1402.790	
DF			808	
χ 2/Df	Between 1 and 3	(Byrne, 2008; Hu & Bentler, 1999; Tabachnick & Fidell, 2007)	1.736	Excellent
CFI	>0.90		0.931	Excellent
SRMR	<0.08		0.048	Excellent
RMSEA	<0.06		0.040	Excellent
PClose	>0.05		1.000	Excellent

χ2 / df – Chi-squared (CMIN) / degree of freedom, CFI- Comparative Fit Index, SRMR- Standardised Root Mean Square Residual, RMSEA- Root Mean Square Error of Approximation

5.7.2 Hypotheses Testing

Hypotheses were tested by assessing the significance of the path coefficient (β or standardised regression coefficient). The significance level aids in determining whether or not these associations are significant, while the beta values demonstrate the impact of independent variables on dependent variables. The statistical significance of path coefficients is generally examined by the 't' values associated with structural coefficients. However, in AMOS, instead of 't' values the Critical-Ratio (CR) for regression weights is used. The path is said to be significant at 0.001 level, thereby confirming the given hypotheses (Gao et al., 2008). The results of the path analysis coefficient and verification of the research hypotheses of the structural model are presented in Table 5.13.

Table 5.13: Results of Path Analysis and Verification of Research Hypotheses

Hypotheses	Variables			β	t	p	Result
H1a	OpPerf	<---	Pple	2.675	0.339	***	S
H1b	MainPerf	<---	Pple	3.225	0.632	***	S
H1c	AdmPerf	<---	Pple	2.61	0.514	***	S
H2a	OpPerf	<---	Cult	-1.113	0.192	0.002	NS
H2b	MainPerf	<---	Cult	-1.419	0.361	***	S
H2c	AdmPerf	<---	Cult	-1.026	0.292	0.004	NS
H3a	OpPerf	<---	Proc	0.198	0.106	0.33	NS
H3b	MainPerf	<---	Proc	0.397	0.201	0.113	NS
H3c	AdmPerf	<---	Proc	0.301	0.163	0.149	NS
H4a	OpPerf	<---	Strat	-0.193	0.107	0.444	NS
H4b	MainPerf	<---	Strat	-0.116	0.202	0.707	NS
H4c	AdmPerf	<---	Strat	-0.097	0.164	0.707	NS
H5a	OpPerf	<---	Techn	-0.309	0.178	0.174	NS
H5b	MainPerf	<---	Techn	-0.321	0.336	0.249	NS
H5c	AdmPerf	<---	Techn	-0.316	0.274	0.175	NS
H6a	OpPerf	<---	1Tool	-2.33	0.31	***	S
H6b	MainPerf	<---	1Tool	-3.008	0.584	***	S
H6c	AdmPerf	<---	1Tool	-2.374	0.474	***	S
H7a	OpPerf	<---	2Tool	-3.084	0.375	***	S
H7b	MainPerf	<---	2Tool	-4.006	0.701	***	S
H7c	AdmPerf	<---	2Tool	-3.414	0.572	***	S
H8a	OpPerf	<---	3Tool	3.881	0.788	***	S
H8b	MainPerf	<---	3Tool	4.844	1.476	***	S
H8c	AdmPerf	<---	3Tool	4.011	1.2	***	S

OpPerf-Operational Performance, MainPerf- Maintenance Performance, AdmPerf-Administrative Performance, Pple-People, Proc-Process, Cult- Culture, Strat-Strategy, Tech-Technology, 1Tool-KM tools for identification and creation,

2Tool-KM tools for capture and storage, 3Tool- KM tools for sharing and application

Significant at p<.001

S= Supported, NS= Not supported

From Table 5.13 we can see that out of 24 hypotheses, 06 relationships are positively significant, 07 relationships are negatively significant, and 11 relationships are non-significant. A p-value of higher than 0.001 indicates that the null hypothesis is accepted, demonstrating that the independent variable does not affect the dependent variable. Conversely, a p-value of less than 0.001 indicates that the alternate hypothesis is accepted.

CHAPTER 6

DISCUSSION AND CONCLUSIONS

This study conducted SEM to test hypotheses 1 to 8 (a to c); to examine the effects of the various enablers of the KM environment and various KM tools used in the KM process on the measures of organisational performance in the IAF. The result of the hypotheses and path analysis of structural mode is presented in Fig. 6.1.

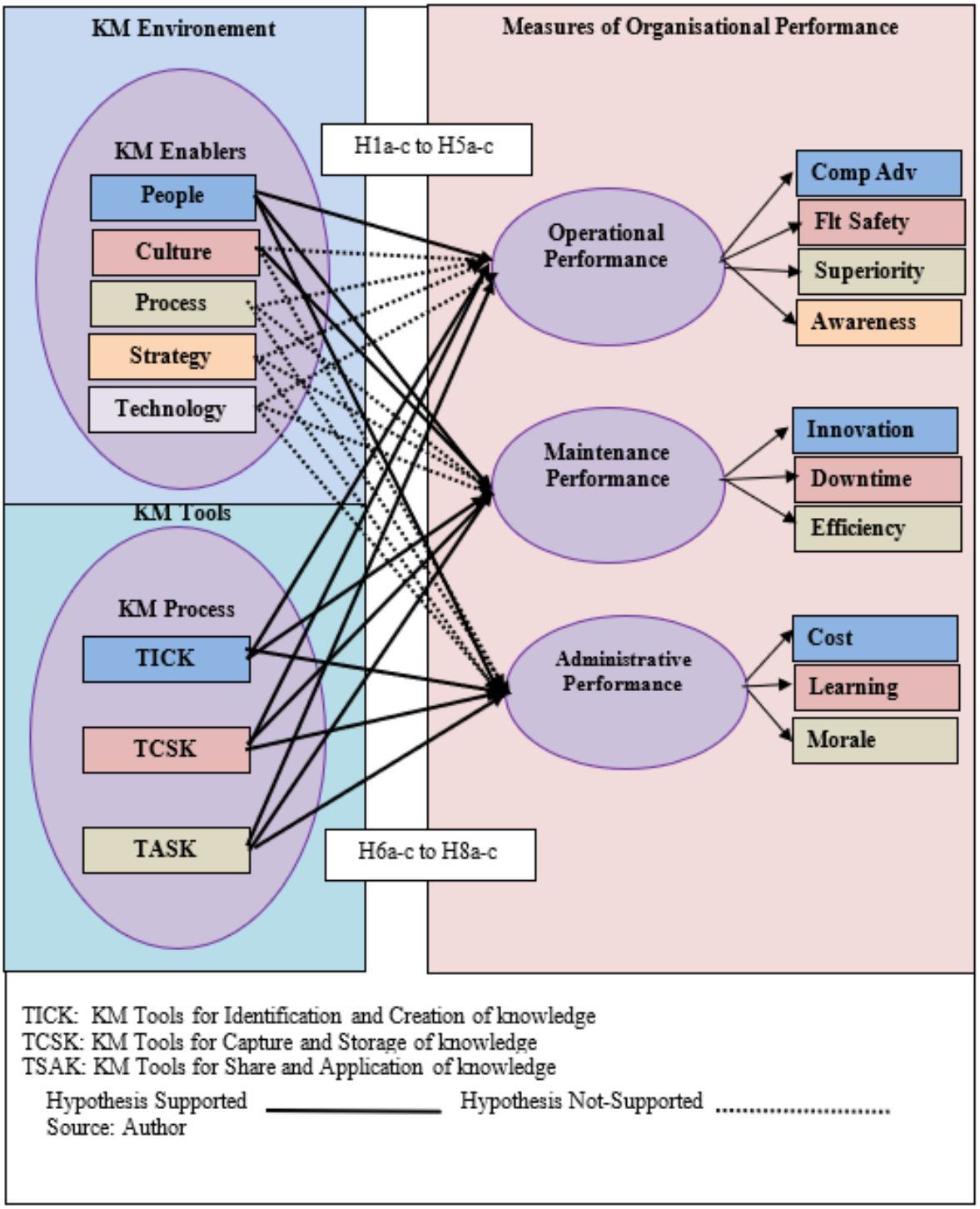


Fig. 6.1: Path Analysis of Structural Model

The relation between the KM of air warriors in IAF and various measures of the organisational performance is strongly supported including the operational performance

H1a (β =2.675, t=.339, p value=.000), maintenance performance H1b (β =3.229, t=.632, p value=.000), and administrative performance H1c (β =2.61, t=.515, p value=.000). Situational awareness and decision-making by the soldiers are the two most fundamental factors that affect modern warfare and they rely heavily on knowledge more than ever. Walsh (2015) states that people in the military are trained to deal with stressful and unpredictable situations. Their lifetime experience, in-depth knowledge of the environment, and culture, attitude to understand complex issues, and aptitude to integrate and correlate knowledge is of utmost importance for organisation sustenance (Singh and Gupta, 2020). The military environment is volatile, uncertain, complex and ambiguous (Soeters, 2023). It is therefore essential that in this environment war fighters share and exploit the knowledge contained within their organisation. The data indicates that the people in the IAF understand KM and are willing to accept and learn from experts and share their knowledge with those in need. Air warriors in operations are actively involved in capturing and preserving mission-critical organisational knowledge that can provide IAF with a sustainable competitive advantage against adversaries (Walsh, 2015). These air warriors are ceased to the importance of flight safety and adopted all the measures to improve the same. They use various KM initiatives to gather current, relevant, and structured data and information that facilitate commanders to make better-informed decisions. The KM efforts made by the air warriors facilitate the sharing and exchange of information and knowledge that increases the situational awareness of the operators. The air warriors involved in the maintenance of weapon platforms have been active in promoting KM initiatives to encourage creativity and innovations. They attempt towards management of individual and organisational knowledge to facilitate expertise build-up, improvement in maintenance quality and reduction in equipment downtime. The technical air warrior have been always at the forefront of enhancing efficiency and effectiveness to boost the overall maintenance performance. The air warriors involved in the administrative service of IAF have facilitated proper storage, transfer, and application of information and knowledge to eliminate the costs associated with duplicated effort and wasted time (Soeters, 2023). They promote the creation of a proper KM environment that increases the learning curve of the employees. These administrative air warriors tend to promote a collaborating organisation culture, open communication, trust, sharing; increase loyalty, commitment and morale of employees so that knowledge workers are happier in the IAF. The finding is reinforced by the literature that lends credence to the people's role in an organisation for fostering a KM environment and its effect on

organisational performance (Lee and Choi, 2003; Wu and Chen, 2014; Marques and Simón, 2006). Researchers have acknowledged that KM is primarily a people issue because it is the people who create, share and use knowledge (Holsapple & Joshi, 2002; Ndlela & Du Toit, 2001; O'Dell & Grayson, 1999). A key element for an enterprise to be successful is to encourage people to communicate and share their knowledge with others (Nonaka and Takeuchi, 1995). Various researchers in the civil environment have appreciated findings and the current study establishes the same for a military background (Davenport, 1999; Mathi, 2004; Novak, 2017; Thomas & Gupta, 2021).

The hypotheses that the culture has a significant effect on the operational performance H2a (β = -1.113, t=0.192, p value=0.002) and administrative performance H2c (β = -1.026, t=0.292, p value=.004) was not supported. While the culture was found to have a negative significant effect on the maintenance performance H2b (β = -1.419, t=0.292, p value=.000). This indicates that though the individual air warriors support the KM initiatives towards achieving operational, maintenance and administrative performance, however, as a culture in the IAF these initiatives are not supported or adversely related. Individuals' interactions, the setting in which knowledge is created, their resistance to change, and finally how they communicate knowledge are all impacted by the organisational culture (De Long, 1997). The culture in IAF may not visualise KM as a potential tool for achieving a competitive advantage, ensuring flight safety, ameliorating information and decision superiority and achieving situational awareness for the operators (Reynolds, 2020). Similarly, the culture of the administrator may not promote the use of KM to reduce duplicity to save cost and time, increase the learning curve or promote open communication. The maintenance technicians probably do not get recognised and rewarded for sharing or contributing to the organisational knowledge base but perhaps for their achievements. They may consider knowledge as power and prefer hoarding it to gain position and appreciation. The IAF has strictly laid down standard operating procedures and policies with little margin for error and therefore reduces creativity and innovations (Pandey & Kothari, 2015). The findings were supported by Adnan et al. (2020), who found that organisational culture in the military does not enforce KM practices in the organisation as there is no explicit structure to encourage KM. In the military, the officer still perceives KM as an academic term only. The findings also find support by Gupta and Govindarajan (2000) who states that the effectiveness of KM programs and a dedication to knowledge-sharing techniques can be seen

as being facilitated or hindered by an organisation's culture and its associated beliefs, values and attitude in the organisations like police and armed forces. Reynolds (2020) say that organisation culture in military does not support knowledge transfer. The essential elements of a successful organisation KM are a result of a supportive culture, whereas strict processes, SOPs, hierarchy and a closed environment may operate as a barrier to the free flow of knowledge across the military organisation (Sanders & Analysis, 2004). Tefft (2002) advocates transforming armed forces culture so that the identification, collection, dissemination, and use of knowledge is a strategic priority and universally shared value. Fountain (2007) states that, while armed forces have always prioritised teamwork, a profound culture shift must be realised from traditional information sharing to knowledge sharing. An efficient strategic KM requires the creation of a suitable organisational environment and culture. A precondition for KM in the military organisation is the creation of a friendly, open, and non-competitive culture and environment (Rhem, 2016). Dunivin (1996) advocates for the shift in the military's culture away from the conventional model marked by social conservatism, homogeneity, a predominance of masculine values and norms, and exclusive regulations and procedures and toward a developing cultural model, which is characterised by social equality, a socially diverse force with a range of values and norms and inclusionary laws and policies.

The relationship between process in the IAF and the measures of organisational performance was found to be insignificant. The hypotheses, the process has a significant effect on the operational performance H3a (β = .198, t=.106, p value=0.033), maintenance performance H3b (β = .397, t=.201, p value=.113) and administrative performance H3c (β=.301, t=.167, p=.149) were not supported. The study indicates that process in the IAF may be focused on military objectives but it does not support the creation, storage, sharing and application of knowledge as routine. The ways and means to capture mission-critical operational knowledge in IAF may not involve the latest KM tools and techniques in vogue. Flight safety is a much stressed and discussed topic in the IAF, however, probably their lack of focus on using KM initiatives and tools to strengthen the same. Considering the sensitive operations of the IAF, there is a need to guard and protect information and knowledge assets and therefore the KM process for free and open sharing and exchange of information and knowledge would not be feasible in a military setup like IAF (Lepak, 2009). In the IAF, the organisational process is well-defined and documented in policies and procedures with little

margin for deviations. This may impose restrictions on creative thinking, inculcating new ideas and innovations towards ameliorating maintenance performance. The results indicate that the administrative process in IAF prefers adhering to the laid down procedures and policies rather than using KM tools and building a sustainable KM environment that exploits individual and organisational knowledge for boosting administrative performance. The findings are supported by Bryant (2002) who states that to form an environment of knowledge creation and sharing, the military organisation needs to overcome the process challenges that fall into the area of abilities, tools, connectivity, geographical separation, access to knowledge and trust. In a military environment, if abilities or tools are not readily available to share knowledge, the process becomes too difficult to function smoothly. It would be hard to capture or codify the knowledge if it is perceived as an additional burden instead of a by-product or normal process (van Lamoen et al., 2023). Armed forces need to set a goal to integrate KM and best business practices into the military routine process. A process that facilitates information sharing across boundaries and innovative thinking to achieve greater performance and enterprise cohesion in army activities (Van Laar et al. 2020). Similarly, Wiig (1997) emphasises value-creating processes such as organisation structure, management practices, system procedures, and the information technology infrastructure in the military setup.

The relationship between KM strategy in the IAF and the measures of organisational performance was found to be insignificant. The hypotheses, the strategy has a significant effect on the operational performance H3a (β = -0.193, t=.107, p value=0.444), maintenance performance H3b (β = -0.116, t=.202, p value=.707) and administrative performance H3c (β= -0.097, t=.164, p=.707) was not supported. The data indicate that IAF may have a formalised strategy towards achieving its operational, maintenance and administrative objectives, however, the same may not be dovetailed with a formal KM strategy. Capturing and preserving mission-critical operational knowledge, ensuring flight safety, and capturing and preserving information to boost situational awareness and information superiority may be an integral process in the IAF, but the same may not be formally augmented by the right KM environment and use of KM tools. The maintenance engineer may have their own strategies for building expertise and reducing equipment downtime, but in the absence of a personalisation KM strategy, enhancing creativity, innovation and efficiency would be a difficult job (Greiner et al., 2007). Similarly, the administrators lack any dedicated KM

strategy to eliminate the costs and efforts associated with duplicity, creating a knowledge environment, promoting KM tools to increase the learning curve and building a collaborating KM culture. Findings are augmented by Bartczak (2002), who states that military organisations either don't have a dedicated KM strategy or most of the people in the organisation lack knowledge about the KM strategy or the future of KM strategy. This provided a major barrier to the coordination of efforts towards a common goal of knowledge management. Greiner et al. (2007) say, not all KM activities are likely to have a constructive effect on corporate performance. Various parameters and their implications are required to be understood for the effective application of KM initiatives in an organisation. Therefore, the choice of an appropriate strategy depends on the organisational environment and the types of knowledge to be shared. KM strategies differ in industries and companies and one one-size-fits-all approach may not work (Choi & Lee, 2002; Donoghue et al., 1999). The KM strategy of IAF needs to be aligned with its overall organisational strategy. They need to develop KM strategies wherein they need to train KM leaders, reward people for knowledge sharing and make every interaction an opportunity to acquire and share knowledge (Elder, 2008). The organisational environment in the military must provide acceptance of and the opportunity for the exchange, use and reuse of knowledge (Pettersson, 2009).

The relationship between information technology in the IAF and the measures of organisational performance was found to be insignificant. The hypotheses that IT has a significant effect on the operational performance H5a (β = -0.309, t=.178, p value=0.174), maintenance performance H5b (β = -0.321, t=.336, p value=.249) and administrative performance H5c (β= -0.316, t=.274, p=.175) was not supported. IAF has a robust IT network named as Air Force Network (AFNET) for connecting the sensor to the shooter and people to people across the organisation (Ganguly, 2015). However, this network lacks orientation towards KM initiatives and hosting KM tools. The IT is generally restricted to traditional DBMS, mining tools, portals, intranet, and groupware (Nissen, 2003). Technology has led to an information overflow, that impends to overwhelm, rather than help its users (Bartczak, 2002). The findings are augmented by various researchers who claim that IT does not make organisations more knowledgeable and therefore there is no link between IT the organisational performance (Agrawal et al., 2021; Davenport & Prusak, 1998). Lausin et al. (2003) say, IT is only an enabler of a good KM and not a precondition.

Schulte and Sample (2006) say, IT enables KM initiatives but is not the most significant component of KM. Abuaddous et al., (2018), state that technology though an important precondition for KM is not directly related to organisational performance. Horwitch and Armacost (2002) say, in the case of the military though the technology is an important enabler of a KM programme, however, it is just secondary to the development of a coherent knowledge strategy and facilitating the KM process. Blackler (1995) emphasised that IT-focused KM ignores the tacit facets of knowledge and only facilitates codified or explicit knowledge. Bryant (2002) say, military organisations are centric and they have a ton of information on computers, but they have trouble sharing it with people outside of their community. It is incredibly challenging to locate, obtain, and verify information. Websites that are created locally are distinctive and memory-intensive. Starns and Odom (2006) say, technology performs a supportive role in KM in an organisation, as an organisation is a purposeful human activity system comprising people who make up the organisation, and the technologies enable or facilitate these activities. Lee and Choi (2003) state that, technology as an enabler is debatable as it can offer an excessive advantage in certain areas of KM, but can sabotage the KM process. Also, the threat of information security is much more critical for defence organisations like IAF, considering the sensitivity of the information handled by the defence forces (Ali & Tang, 2022; Joshi & Singh, 2017). Therefore, just deployment of IT tools for the management of organisational knowledge would not be adequate and impetus is to be given to information and knowledge security as well. Under such conditions, the relationship between IT, KM and organisation performance in a military organisation like IAF needs further exploration.

The relation between tools used for identification and creation of knowledge (TICK), on the organisational performance in the IAF was found to be significant. The hypotheses, TICK have a significant effect on the operational performance H6a (β = -2.33, t=.31, p value<.05), maintenance performance H6b (β = -3.008, t=.558, p value<.05) and administrative performance H6c (β= -2.374, t=.474, p<.05) were supported, however, their relation was found to be negative. Data indicate that the IAF encourages the use of KM tools for the identification and capture of knowledge to enhance its performance, however, the outcomes are contrary to what is desired. The U.S. Army first created an after-action review (AAR) to offer a realistic review of events, as well as unit and individual responses to those incidents to consider what transpired and develop conclusions for the future (Orhan, 2015).

The IAF like any other military too conducts debriefing and lesson learnt sessions (Dyson, 2020). These AAR tools are meaningful when the focus is on learning, communication is open, honest and without any fear to explain failures and what went wrong conducted in an atmosphere of trust and openness (Hasnain, 2016). However, considering the strict military regulations, interior law and orders with little tolerance for errors, the efficacy of such tools towards knowledge enhancement remains uncertain (Vlăsceanu & Drăghici, 2013). IAF has a formalised system for recognising and rewarding individuals. These rewards are being provided to the individuals for their expertise and personal achievements rather than for sharing knowledge with others. Gray and Meister (2004) say that, deeply knowledgeable people may obstruct the free exchange of ideas if they are viewed as the "last word" or an authority on the topic. Such individuals believe that knowledge is power and by sharing their expertise, their value may decrease in the organisation or someone else may take credit for their achievements. This creates an atmosphere of knowledge hoarding and tools like knowledge celebration will not have the desired effect (Lee et al., 2011). In IAF communities of practice (CoP) are formed as per the personal likings of the individuals and groups aligned with their shared interest and may not be exclusively for sharing of their domain knowledge and expertise. There is no organisational-driven or formalised set-up that encourages the use of KM tools like CoP or others (Pirsoi, 2022). In the absence of organisational or top leadership support, the unformalised practice of tools may not obtain the desired results. Similarly, knowledge identification and creation tools like the wall of ideas require the free sharing of thoughts and ideas. The military organisations like IAF where uniforms, military ranks, insignia, conduct, authority and power assume great importance, such tools also may get subdued (Adnan et al., 2020). The geographically dispersed location of the IAF, formal and strict hierarchical controls and rigid structure in the military further decline the efficacy of such KM tools on the measures of organisational performance (Vlăsceanu & Drăghici, 2013).

The relation between tools used for the capture and storage of knowledge (TCSK), on the organisational performance in the IAF was found to be significant. The hypotheses, TCSK have a significant effect on the operational performance H7a (β = -3.084, t=.375, p value<.05), maintenance performance H7b (β = -3.414, t=.701, p value<.05) and administrative performance H7c (β= -3.414, t=.572, p<.05) were supported, however, their relation was found to be negative. The study indicated that IAF encourages knowledge

capture tools like exit interviews conducted with the air warriors leaving the organisations. However, the desired end results may not be obtained, if the organisation follows the traditional concept of the exit interview to gather employee feedback on "why he is quitting, what they liked or didn't and what are the areas that need improvements". Traditional exit interviews are mostly restricted to HR feedback and satisfaction surveys instead of expanding as a KM tool to capture knowledge from the leavers. The use and scope of such tools are further left at the discretion of the local commanders without any formal strategy or policy to capture and store the wealth of knowledge and experience from the air warriors leaving the organisation (Perjanik, 2016). KM tools like experience capitalisation may not be effective if it is merely restricted to creating an individual legacy, reflecting accomplished action and success documents rather than tapping into past experience for adopting or improving future practices (Van Laar, 2023). In an organisation of the size of IAF whose people are dispersed at various places have less opportunity to interact with each other, and therefore the expert directory can play a significant role in connecting people with the experts. This is possible only if the directory is designed as a KM tool and hosts the details of domain experts, communities and project teams from within and outside the organisation. The outcome of the expert directory cannot be ascertained if it is restricted to a telephone or information directory just having names and contact numbers (Caruso, 2017). IAF has a robust wide area network (AFNET), hosting copious data and information through numerous portals. These portals can have a positive effect on the organisation's performance only if they are expanded as knowledge portals that act as knowledge workplaces and support a full range of knowledge work tasks within the organisation, right from capturing knowledge and expertise created by knowledge workers and make it available to others in the organisation to supporting knowledge communities and domain experts (Mack et al., 2001). The outcomes may not be positive if the portals are reduced to information portal which simply provides access to distributed online information (Van Baalen et al., 2005). Similarly, a knowledge taxonomy tool may not be as effective unless it is devolved in a structured way to assist people in efficiently navigating, storing, and retrieving needed data and information without wasting time.

The IAF can gain significantly from the wealth of knowledge acquired by its air warriors during various operations, deployments, exercises and training only if they are effectively shared throughout the organisation and put to use by others (Andrea et al., 2024).

The study's findings are on similar lines and indicate a significant contribution of the tools used for the sharing and application of knowledge (TSAK), on the organisational performance in the IAF, thus supporting the hypotheses, TSAK has a significant effect on the operational performance H8a (β = 3.881, t=.788, p value<.05), maintenance performance H8b (β = 4.844, t=1.476, p value<.05) and administrative performance H8c (β= 4.011, t=1.2, p<.05). Various KM tools for sharing and application of knowledge like training, mentoring, storytelling, peer assisting, conducting of knowledge fair and sharing of best practices were found to have a significant positive effect on the performance of the IAF. The IAF like any other military organisation has a robust training methodology, stretching for more than years. This is followed by job training under an experienced supervisor before the incumbent is declared fit to take on an independent charge. These training sessions serve as knowledge transfer vehicles and offer a great chance to convey both explicit and implicit knowledge (Hasnain, 2016). The military exercises conducted in-house and jointly with air forces of other countries are also an exceptional mechanism for knowledge transfer between the knowledge seekers and the knowledge providers and thus help to develop military efficiencies (Hasnain, 2016). The routine job rotation of the air warriors through regular postings across the country provides an excellent way to share tacit knowledge throughout the organisation. The air warrior with them also carries the best practices learned at the previous place and transfers to a new place. The best practices are also shared in explicit form in the form of standard operating procedures (SOP), directives and policies. For armed forces which are scattered at dispersed locations, sharing of best practices followed at one place with others performing a similar task at a widely dispersed location can be highly advantageous in eliminating bad practices or re-inventing the wheel. The IAF is known to showcase the achievement and innovations of its air warriors in larger public events, displays and expos which is akin to small-scale knowledge fairs for sharing and disseminating expertise across the organisation. The armed forces always boast about bonhomie and comradeship among the soldiers. This relationship strengthens the essence of KM tools like peer assists wherein experts share their experience with their peers thereby avoiding reinventing the wheel and the menace of repeating mistakes. This is especially significant in military organisations like IAF where work is usually in a crisis or post-crisis scenario and time for strategic planning is generally inadequate and mistakes may have serious repercussions. Horwitch and Armacost (2002) say, the success of KM requires the active involvement of top brass. In the military few KM tools prove to be helpful to the soldiers

because they spread voluntarily because they were “pulled” by the users and not “pushed” down by the top brass”. The IAF encourages the use of storytelling as a KM tool to disseminate various accidents, incidents, inquiries and the lessons learned during various training lectures, informal gatherings, and flight safety meetings for better appreciation and assimilation (Perjanik, 2016). Mentoring as a KM tool is deeply rooted in the IAF training philosophy. A mentor is someone older, more experienced and at a higher place in rank or the organisational, provides career guidance, personal support and facilitates the transfer of knowledge and experience to the novice and into the organisation (McManus & Russell, 1997; Ostroff & Kozlowski, 1993). Sosik et al. (2005) say, mentoring can enhance better organisational commitments, individual skills, knowledge retention, managerial succession, productivity and overall organisational performance and the same relation is also found in the present study. Findings of the relationship are augmented by various other studies (Eslamkhah & Hosseini Seno, 2019; Plyasunov et al., 2017; Serrat, 2008; Surve & Natarajan, 2015).

6.1. Conclusions

The capability of an institution to capitalise on the knowledge base of its people is more significant than ever in the current competitive global economy. Effective KM is regarded as a valuable activity due to its effects on a company’s performance because it enables an organisation to be quicker, more proficient and more innovative. Like any other organisation, the requirement of effective KM in a contemporary military is indispensable. The IAF is the fourth largest air force in the world and is also no exception therefore needs to keep pace with these changes. Aggressive KM initiatives assume a vital role for the IAF, as timely, accurate, decision-ready and actionable knowledge is imperative for planning and conducting aerospace operations. The IAF, therefore, is required to develop a KM strategy, to transform from information-based to knowledge-based operation and turn into a net-centric-knowledge-based force. To achieve this, IAF must support a culture that makes it easier for people to find, create, collect, store, share and use knowledge within the organisation by actively using various KM tools. Although the volume of literature on various KM initiatives in civil society is rising, however, there is still a dearth of publication that comprehensively explores such issues in a military organisation. The literature that supports the existence of any KM initiative or policy in the IAF or any of the Indian Armed Forces is also deemed lacking. A military organisation

is known to have an exclusive characteristic that affects the limit of publication year. IAF is enormously diverse in its knowledge systems and practices and any attempt to summarise military KM in its totality would be presuming, if not impossible. The environment in IAF is volatile, uncertain, complex and ambiguous. The study made an effort to study the nuance of KM in such an environment without adequate support from the relevant literature. This paper makes an effort to understand various enablers of a knowledge environment, KM tools and their relation with the organisation performance in the Indian Air Force. To address these gaps, the study formulated the following research objectives:

To identify and adopt the most suitable measures of organisational performance for the IAF.

To examine the relationship between the enablers of a KM environment with the measures of organisational performance in the IAF.

To examine the relationship between relevant KM tools with the measures of organisational performance in the IAF.

The literature indicates that military organisations are enormously complex and have unique contexts, missions, structural and cultural attributes, leadership, resources and operating environments. The KM in a military organisation is considered to be more intricate and has largely remained unexplored (Bartczak, 2002; Ismail et al., 2011). From the various definitions in the literature, KM in the military context can be summarised as a methodical strategy for achieving military goals by maximising the value of collective knowledge through the creation, gathering, organisation, sharing and application of knowledge. The available literature establishes KM as a force multiplier for military establishments and in the 21st century military organisations of the world have no option other than to take cognizance of the fact and embrace KM in a big way to remain current and relevant. The militaries across the world have recognised that KM must become part of their basic fabric to achieve service goals of information and knowledge superiority. Effective management of individual and organisational knowledge is a prerequisite for any military organisation to gain knowledge superiority over its adversaries.

To measure the efficacy of the various KM initiatives, organisations need to identify certain measures of performance. There are no specific measures of KM performance available for the IAF or any military organisation of a developing country. For civil organisations, the main performance indicators are primarily financial like net profit, sales growth, ROI, income, and market share, along with a few non-financial ones like product quality, marketing effectiveness, value addition, innovation, customer satisfaction, etc. Since the military organisation has unique processes and procedures that are unparalleled outside the military, the one-size-fits-all approach may not work. Therefore, to develop a suitable measure of performance for the IAF, the study shortlisted the most common performance measures of KM used in the literature for the public and other large organisations, compared with the parameters used to measure the effectiveness of KM on the performance of the U.S. Army by Van Laar et al. (2020), the Canadian Armed Force Environment by Lecocq and Gauvin (2006a), Department of Navy by Schulte and Sample (2006) and the KM effects highlighted in the Air Force Instructions 33-396 of the U.S. Air force (2014). The parameters were further discussed with the senior officers of the IAF, who have been associated with the organisation for over 30 years to finalise the most suitable measure which may have a significant effect on the performance of a military organisation in the Indian context. The key performance measures used in the study were competitive advantage, decision superiority, flight safety, , situational awareness, creativity, expertise, equipment downtime, cost, learning curve and morale. Considering the three main working domains of the IAF's performance, the selected measures of organisational performance were further categorised into three verticals comprising Operational Performance, Maintenance Performance and Administrative Performance.

The other two objectives were examined using Structural Equation Modelling. Path analysis was undertaken to examine the link between the enablers of a KM environment and various KM tools on the performance of IAF. Greiner et al. (2007) say, not all KM activities are likely to have a positive effect on business performance or result in a competitive advantage. The study's findings also showed that there was a lack of consistency, with some KM indicators having a negative impact on an organisation's performance while others had a favourable one. The relation between the KM of people in IAF and various measures of the organisational performance was strongly supported including the operational performance, maintenance performance, and administrative performance. The data indicates that the people in the IAF understand KM and are willing to accept and learn from experts and share their knowledge with

those in need. The literature that supports people's contributions to creating a KM environment and its impact on organisational performance lends credence to the finding. Because it is people who produce, share and use information, researchers have realised that KM is primarily a human issue. Whereas, the relation of other enablers of the knowledge environment that is culture, process, strategy and information technology with the measure of performance of the IAF was not supported. While the culture was found to have a negative relationship with maintenance performance. This indicates that though the individual air warriors support the KM initiatives towards overall organisation performance, the culture in the IAF, process, strategy and IT does not support these initiatives. A supportive culture is one of the most important factors in the success of an organisation's KM, whereas a closed environment like the IAF, which has rigid processes, Standard Operating Procedures, hierarchy, and leadership styles may function as a barrier to the free flow of knowledge throughout the organisation. Though the finding varies with results in the civil organisation, it is augmented by certain literature on military organisations. The relation of the process with performance indicates that processes in the IAF may be focused on military objectives but it does not support the creation, storage, sharing, and application of knowledge as a routine. The ways and means to capture individual and organisational knowledge in IAF may not involve the latest KM tools and techniques in vogue. In the IAF, the organisational process is well-defined and documented in policies and procedures with little margin for deviations. This may impose restrictions on creative thinking, inculcating new ideas and innovations. The results also indicate that the IAF may not have a formal KM strategy that is dovetailed in the organisational strategy. Any fragmented KM initiatives may not provide the desired results unless, it is formalised in the form of a strategy which has well-defined aims, objectives, methodologies, roles and responsibilities for the stakeholders of KM. The KM strategy should not be viewed as an additional burden but should be part of a routine process aligned with the overall organisational strategy. Findings are augmented by (Bartczak, 2002), who states that military organisations either don’t have a dedicated KM strategy or most of the people in the organisation lack knowledge about the KM strategy or the future of KM strategy. IAF has a robust Air Force Network (AFNET), however, this network lacks orientation towards KM initiatives and hosting KM tools. This IT network largely consists of groupware, intranet, portal, and traditional database management systems, data warehouses and mining tools. It may be suitable for the operational, maintenance and administrative job for which it has been created, but not upgraded as a knowledge network. The

findings are augmented by various researchers who claim that there is no link between IT and organisational performance

The last objective of the study was to study the link between KM tools used for the identification and creation, capture and storage, and application and use of knowledge with organisational performance measures in the IAF. The relation between tools used for identification and creation of knowledge (TICK) and tools used for capture and storage of knowledge (TCSK), on the organisational performance in the IAF was found to be significant, however, their relation was found to be negative. Whereas the relation of organisational performance with the tools used for application and use of knowledge (TASK) was found to be significant. The study indicates a possible lack of an organisational-driven or formalised setup that encourages the use of KM tools in the IAF. The military organisations like IAF where uniform, military ranks, insignia, conduct, authority and power assume great importance, the KM tools designed for open and lateral communication may get subdued. The geographically dispersed location of the IAF, formal and strict hierarchical controls and rigid structure in the military further decline the efficacy of KM tools especially TICK and TCSK tools which require resources and support of top leadership and organisation. Any unformalised and fragmented practice of such tools may not obtain the desired results. The debriefing and lesson learnt sessions conducted in IAF are akin to the formal AAR tool. However, these tools are meaningful when the focus is on learning, communication is open, honest and without any fear of explaining failures and what went wrong conducted in an atmosphere of trust and openness. However, considering the strict military regulations, laws and orders with little tolerance for errors, the efficacy of such tools towards knowledge enhancement is not assured. The rewards and recognition to the individuals for their expertise and personal achievements rather than for sharing knowledge with others may encourage knowledge hoarding. The communities formed in individual capacity as per personal likings without any aim for sharing of domain knowledge and expertise would have no meaningful outcome. Knowledge capture tools like exit interviews will not be effective if the organisation follows the traditional concept of the exit interview to gather employee feedback on HR issues and satisfaction surveys instead of expanding as a KM tool to capture knowledge from the leavers. KM tools like experience capitalisation may not be effective if it is merely restricted to creating an individual legacy, reflecting accomplished action and success documents rather than tapping into the experience for adopting or improving future practices. The outcome of an expert directory cannot be ascertained if it is restricted to a

telephone or information directory just having names and contact numbers. Similarly, web portals may not have positive knowledge outcome, if it is restricted to an information portal instead of knowledge portals that act as knowledge workplace and support a full range of knowledge work task within the organisation.

The armed forces always boast about bonhomie, comradeship and team spirit. This relationship strengthens the essence of the KM tool used for sharing and application of knowledge (TSAK) like peer assist, training, mentoring, storytelling and sharing of best practices. The study augmented this philosophy as the KM tools for sharing and application of knowledge were found to have a significant positive effect on the performance of the IAF. The IAF has a robust training methodology with a system of on-the-job training of novices under an experienced supervisor. Mentoring as a KM tool is deeply rooted in the IAF training philosophy. These training events are the vehicles of knowledge transfer and promise an excellent opportunity to transfer explicit as well as tacit knowledge. The military exercises with the air forces of other countries also provide an excellent mechanism for knowledge transfer. The periodic job rotation of the air warriors facilitates the sharing of tacit knowledge along with the best practices throughout the organisation. The IAF encourages the use of storytelling to disseminate various accidents, incidents, inquiries and lessons learned during various training lectures and other formal and informal gatherings. Findings of the relationship are augmented by various other studies in civil and certain military organisations. Horwitch and Armacost (2002) say, the success of KM requires the active involvement of top brass. In the military few KM tools prove to be helpful to the soldiers because they spread voluntarily because they were "pulled" by the users and not "pushed" down by the top brass".

CHAPTER 7

IMPLICATIONS, LIMITATIONS AND FUTURE SCOPE OF RESEARCH

7.1 Theoretical Implications

Though KM research is growing fast, very little has yet focused exclusively on efforts in the military. There is a dearth of formal research in military organisations, especially in the militaries of developing countries. The paper attempts to present a long-due study of KM in any of the armed forces of a developing country. This research would significantly infuse theoretical rigour into the KM literature in a military environment, and open fresh avenues for research inquiry. The findings of the study have made a significant contribution to the preceding literature in various ways:

The first is in terms of the research gap. Although the volume of literature on KM initiatives in the civil sector is growing, however, there is a dearth of publication that comprehensively explores such issues in a military organisation. The literature that supports the existence of any KM initiative in the IAF or any of the militaries in developing countries is also deemed lacking. Of the literature studied on various aspects of KM in military organisations, 65 % belongs to the militaries of the U.S., Canada and other European countries. Scarcity of publication exists in the context of KM in the Indian military. While there may be a different reason for this deficiency, one prominent reason is due to the fact that the military services are just now beginning their KM efforts in earnest. Unlike other institutions, a military organisation is known to have an exclusive characteristic that restricts the limit of publication year. The military has concerns about the confidentiality of information, their ethical code prevents them from disseminating their work openly as compared to civil research. The secluded boundaries of the military, further act as a moat for the researchers in accessing a deep understanding of the organisation. This study is unique in generating a detailed empirical insight into the KM in a military setup and therefore this paper would be a stepping stone in bridging the gaps in the KM literature.

Second, Adnan et al. (2020) says, they could find only nine previous literatures in the context of KM in a military organisation. The study conducted a comprehensive search of the literature and expanded the index to include 61 most relevant papers on various aspects of KM in a military organisation.

Thirdly, Bheenick and Bionyi (2017) say that, there are more than 180 KM methods and tools available. Though lists are exhaustive, however, selecting the desired tools or categorising the tools as per the user's context could be a daunting task for KM practitioners. Therefore, to facilitate KM practitioners to identify a narrow range of the most optimal KM tools and techniques that can be considered applying as per the requirement of the KM process, the study shortlisted 15 KM tools that the world's most successful organisations have used in KM initiatives and also considered relevant for the military organisation.

Fourth, is the selection of the research object. The majority of studies on KM are focused on civic society including commercial, educational, private and public sector organisations. However, the types of knowledge, job, structure, culture, strategy and objectives of a military organisation are unique and different from a civic organisation. Therefore, various KM theories, models, tools and strategies that have been elucidated for civil society, may not be applicable for a military organisation. This study chose the IAF as a research object with the hope of expanding the scope of KM in the military domain and bridging this gap between the military and civil society. The study highlights the complications of civil-military relationships and challenges the existing KM practices in civic society while applying these theories and practices in military organisations. The study provides an opportunity for researchers to explore the hidden insights into the various aspects of KM in a military organisation. The study would also motivate the aspiring researchers to choose the complex military establishment as a subject to research various issues, and problems faced by the militaries and provide a researched logical solution.

Fifth, the study has improved the theoretical know-how of KM in a military setup by formulating and testing an integrated model on the KM environment, KM tools and organisational performance. The research model included five enablers of a KM environment comprising of people, culture, process, strategy and information technology; fourteen KM tools categorised as per the knowledge process of identification and creation,

capture and storage, and sharing and application of knowledge; and ten measures of organisational performance categorised under the three verticals of IAF working comprising of operational performance, maintenance performance and administrative performance. KM literature has generally focused on KM enablers or KM tools or organisational performance in isolation, whereas, the study adopted an integrated approach to obtain a comprehensive understanding of KM in a complex military setup.

Sixth, the studies conducted in a military organisation have been generally theoretical and mostly restricted to the significance of KM without any empirical backing. This study is unique in empirically testing various aspects of KM in a military organisation. The study demonstrates the relation of various KM enablers and KM tools that can be leveraged to enhance organisational performance.

7.2 Practical Implications

Though the study is focused on a single military organisation, however considering the similar roles, tasks and structure of all the military organisations whether Army, Navy or Air Force the results can be equally generalised for others. The results of the study find many implications for the leaders and KM practitioners in the IAF or other military organisations:

First, our study takes a fine-grained approach to understanding KM issues in a complex military environment. The study endorses that military organisation is enormously intricate and has a unique context, missions, structural and cultural attributes, leadership, resources and operating environment. The militaries across the world have acknowledged that KM is a force multiplier and must become part of their basic fabric to achieve information and knowledge superiority. However, there lacks a formalised strategy or policy on KM in most of the militaries other than that of a few developed nations. KM in developing countries like India is being practised in a fragmented way by individuals or local commanders. The study highlights these shortcomings for the knowledge managers, leaders in the IAF and other military establishments.

Second, the research in civil industries has acknowledged various financial and non-financial parameters to gauge the efficacy of KM initiatives on the organisations'

performance. There is a lack of any such measures in the Indian military or any other military force of a developing country. Considering the unique processes and procedures that are unparalleled outside the military, the measures of a civil industry cannot be adopted the same way for the armed forces. In the absence of any specific measures of performance for the military organisations of a developing country like India, the study developed and empirically tested certain measures after a systematic review of the literature and consulting experts. Considering three main domains of the IAF's working, the selected measures were further categorised into three verticals comprising Operational Performance, Maintenance Performance and Administrative Performance for ease of implementation. The study provides a set of suitably selected performance measures to the managers of the military organisation to test the efficacy of their KM initiatives.

Third, the study found a positive association between the KM of air warriors and various measures of organisational performance in IAF. The data indicates that the people in the IAF understand KM and are willing to accept and learn from experts and share their knowledge with those in need. These air warriors possess in-depth experience, knowledge of the environment, and culture, an attitude to understand complex issues and the aptitude to integrate and correlate knowledge which is of utmost importance for organisation sustenance. If the efforts of people are supported by the organisation and top leadership by creating a conducive knowledge environment and providing proper KM tools, it will help IAF in creating, preserving and sharing mission-critical organisational knowledge that can provide a sustainable competitive advantage against adversaries.

Fourth, the study found no relationship between the KM culture, process, strategy, and technology with the organisation's performance in the IAF. The study indicates that though the individual air warriors support the KM activities, the other enablers which are key for creating a knowledge environment are not supportive or aligned towards KM initiatives. A precondition for KM in the military organisation is the creation of a friendly, open, and non-competitive culture and environment. The study identified probable causes in IAF which may act as a barrier towards creating a KM environment such as strictly laid down standard operating procedures with little margin for error, rigid processes, confined environment, leadership hierarchy, and leadership style and lack of a formal KM strategy, absence of defined KM role or designated knowledge officers to name a few. The leaders

and practitioners in IAF may consider identifying and removing these barriers without affecting their organisational objectives. The best way to achieve the same is to start with small change management towards a KM culture, dovetail the KM in the routine processes and build up a KM strategy that aligns with the organisational strategy and utilise the IT resources as a KM platform.

Fifth, the study found that KM tools used for sharing and application of knowledge (TSAK) which are mostly individually driven and rely on people for sharing and applying the knowledge have a profoundly positive impact on performance in the IAF. Whereas, the KM tools used for identification and creation of knowledge (TICK) and for capture and storage of knowledge (TCSK), which mostly requires organisation support and resources were negatively related to the organisational performance in the IAF. The study indicates a possible lack of an organisational-driven or formalised setup that encourages the use of KM tools in the IAF. The military organisations like IAF where uniform, military ranks, insignia, conduct, authority and power assume great importance, the KM tools designed for open and lateral communication may get subdued. The geographically dispersed location of the IAF, formal and strict hierarchical controls and rigid structure in the military further decline the efficacy of KM tools. The literature claims that for a military organisation, the use of KM tools supports decision-making and helps to enhance efficiency, productivity, financial value, quality and innovation. Therefore, the leaders in the IAF may study these tools and methodologies for their implementation. Tools such as TASK may be strengthened and tools such as TICK and TCSK may be incorporated into a routine through active support through a formalised strategy and allocating required organisational resources.

7.3 Limitations and Future Scope of Research

Although this study makes every effort to be thorough and objective, there are some drawbacks that, if they are addressed in follow-up research, could give the study greater depth.

The first limitation is that the research has been piloted on a single organisation (IAF) which is one of the fighting arms of the Indian military setup. A comprehensive

study of all three arms of the military organisation (IA, IAF, IN) may provide a better generalisation.

Second, the IAF being a military organisation, the study's scope of discussion and data was limited to an unrestricted and insensitive nature; therefore, getting more detailed insight was not possible.

Third, due to the scarcity of literature on various aspects of KM in military organisations, the findings could not be adequately augmented by the relevant literature. Thus, the study's finding, though empirically tested, can be taken with caution as a foundation for further studies to get more insight into the KM in military organisations.

Fourth, the respondents comprised veterans from the IAF, as it was difficult to approach serving soldiers for the sample collection. Future researchers may conduct a study using a larger sample from other categories of respondents involving Army, Navy and other paramilitary organisations with the individuals who are still serving in the organisation to get the latest insight and views. Moderators and mediators can also be included in the model.

Fifth, there is an abundance of literature specifying numerous KM enablers, however, the study used only five of these enablers i.e., people, culture, process, strategy and IT based on the popularity. The scope of study was wide and also involved various KM tools and performance measures, so to keep the scope within the practicable limits, all the specified enablers could not be used and the number of objects utilised for each construct was restricted.

Lastly, the study may be subjected to selection bias as the non-probability convenience-based snowball sampling method was used for data collection due to restrictions of COVID-19 and the lockdown. Though many researchers advocate for using snowball sampling for accessing hidden or hard-to-reach populations, however, empirical results using a probability-based sampling may provide better generalisation.

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APPENDIX-A

QUESTIONNAIRE

SURVEY COVER LETTER AND INFORMED CONSENT

Dear Participants,

We are conducting a study to examine various aspects of Knowledge Management (KM) in your organisation. Ultimately, we would like to find out the effect of various KM enablers and tools on your organisation's performance. To advance research in this area, we need your help in describing KM within your organisation. By participating in this study, your organisation may benefit from instituting KM practices in a better way.

Scope of Study: The study intends to record the feelings of the personals on KM. **It does not seek any information related to operations or any information which is classified or sensitive in nature**.

The survey has four sections with a total of 12 questions. Section five records personal characteristics. The online survey may take approx. 30 minutes. Your participation in this survey is completely voluntary. If at any time you do not wish to participate, you may end the survey by exiting the survey program. Your responses will remain completely confidential. You will not be asked to identify your unit or yourself.

Thank you for taking the time to read this information, and I hope you decide to complete the survey. You are welcome to a summary of the study findings in about 1 year. If you have any questions concerning this research study, please feel free to contact me at singhmkiitr12@gmail.com.
Sincerely,

Informed consent: Check yes or no to the following statements. By checking "yes", I acknowledge that I understand the purpose of this KM study, the potential risks as a participant, and how my identity will be kept confidential. I am 18 years or older, and I give my permission to serve as a participant in the study described above. By checking "no", I terminated the survey because I do not want to participate in this research study.

□ Yes □ No

SECTION-1

This section has some **general questions** on your understanding of knowledge management and the effects of knowledge loss in your organisation. This will be used as a marker **for testing method bias.**

Q 1. General Questions for testing method bias.						
Sl No	**Questions**	**Strongly Disagree 1**	**Dis agree 2**	**Neutral 3**	**Agree 4**	**Strongly Agree 5**
(i).	Retiring air warriors possess critical professional knowledge, the loss of which adversely affects the organisations performance.					
(ii).	The existing system and process cater to redundancies with adequate induction and training, so that early retirement does not have any significant effect on the organisation's performance?					
(iii)	Early retirement creates a vacuum at senior supervisory level in a technology-intensive organisation?					
(iv).	Early retirement is good for the organisation as it helps to maintain a young and fit workforce with greater adaptability and current knowledge.					

SECTION-2

Knowledge Management (KM) practices are effective, only if supported by the right environment. The key enablers of the KM environment include (a) People, (b) Culture, (c) Processes, (e) Strategy, and (f) Technology. **In this section, we aim to find out, the environmental condition of your organisation for KM practices.**

Q 1. Do the **people** in your organisation support KM activities?						
Sl No	**Questions**	**Strongly Disagree 1**	**Dis agree 2**	**Neutral 3**	**Agree 4**	**Strongly Agree 5**
(i).	People in my organisation **understand about KM**?					
(ii).	People are always **willing to accept and learn** from the knowledge of the peers and experts.					
(iii)	People **don't want to share their knowledge**, because they consider knowledge is power, or they don't have time for such activities.					
(iv)	People always try to find and **use existing knowledge** in the organisation, rather than re-inventing the wheel.					
(v).	People simply **don't realise** what they know, or the value of what they know. Even if they do, they do not know with whom to share and how.					
Q 2. Does your **organisation culture** support KM?						
Sl No	**Questions**	**Strongly Disagree 1**	**Dis agree 2**	**Neutral 3**	**Agree 4**	**Strongly Agree 5**
(i).	People are seen as the organisation's most **valued asset**.					
(ii).	People are **recognised and rewarded** for sharing their					

	knowledge and not for hoarding their knowledge.					
(iii)	There is a **team-oriented approach** throughout the organisation i.e. various departments and people trust, cooperate, and help each other.					
(iv)	**Top leadership** in the organisation sees knowledge as a strategic asset and provides incentives and support for knowledge management processes.					
Q 3. Do routine **processes in your organisation support** KM?						
Sl No	**Questions**	**Strongly Disagree 1**	**Dis agree 2**	**Neutral 3**	**Agree 4**	**Strongly Agree 5**
(i).	Knowledge creation, sharing, and use are a natural and recognised part of the organisation's normal **work processes**.					
(ii).	The processes and procedures to perform a job are **flexible** and there is always scope for creativity and initiative.					
(iii)	My organisation has strict rules and there is **intolerance for mistakes**.					
(iv)	Organisation is very **hierarchical** and have long chains of command.					
Q 4. What are the existing **knowledge management (KM) strategies** in your organisation?						
Sl No	**Questions**	**Strongly Disagree 1**	**Dis agree 2**	**Neutral 3**	**Agree 4**	**Strongly Agree 5**

(i)	The organisation has comprehensive and **documented KM strategies.**					
(ii)	**KM roles and responsibilities** are clearly defined in the organisation.					
(iii)	**HR policies** in the organisation support the proper management of individual and organisational knowledge?					
(iv)	**KM** is an integrated part of routine work processes, but it is **practised without realising** it**.**					
Q 5. Is adequate **Technology** available in the organisation to support and enable KM?						
Sl No	**Questions**	**Strongly Disagree 1**	**Dis agree 2**	**Neutral 3**	**Agree 4**	**Strongly Agree 5**
(i).	Adequate **information technology (IT) infrastructure** exists to capture, store and share knowledge across the organisation (E.g., intranet, database).					
(ii).	Adequate technologies are available **to connect people with people** so that they can share their know-how (E.g., VoIP, video conference, etc).					
(iii)	There is a lack of guidelines and proper management of IT infrastructure which results in **information overload**.					
(iv)	My organisation uses technology primarily for i**nformation management rather than knowledge management**.					

SECTION-3

KM Tools are various methods that are used for the implementation of KM in the organisation. The tools can be broadly categorised as per three KM processes i.e. (i) Identification and creation of knowledge, (ii) Capture and Storage of knowledge, and (iii) Sharing and application of knowledge. **In this section, we aim to find out, various KM tools that are used in your organisation for the management of individual and organisational knowledge.**

Q 1. KM tools for **identification and creation** of knowledge.						
Sl No	**Questions**	**Strongly Disagree 1**	**Dis agree 2**	**Neutral 3**	**Agree 4**	**Strongly Agree 5**
(i).	**After Action Reviews:** My organisation encourages, an open and honest AAR after every major exercise, task, and project to find what happens, what went well and what did not, and what are lessons learned.					
(ii).	**Celebrating Knowledge:** My organisation recognises and rewards individual, and team members for sharing their knowledge with others.					
(iii)	**Communities of Practice:** My organisation encourages, people with common passion and interest (e.g., technicians from the Sukhoi fleet) to voluntarily form a common group or community to interact regularly and share common skills, knowledge, and expertise among group members.					
(iv)	**Knowledge Audits:** My organisation carries out knowledge audits to identify the existing knowledge and					

	assess the knowledge needs, gaps, and risks to manage its knowledge assets.					
(v).	**Wall of Ideas:** People in my organisation are encouraged to freely share thoughts, ideas, or talk about an issue on a certain topic (e.g., a whiteboard set up at the hangar, asking people to share ideas by posting comments, pictures, quote, etc on any general topic).					
Q 2. KM tools for **capture and storage** of knowledge.						
Sl No	**Questions**	**Strongly Disagree 1**	**Dis agree 2**	**Neutral 3**	**Agree 4**	**Strongly Agree 5**
(i).	**Exit Interviews:** Exit Interviews are conducted in my organisation to capture knowledge (not just HR feedback) from those who are leaving the organisation.					
(ii).	**Experience Capitalisation:** My organisation facilitates the capture and documentation of the experience and knowledge of experts for future use.					
(iii)	**Experts Directory:** My organisation maintains a directory of experts to help people find experts who have the knowledge and expertise needed for a particular task, problem, snag analysis, or project.					
(iv)	**Knowledge Portal:** My organisation has a dedicated knowledge portal (not just an information portal) as a one-					

	stop place for essential information and knowledge to accomplish a required task.					
(v).	**Knowledge Taxonomy:** Knowledge, information, documents, and libraries are maintained across the organisation in a consistent and structured way to assist people in efficiently navigating, storing, and retrieving needed data and information without wasting time.					
Q 3. KM tools for **sharing and application** of knowledge.						
Sl No	**Questions**	**Strongly Disagree 1**	**Dis agree 2**	**Neutral 3**	**Agree 4**	**Strongly Agree 5**
(i).	**Best practices:** My organisation encourages the sharing of best practices followed at one place with others performing a similar task at a widely dispersed location.					
(ii).	**Knowledge Fairs:** Knowledge fairs are conducted to share exchange and disseminate knowledge and expertise across the organisation.					
(iii)	**Peer Assist:** In my organisation, a team tasked with any specific job, can freely solicit assistance from peers who are subject matter experts, to share their knowledge, insight, and experience on the specified job.					

(iv)	**Storytelling:** Ideas, knowledge, and experiences (like accidents, incidents, etc.) are regularly shared in my organisation through stories for easy communication and assimilation.					
(v).	**Mentoring:** In my organisation, a mentor who is someone older, more experienced and at a higher professional rank, often provides career guidance, personal support and facilitates the co-socialisation process to the novice air warrior.					

SECTION-4

Organisational Performance (OP) is the measure of the extent to which an organisational goal and objectives can be achieved. Certain, OP indicators that are relevant for a military organisation have been grouped under three categories for the study i.e. (a) Operational Performance Indicators, (b) Maintenance Performance Indicators, and (c) Human Resource Performance Indicators. **In this section, we aim to study, the effect of various KM tools on the performance of your organisations.**

Q 1. Effect of KM tools on Operational Performance?						
Sl No	**Questions**	**Strongly Disagree 1**	**Dis agree 2**	**Neutral 3**	**Agree 4**	**Strongly Agree 5**
(i).	**Competitive advantage:** Capturing and preserving mission-critical organisational knowledge provides organisations with a sustainable competitive advantage against adversaries.					
(ii).	**Flight Safety**: KM practices and tools like best practices, communities of practice, and lessons learned help in improving Flight Safety.					
(iii).	**Decision Superiority**: Active KM initiatives and the use of KM tools provide current, relevant, and structured data and information that facilitate commanders to make better-informed decisions.					
(iv).	**Situational Awareness:** A KM in IAF facilitates the sharing and exchange of information and knowledge that increases the situational awareness of the operators.					

Q 2. Effect of various KM tools on the Maintenance Performance?						
Sl No	**Questions**	**Strongly Disagree 1**	**Dis agree 2**	**Neutral 3**	**Agree 4**	**Strongly Agree 5**
(i).	**Innovation**: A positive KM environment encouraging the creation and sharing of knowledge and the use of KM tools promotes innovations.					
(ii).	**Equipment Downtime**: Proper management of individual and organisational knowledge and use of various KM tools like Peer assists, CoP, best practices etc., facilitates expertise build-up, improvement in maintenance quality, and reduction in equipment downtime.					
(iii).	**Efficiency:** KM processes and tools like data mining knowledge taxonomy, portals, etc., enhance the efficiency and effectiveness of the technicians.					
Q 12. Effect of various KM tools on Human Resource Performance?						
Sl No	**Questions**	**Strongly Disagree 1**	**Dis agree 2**	**Neutral 3**	**Agree 4**	**Strongly Agree 5**
(i).	**Cost:** Proper storage, transfer, and application of information and knowledge, eliminate the costs associated with duplicated effort and wasted time.					
(ii).	**Learning curve**: KM environment and KM tools like lessons learned, after-action reviews, storytelling,					

	mentoring etc., increase the learning curve of the employees.					
(iii).	**Morale:** A conducive KM environment that has a collaborating organisation culture, open communication, trust, and sharing; increases the loyalty, commitment, and morale of employees.					

SECTION-5

This final section contains items regarding participants' personal characteristics. These items are very important for statistical purposes. Respond to each item by WRITING IN THE INFORMATION requested or CHECKING THE BOX that best describes you.

1. Rank_____ 2. Name (optional):_____

3. Age:_____years_____months

4. Category: Officer ☐ Airmen ☐

5. Branch/Trade:_____

6. Gender: Male ☐ Female ☐

7. Native Place (Optional):_____

8. Educational Qualification (Tick appropriate)
   Metric ☐ Intermediate ☐ Graduate ☐
   Post Graduate ☐ Doctorate ☐

9. How much experience do you have in this organisation? _____ Years_____month

10. What is your position in your organisation_____

APPENDIX - B

SAMPLE SIZE CALCULATION

$$Sample\ Size\ (n) = \frac{[Z^2(p * (1-p)]}{e^2}$$

Where,
Z = Confidence level or "Z" Value

p = Proportion - The probability of an event occurring during a given observation or sample expressed as a decimal (Hildebrand & Ott, 1996).

e = Margin of Error expressed as a decimal.

Confidence Level: To achieve a 95% confidence level in the study's findings, a "Z" level of 1.96 49 is used in calculating the study's desired minimum survey sample size (Cooper and Emory, 1995). Same has been found to be appropriate in most of the studies and could be used for the calculations.

Proportion Level: To reduce the chance of Type I errors occurring, a mathematically conservative proportionality or "p" level of 0.5 (i.e., a 95% confidence rating) was used in estimating the study's recommended minimum survey sample size.

Confidence Interval: Giving due consideration to the confidence interval (CI) is required to ensure the study's findings more accurately represent the behaviour of the target population at large (Niles, 2002). As such, an assumption was made that if a low CI was used during the effort's statistical testing processes, more confidence could be given to the likelihood that the study's findings would better reflect the true behaviour of the overall target population. Thus, a conservative CI value of 0.05 could be used during this research.
Based on above a calculation for minimum survey sample size (uncorrected) would be:

n = [$(1.96)^2$ * (0.5) (0.5)]/ $(0.5)^2$

$$Sample\ Size\ (n) = \frac{[1.96^2(.5 * (1-.5)]}{.5^2}$$

n= 384.16
Where,
Z =1.96 (95% confidence level),
p = 0.5 (worst-case estimate), and
e = 0.05 (+/- 5)

APPENDIX - C

DETAILS OF PUBLISHED PAPERS AND CONFERENCES

Sl No	Title	Name of Authors	Name of Journal / Conference	Indexing Status of Journal / Conference
1	Knowledge Management in a Military Organisation	Mukesh Kumar Singh and Dr Vikas Gupta	XIX Annual International Conference Managing Digital Revolution: Inventing Future India (2018)	Delhi School of Professional Studies and Research and DTU.
2	Knowledge Loss and KM in Indian Armed Forces	Mukesh Kumar Singh and Dr Vikas Gupta	International Conference on Business and Management (2019)	Delhi School of Management, DTU
3	Critical types of knowledge loss in military organisations	Mukesh Kumar Singh and Dr Vikas Gupta	VINE Journal of Information and Knowledge Management Systems	Scopus: 5.3
4	IAF Transition towards a Network-Centric-Knowledge Based Force	Mukesh Kumar Singh and Dr Vikas Gupta	Journal of the United Service Institution of India	Military Journal, No indexing
5	An empirical study of knowledge environment and suitability of performance measures of a civil organisation for a knowledge-based military force	Mukesh Kumar Singh and Dr Vikas Gupta	Kybernetes Journal	SCI Scopus: 4.2

DISCLAIMER

This thesis has been written solely for academic purposes. Research is based on the personal views and perceptions of a few veterans from the IAF. It does not reflect any view or opinion of the IAF. There could be some variance in the findings of the study and actual KM in the IAF and therefore the data/ findings of the study should not be used to make any claims or form any opinion about the IAF. No classified or sensitive data/material whatsoever was used in the conduct of the study.

BRIEF PROFILE

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EDUCATION

B.E (Electrical &Electronics-MJPRU)
MBA (Information Technology-SMU)
M.Tech (Signal Processing-IIT, Roorkee)
Ph.D (Knowledge Management-DSM)

DESIGNATION

Group Captain (IAF)

EXPERIENCE

More than 20 years of experience in management, administration, HRM, aircraft and signal system maintenance.

HOBBIES

Trekking, Mountaineering

PROMINENT PUBLICATIONS

Critical types of knowledge loss in military organisations- VINE Journal of Information and Knowledge Management Systems

IAF Transition towards a Network-Centric-Knowledge Based Force- Journal of the United Service Institution of India

An empirical study of knowledge environment and suitability of performance measures of a civil organisation for a knowledge-based military force- Kybernetes Journal

RESEARCH AREA / INTEREST

Knowledge Management
Human Resource Management
Armed Forces
Military Organizations