UNIVERSITY OF THE PHILIPPINES
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MASTER OF RESEARCH AND DEVELOPMENT MANAGEMENT

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KNOWLEDGE MANAGEMENT SYSTEM ENHANCEMENT FOR A PRIVATE R&D UNIT IN THE PHILIPPINES

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01 January 2025

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This Special Problem of **DANZEN F. DANG-AWAN** titled: **"KNOWLEDGE MANAGEMENT SYSTEM ENHANCEMENT FOR A PRIVATE R&D UNIT IN THE PHILIPPINES"** is hereby accepted by the Faculty of Management and Development Studies, U.P. Open University, in partial fulfillment of the requirements for the Master of Research and Development Management.

Jaine C. Reyes — 18 September 2025

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Declaration

This is to certify that:

I. The special problem comprises only my original work towards the MRDM except where indicated in the Preface

II. Due acknowledgment has been made in the text to all other material used

III. The special problem is fewer than 25,000 words in length, exclusive of tables, maps, bibliographies, and appendices.

Danzen F. Dang-awan

Biographical Sketch

Danzen F. Dang-awan serves as the Product & Process Manager and Quality Management Representative (QMR) for the Coating Resins Business at RI Chemical Corporation. With over nine years of progressive experience with the company, he leads a team of researchers in the development of sustainable resins for diverse coating applications. His responsibilities also encompass people development, process optimization, and fostering customer partnership towards innovation.

He earned a Diploma in R&D Management from the University of the Philippines Open University where he was recognized as a Dean's Lister. Furthermore, he is a Licensed Chemical Engineer, graduating Cum Laude from the University of the Philippines Diliman. His combined expertise in chemical engineering, R&D management, and hands-on experience in quality, process, and people management positions him as a key contributor to the enhancement of Knowledge Management Systems in the R&D setting.

Acknowledgment

First and foremost, I give praise to my God as the source of all talent, and skill, and everything good. He is my wisdom and my strength, and the wellspring of my love for learning and teaching.

I also want to express my deep appreciation for my adviser, Dr. Jaine Reyes, whose insights, expertise, and patience were instrumental in the shaping of this study from start to finish. In the rough roads during the making of this study, her understanding and advice were a big part that kept me motivated.

And finally, my loving gratitude to my family, Loisse and Kairos. You are my inspiration.

Dedication

I dedicate this paper to the participants of the private R&D unit of this study. It would not have been possible without you, and I hope the results will benefit you and your work.

Abstract

This case study aims to enhance the Knowledge Management System (KMS) of a private Research and Development (R&D) unit in the Philippines. The insights of all four R&D staff were gathered using semi-structured interviews. Thematic analysis of the qualitative data yielded five key themes: KMS Effectiveness and Challenges, Knowledge Quality and Documentation Practices, Knowledge Sharing and Collaboration, Knowledge Acquisition and Learning, and Organizational Support and Training. The commonalities, contradictions, and complementarities of the participant responses within each theme were explored to illustrate the KMS landscape. Then, the facilitating and hindering factors of the current KMS were distilled. Participant proposals for improvement were combined with literature recommendations to resolve the observed hindrances. The findings led to the following recommendations to enhance the KMS: Centralize and Standardize Documentation, Leverage AI to Enhance Efficiency, Nurture a Culture of Openness and Inquiry, Align and Increase Training Opportunities, and Formalize and Communicate Incentives.

Keywords: Knowledge Management Systems (KMS), Research and Development (R&D), Knowledge Management (KM), Philippines, Qualitative Research, Thematic Analysis, Knowledge Sharing, Organizational Learning, Innovation

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Chapter I

INTRODUCTION

Background of the Study

Effective Knowledge Management (KM) is a critical factor in an organization's capacity for innovation and sustainable growth. Studies demonstrate the strategic value of KM on innovation performance, employee satisfaction, and project success (Nieto, 2003; Darroch, 2005; Kianto et al., 2016; de Souza et al., 2021). In modern Research and Development (R&D), a well-designed Knowledge Management System (KMS) acts as a moderator for innovation and is essential for rapidly developing customer-oriented solutions (Ferraris et al., 2021; Park & Kim, 2006).

This emphasis on KM is part of a global agenda. The United Nations (UN) recognized KM as a critical tool in its 2030 Agenda for Sustainable Development in its capacity as a knowledge facilitator of member nations. (Dumitriu, 2016). A recent systemic literature review on the effect of KM on the UN Sustainable Development Goals (SDGs) showed that KM had clear contributions on ending poverty (SDG 1), health and well-being (SDG 3), clean water and sanitation (SDG 6), decent work and economic growth (SDG 8), industry, innovation, and infrastructure (SDG 9), and climate action (SDG 13) (Costa et al., 2023). These initiatives indicate the utility of KM not just for corporate growth, but also for national development.

Despite the established strategic value of KMS, there is a significant research gap regarding its application within private R&D units in the Philippines. This is critical because successful R&D is a proven catalyst for national economic growth (Agezew, 2024). This study aims to address this deficit by exploring the current landscape of KMS in a private R&D unit and determining opportunities for enhancement. These

opportunities will be presented as a proposal to empower the unit towards leveraging KMS, reap its aforementioned benefits, and strengthen its contributions to the Philippine economy.

Statement of the Problem

Despite the globally recognized benefit of KMS in driving innovation and economic growth, a private R&D unit in the Philippines faces challenges in converting R&D efforts to sales and in retaining institutional knowledge and talent. This situation suggests that the unit's KMS is insufficient in supporting its organizational goals. Therefore, this study seeks to propose enhancements for the unit's KMS by addressing the primary research question and its associated specific questions:

Main Problem: How can the KMS of a private R&D unit in the Philippines be enhanced to improve its R&D-to-sales conversion and strengthen its knowledge and talent retention?

Specific Problems:

- What is the perceived effectiveness of the current KMS within the private R&D unit?
- How does the current KMS facilitate or hinder the efficient storage, review, and retrieval of historical experimental data?
- What is an actionable proposal for the implementation of an enhanced KMS for the private R&D unit?

Objectives of the Study

The main objective of the study is to propose an enhanced KMS for a private R&D unit in the Philippines that will improve its R&D-to-sales conversion and institutional knowledge retention. Specifically, this study aims to:

1. Describe the private R&D unit's current KMS practices.
2. Analyze the facilitating and hindering factors in the practices of KMS; and
3. Develop an actionable proposal that will enhance the KMS.

Significance of the Study

The study's output is a proposal for the improvement of the KMS of the selected private R&D unit. It contributes to the body of literature by applying theoretical principles in a specific context for R&D management. The results of this study would provide actionable recommendations for the R&D unit's leadership that could enhance their project success, innovation, and even employee job satisfaction.

Scope and Limitations of the Study

This study is confined to the development of a proposal for improving the existing KMS of the specific private R&D unit. It is limited to non-confidential data collected from the selected private R&D unit, which may limit the generalizability of the output. The potential impacts of the proposal would be evaluated by the R&D team only and may not represent a complete picture of the proposal's impact. Implementation is not part of the study's scope and will be contingent on the private R&D unit's resources and priorities.

Chapter II

REVIEW OF LITERATURE

Knowledge and Knowledge Management

Knowledge is belief that is true and based on reasonable evidence (Nonaka, 1994). One popular theory segments knowledge into tacit and explicit (Polanyi, 1966). The theory defines tacit knowledge as knowledge that resides within individuals and is difficult to share. Explicit knowledge, on the other hand, is defined as knowledge that can be articulated, documented, and accessible. Given this two-sided nature of knowledge, some studies perceive that knowledge cannot be managed. One study argues that Knowledge Management (KM), as popularly known, is simply knowledge flow management (Armbrecht Jr. et al., 2001). An early framework seems to agree with this by defining the aspects of KM as: identification of knowledge, knowledge manipulation (such as production and utilization), and the influencers of the knowledge flow (Holsapple & Joshi, 2002). Due to the multifaceted nature of KM, there would be no shortage of good definitions for it. KM has been defined as the acquisition, dissemination, and utilization of knowledge (Darroch, 2003). An expanded definition stated that KM includes knowledge acquisition, sharing/dissemination, creation/generation, codification/categorization, and retention/storage (Kianto et al., 2016). Another view defines KM as the activities of knowledge collection, organization, sharing, and analysis put into commercial value by evaluating profit generation (Shettar, 2007). KM encompasses the set of activities involved in harnessing knowledge for the achievement of strategic objectives. As a science and an art, KM is viewed from a multi-disciplinary perspective, which includes Information Technology (IT), business, communication science, and psychology (Castillo & Cazarini, 2017).

Knowledge Management Systems

KM is distinguished from Knowledge Management Systems (KMS), which are defined as the selection of information systems used to plan, organize, direct, and control organizational knowledge (Alavi & Leidner, 2001). In this sense, KMS refers to the set of elements - including policies, technologies, and processes - that enable KM. The technological activities and functions of KMS in literature were classified under Knowledge Portal, Information Retrieval, Document Management, Workflow Management, Collaboration, and Analysis (Park & Kim, 2006). Some studies perceive KMS as more than information systems, highlighting the social and cultural aspects that need to be considered in the application of these IT tools (Riswanto & Sensuse, 2021). These studies present that the human factor is a significant consideration in the implementation of any technological tool for KMS.

Some studies assessed that certain management systems are also able to perform the functions of KMS. Quality systems, for example, were found to be capable of facilitating knowledge (Jayawarna & Holt, 2009). Another study presented how the establishment of a Project Management Office (PMO) was important in doing KM activities (Dybek & Glodzinski, 2023). The above two examples illustrate how existing quality and project management systems can function as KMS. Similar to the systems above, KMS combines the elements of technology, policy, and people in the leveraging of knowledge for the desired objectives.

KMS in R&D Organizations

KMS in R&D organizations is more than a set of IT tools that the researchers utilize. One way KMS facilitates knowledge flow is through the formation of a supportive culture and structure that nurtures creativity and learning (Armbrecht Jr. et

al., 2001). KMS may also incorporate performance management and reward systems to be effective (McCarthy et al., 2011).

The dimensions of KMS in R&D are knowledge creation, communication, and commercialization (Tikas, 2024). KMS in R&D organizations employs a variety of IT tools to improve efficiency. Barriers to knowledge sharing have been identified as a lack of time (time to identify colleagues who need or can give information, and time to interact with them), insufficient documentation and learning from past mistakes, and the limited sharing of tacit knowledge (Lajcin & Guzonova, 2023). IT tools can solve these barriers, such as augmenting agents in groupware portal technology to speed up the search and retrieval of data (Barthes & Tacla, 2002). KMS in R&D organizations is a combination of policy, system, culture, and technology.

Facilitating and Hindering Factors in KMS

Facilitating factors for KMS encompass systems, leadership, technology, and user feedback, while hindering factors arise when the mentioned factors are unfit. Organizational support measures such as leadership championing of KM, supervisor and coworker support for using KMS, as well as incentives, were observed to encourage knowledge sharing and use (Kulkarni et al., 2006/2007). In addition to those factors, the study observed that user-friendliness and accessibility of the KMS, the quality of the knowledge content, and the perceived relevance of the KMS for work all facilitated knowledge flow.

Quality systems that encourage inquiry were found to promote effective KM in R&D teams, while heavy bureaucratic policies hindered the knowledge flow (Jayawarna & Holt, 2009). In a project-based R&D case study, facilitating factors were identified as organizational regulations, defined processes, applied project

management methodologies, and supporting software and databases, while hindering factors were insufficient management of people's behavior, communication, and evaluative capacity was identified as a barrier to knowledge sharing (Dybek & Glodzinski, 2023). A synthesis of eight KM works shows the importance of the following factors for KMS: Management Support, Staff Motivation and Development, Information System Training, and Staff Reception (Asiedu, 2015). A study in a Czech R&D environment showed the following hindering factors to knowledge sharing: lack of time to identify sources and recipients of relevant knowledge, lack of interaction between knowledge sources and recipients, insufficient documentation, learning, and tolerance of past mistakes, sharing is limited to explicit knowledge rather than tacit, differences in levels of experience, geographic/workplace layouts, lack of transparent reward and recognition system, and lack of space for sharing, reflection, and knowledge creation (Lajcin & Guzonova, 2023). A summary of these factors is found in Table 2.1.

Table 2.1

Facilitating and Hindering Factors for Effective KM

Facilitating and Hindering Factors	Source
Facilitating • Organizational Support (Leadership, Supervisor, Coworker, Incentive) • KMS Effectiveness and Usefulness • Knowledge Quality	Kulkarni et al., 2006/2007

Facilitating and Hindering Factors	Source
Facilitating • Quality systems that encourage inquiry *Hindering* • Heavy bureaucratic policies	Jayawarna & Holt, 2009
Facilitating • Organizational regulations *Hindering* • Insufficient management of people's behavior, communication forms, and evaluative capacity	Dybek & Glodzinski, 2023
Facilitating • Management Support • Staff Motivation and Development • Information Systems Training • Staff Reception	Asiedu, 2015
Hindering • Lack of time to identify sources and recipients of relevant knowledge, and lack of time to interact with them • Lack of interaction between knowledge sources and recipients • Insufficient documentation, learning, and tolerance of past mistakes	Lajcin & Guzonova, 2023

Facilitating and Hindering Factors	Source
• Sharing is limited to explicit knowledge rather than tacit knowledge • Difference in levels of experience • Geographic/Workplace layout • Lack of a transparent reward and recognition system	

Thematic analysis resulting in the above factors was explored from the commonalities across various related knowledge management studies (Lajcin & Guzonova, 2023). This consensus approach is not rare, and was applied in other fields such as relating knowledge creation in business and in art, and in human resource management and performance (Imani, 2007; Boseli et al., 2005). The consensus approach was also applied to explore participant feedback on research info dissemination (Purvis et al., 2017). However, a dissensus perspective was proposed for quality management research, arguing that contradictions can present value when seen through multiple identities (Hansen & Dorland, 2016). The dissensus study emphasized how seemingly conflicting accounts labelled as a contradiction leave room for both to be possibly true, depending on the approach.

KMS Implementation

One model for KMS implementation is based on the Enterprise Knowledge Development (EKD) modeling method (Castillo & Cazarini, 2014). This model is categorized between KM processes, KM enablers, KM results, Knowledge Taxonomy, and Maturity levels. The study classified the processes as: Production, Assessment, Storage, and Integration. The enablers include: strategy, organizational culture,

organizational structure, team, tools, processes, metrics, and partnerships. KM results encompass organizational effectiveness, innovation, continuous organizational change, appropriate decisions, and network establishment. This model seeks to align the various enablers with the desired results in the various processes and knowledge types involved. In addition, it incorporates a feedback system for continuous improvement.

Another framework for KMS implementation is Plan-Do-Check-Act (PDCA) (Abualwafa et al., 2023). This framework encompasses business analysis, strategic planning, setting of outcome indicators, and the dissemination or improvement of the system. It highlights how aligning the KMS to strategic goals motivates management for its implementation. It also promotes the adaptation of a strategy based on existing and target knowledge for facilitation. This allows the framework to be applicable in a variety of contexts.

Chapter III

METHODOLOGY

Research Design

A qualitative case-study design was employed to focus on the experiences of R&D engineers from a single department within a company in the Philippines. A case study was chosen to have flexibility, low operational disruption, and gain an in-depth understanding of the complex issues surrounding KMS in a real-world context.

Locale of the Study

This study was conducted in a private R&D unit of a company in the Philippines. The company operates under a business-to-business model and is a pioneer in several of its products and technologies. The company has been present for more than 60 years. The R&D unit is located in an urban setting.

Participants of the Study

This study used purposive sampling in selecting all the R&D Engineers in the unit for a total of four participants. All participants are project owners and have first-hand experience with the unit's KMS. In addition, they all have at least one year of experience with the R&D unit.

Data Collection

Informed consent was obtained from the participants. Then, semi-structured interviews were conducted with each of them, ranging from 15 to 30 minutes. These interviews explored the personal experiences of the participants with the current KMS.

The interview questions were prepared based on the summary of KMS facilitating and hindering factors in Table 1 and are in Appendix A. These interview questions were pretested with a person working in R&D but not part of the participants.

Data Analysis

Thematic analysis using the six-phase method of Braun and Clarke (2006) was applied to the qualitative data from the interview transcripts. First, the researcher read and re-read the interview transcripts to familiarize themselves with the data. Then, initial codes were generated to describe specific concepts. These concepts were grouped into themes that were reviewed alongside the codes in an iterative process. Within each theme, the analysis focused on identifying patterns including views shared by the majority (commonalities), perspectives that conflicted with the majority (contradictions), and viewpoints that offered supplementary insights (complementarities). This approach allows for a holistic picture of the participants' experiences. The themes and patterns were then used to identify the key facilitating and hindering factors associated with the current KMS. These factors and the participants' proposals were summarized and compared with existing literature recommendations to arrive at a combined actionable proposal for the private R&D unit.

Ethical Consideration

All participant names and identifiers and business-specific information are kept confidential under the Research Ethics Policy of the University of the Philippines—Open University and the Non-Disclosure Agreement of the researcher and the participants with the private R&D unit.

Chapter IV

RESULTS AND DISCUSSION

This section presents the results of the thematic analysis of qualitative data from the semi-structured interviews with each participant. This analysis led to the formation of themes that were aligned with the key facilitating and hindering factors from literature previously summarized in Table 1. Direct quotes are incorporated to provide a richer understanding of the participants' experiences. Each theme's discussion will focus on the patterns (commonalities, contradictions, and complementarities) of the response data. The key themes for the study are: KMS Effectiveness and Challenges, Knowledge Quality and Documentation Practices, Knowledge Sharing and Collaboration, Knowledge Acquisition and Learning, and Organizational Support and Incentives. Their alignment with the literature is presented in Table 4.1. The discussion will culminate in a summary of facilitating and hindering factors and a combined actionable proposal for KMS enhancement. For brevity, the four participants are labeled as P1, P2, P3, and P4, respectively.

Table 4.1

Key Themes in the Current KMS and Related Facilitating and Hindering Factors from Literature Review

Key Theme	Facilitating and Hindering Factors
KMS Effectiveness and Challenges	KMS Effectiveness (Kulkarni et al., 2006/2007) Geographic/Workplace layout (Lajcin & Guzonova, 2023)

Knowledge Quality and Documentation Practices	Knowledge Quality; KMS Usefulness (Kulkarni et al., 2006/2007) Organizational regulations (Dybek & Glodzinski, 2023) Insufficient documentation (Lajcin & Guzonova, 2023) Heavy bureaucratic policies (Jayawarna & Holt, 2009)
Knowledge Sharing and Collaboration	Lack of time to identify sources and recipients of relevant knowledge, and lack of time to interact with them; Sharing is limited to explicit knowledge rather than tacit knowledge (Lajcin & Guzonova, 2023) Quality systems that encourage inquiry (Jayawarna & Holt, 2009)
Knowledge Acquisition and Learning	Staff Motivation and Development; Information Systems Training (Asiedu, 2015) Insufficient learning and tolerance of past mistakes (Lajcin & Guzonova, 2023)
Organizational Support and Incentives	Organizational Support (Kulkarni et al., 2006/2007) Management Support; Staff Reception (Asiedu, 2015)

Lack of a transparent reward and recognition system (Lajcin & Guzonova, 2023)

KMS Effectiveness and Challenges

This theme explores the R&D unit's current KMS, accentuating the effectiveness of its tools and the challenges encountered by participants.

Commonalities:

The participants identified Microsoft Teams, Excel, and Outlook as the primary digital tools employed in knowledge management for the R&D unit. P1 said, "We mainly use Microsoft Teams; we also use Excel…typically store our data there and share as a team." P2 similarly stated, "We use Microsoft Office applications like Word, Excel, PowerPoint to write down our experiments or procedures... then usually we either send them through email to each other or save them in a shared folder in the company's system, or through Microsoft Teams." P4 mentions using "Mostly Excel, Teams… is where I record my experiments, all my testing, all the data. Teams is (for)... posting results needed for reporting, and when they need something tested by others". These responses indicate that other software is used, including Microsoft Office applications such as Word and PowerPoint, as well as a company-wide shared folder system. A significant challenge in accessing and retrieving knowledge was identified across the participants due to the fragmented nature of knowledge storage. P3 expresses how Outlook is "a bit clunky because there's no standard way to name or put a subject to an email, so it's a bit hard to find unless you know the keywords…unless you remember." P2 vividly describes the process of retrieval: "We need to look for a specific document. We have to always check if it's either in the email,

in the Teams, or in the shared folder. So, we have to check all those." P4 demonstrates the difficulty of varied storage locations "when it comes to information that …is needed, but I didn't put it in Teams from Excel… I can't get it instantly. I would have to go back to my unit…access my Excel, then upload the copy…to Teams from there." P1 states "We don't know where to look for the data or where to continue the projects that got least prioritized?" then proceeds to rate the accessibility "from one to 10, a five or a four, because from what I've observed from …Monday meetings, when the person is absent, other members of the team don't know anything or have a little idea only, but they're not sure." This fragmentation is aggravated by accessibility concerns when personnel are off-site or in "emergency concerns outside and we are the only ones who have the answers to some specific questions." (P1). This fragmentation of data storage leads to difficulty in accessing, updating, and retrieving information, which leads to lower utility (Alavi & Leidner, 2001).

Contradictions:

Despite the shared sentiment on the challenges in knowledge retrieval, P4 gave a contrasting view on the overall system by saying, "I'm fine with it already as it is." P4 also said that, "I suppose the others, they do things like talk to the sales people, get feedback from them. That's hard…where they get their information. Yeah, but I've never really relied or felt like I needed information like that…only the trainings that come to mind are those about research itself." These statements indicate that P4 may have a low inclination towards collaboration and leans more towards efficient conduct of personal research. This shows how individual work styles also affect the perception of KMS effectiveness. It may also suggest that P4's workflow relies less on collaborative data retrieval from Teams or Outlook, as shown by how P4's issues are

focused on “my result, in my experiments, and roles themselves” rather than system-wide accessibility.

Complementarities:

P2’s view on how knowledge is “scattered” among various data storage is complemented by P4’s remark on needing to “transfer from the Excel to the Teams” any necessary information. P3’s experience with Outlook, where they place “reports to the shareholders” and “data of the past experiments,” adds to the picture to demonstrate how multiple functions and software led to the fragmented nature of the current KMS storage. This collective experience highlights an urgent need for a more centralized and organized KMS, as described by P2's suggestion to have data “reorganized such that everything is just in one folder… and organize them further based on what they contain…preferably something that's accessible for us…especially with our job that we have to go to different places within the company premises” pointing out a clear enhancement area. P2’s suggestion is similar to an integrated model for KM implementation in the literature that seeks to align the KMS with all organizational activities, including research documentation (Castillo & Cazarini, 2014).

Knowledge Quality and Documentation Practices

Commonalities:

A consensus among the participants indicates a lack of standardized documentation guidelines. P2 stated, “Where we put the files is not consistent.” The sentiment is shared by P3, who mentioned, “There's no standard way to name or put

a subject in an email." P4 corroborates this by saying, “I guess we have our versions of documentation. It's just not standardized." This becomes a barrier to retrieving and understanding information. All the participants showed interest in improving the documentation system. P1 said, "You perceive that there would be some improvement if there were…additional restrictions or… guidelines that are implemented strictly with regard to the documentation of knowledge." P2 wanted "a standardized format in recording the results.” P3 thought, “It could help if we could have a standard rule or a good or better implementation." P4 simply states, "I think it would be better if we have a similar standard to follow." Although there is a recognized difficulty in documentation, P2 and P4 describe the existing data as a useful “starting point” (P2: "Most of it at least, they helped me have a starting point when I do experiments," P4: "Yes, they gave me a starting point"). These collective experiences highlight that the data are not unusable, but that they have limited utility. Standardized documentation to improve the data utility can form part of the belief and boundary systems in knowledge management control (McCarthy et al., 2011).

Contradictions:

Despite the widespread acknowledgment of incomplete and fragmented data, a subtle contradiction arises from the existing documentation’s utility. This contradiction emerges from P1’s commitment to “always log everything, to put everything into writing.” P1 also remarked how “sometimes some other projects have incomplete data." These remarks show that the existing documentation system is dependent on the researcher’s initiative and that individual efforts are not enough to overcome systemic issues.

Complementarities:

Overwhelming work and urgent project deadlines emerged as drivers of documentation difficulties. P1 illustrates, "Sometimes experiments from different projects overlap and you get lost in tracking the time of time of completion, or the date when each experiment is completed." P3 found it "a bit hard to spare time for... that activity since sometimes there are holidays and we are rushing some of the projects for results." P4 expressed the need for “more experiments, more runs, and more time" for thorough documentation. This spotlights a critical tension: while participants acknowledge the necessity of improved guidelines, there's concern about the additional time such tasks would consume. P1’s suggestion to utilize technology and “personalize or make a specific prompt for AI to generate the paper, and just let us proofread" is a potential improvement on the KMS and the documentation process. The lack of time as a hindrance to knowledge sharing was also observed in a Czech academic environment (Lajcin & Guzonova, 2023). Similar to the incorporation of AI assistance, other technological modifications, such as the use of agent-supported groupware portals, could help resolve the issues here (Barthes & Tacla, 2002).

Knowledge Sharing and Collaboration

Commonalities:

The participants highlighted the daily team meetings as a productive and strategic means of collaboration. P3 described them as “productive” and “essential to redirect our activities towards our goals." In terms of team support, P2 portrayed them as “very cooperative and making sure that everybody is up to date," and P4 corroborated this by saying that “whenever I ask questions or need something tested,

they're able to do it in a timely manner." These statements illustrate a team environment conducive to knowledge-sharing and collaborative work. This conducive environment is a good approach to allowing normal meetings and conversations to become opportunities for knowledge exchange, conversion, and combination (Nonaka, 1994).

Contradictions:

An important contradiction emerged regarding weekly meetings and leadership's impact on knowledge sharing. P3 shared that the weekly meetings need "some improvement in terms of sharing," because it was "a bit difficult to share," attributed to "the environment itself...doesn't encourage much free speech." P3 added a "fear of voicing out" and needing to "really pick your words to say it in a short time." These remarks stand in contrast to P1 and P4's perceptions of supportive leadership for knowledge sharing. P1 said, "The leadership...is very supportive of disclosing relevant information," and P4 indicated that "the higher-ups...always appreciate all the information you're getting and how we're able to report it. Well, they always ask questions. They always want details and stuff." P2 mentioned that "the leadership and the admin (are) supportive of sharing the knowledge." The perceived gap between expected and delivered information, as suggested by P1 and P4's comments on 'relevant information' and 'details,' appears to create an emotional barrier for P3, impacting their willingness to engage fully in these formal settings. This suggests that the formal setting, where P3 perceives a lack of psychological safety, becomes a barrier to knowledge sharing. We observe how an insufficient KMS in formal settings evokes negative feelings in P3 (Kianto et al., 2016).

Complementarities:

The dynamics of knowledge sharing in the unit are illuminated by complementary perspectives on formal and informal settings. Participants share challenges in the weekly meetings, as P3 reported, “It's a bit difficult to give context sometimes with that kind of environment," and “I think there needs to be some improvement in terms of sharing honest opinions.” P1 noted that “not all information” is shared unless specifically asked. These accounts portray formal sharing as a less conducive environment for in-depth knowledge exchange. In contrast, informal settings appear more effective. P2, for instance, prefers personal conversations over email, elaborating, "I tried to email first, but since sometimes email doesn't capture the thought that you want to convey...I tried to find the person and talk to them personally because, for me, it's easier that way." This preference for informal sharing is given further light by P3’s observation on formal settings that “both sides have shortcomings if you or the other person does not have the attitude to listen…and if the other…is not eloquent enough, or not engaging, that's mainly my issue.” P1’s additional insight, “It's not about not sharing, but we don't know what information we need to share,” coupled with the company’s expectation for “brief but complete answers,” suggests that unstated expectations and potential gaps in communication training for meeting attendees contribute to the difficulties experienced in formal settings. Thus, P2's reliance on more adaptable, informal exchanges for effective knowledge transfer is reinforced. Both formal and informal exchanges are valuable Lessons Learned Sessions for knowledge and solution exchange and have greater benefit when documented in a database (Talisayon, 2014). This shows how important it is to address the observed communication issues in formal settings and improve the documentation for informal settings.

Knowledge Acquisition and Learning

Commonalities:

Inherited knowledge was recognized, although it may be outdated or no longer aligned with industry standards. P3 shared, “Back then it was just...relying on what was given to us, what we inherited, but without being critical about the content of that or being in line with the industry properties." There was a common sentiment about a lack of formal training, particularly with the KMS tools. P1 said that “the company did not provide any training,” and P4 supplemented it by saying, “I figured it out mostly on my own” when it came to handling the KMS tools. This self-reliance likely had an impact on learning from existing documentation. The participants acknowledged the benefit of external inputs. P3 specifically emphasized the need for “more external training, like visiting suppliers or consulting suppliers…They have sufficient knowledge about how to handle their products.” P4 added that “the others in my unit…do things like talk to the salespeople (and) get feedback from them. That's where they get their information.” This shows that some participants adapt informal methods of gathering knowledge from outside. Training to use the tools that facilitate knowledge flow is recognized as an important aspect of any KMS (Riswanto & Sensuse, 2021). Also, the participants’ acknowledgment of the importance of external training represents the unit’s absorptive capacity, which is tied to project success (de Souza et al., 2021).

Contradictions:

Although P3 expressed the value of external training, which could take the form of supplier visits or consultations, the relevant training for P4 referred to broader research skills: “The others in my unit…do things like talk to the salespeople (and) get

feedback from them. That's where they get their information. I've never really relied on or felt like I needed information like that…only the training I would think comes to mind are those about research themselves - how to conduct research, how to analyze data, how to plan." In addition, only P3 mentioned existing formal training but described them as "not objective or doesn't make use of our resources. It's not aligned with the parent strategy." This indicates that the training referred to was not aligned with the actual knowledge gaps and the unit's capabilities and goals. P3's further statements on a new business also show the continual need for knowledge acquisition and strategic training alignment (P3: now that we have acquired a new business…I think we don't have sufficient knowledge for that. I think it would help if we could acquire from industry or from experts in that field.)

Complementarities:

The team's external learning through the testing of commercial products and review of external formulations complements individual and team-based informal learning approaches. (P3: "We've been doing recently, testing the commercial products and checking the formulation and the lectures; P2: if we're trying to do a project similar to that, we can talk to each other, usually to ask how they did it, or even sometimes get suggestions if, let's say, I'm targeting a different specification for the project, and since this person already did several trials for their runs, they already probably seen the trends on when they adjust the different materials and procedure that they did. So, it's also helpful to have a conversation with a teammate. It's good to have a personal talk, because it, for me, [is a] better way of clarifying things, especially those principles that are not yet very familiar to me.) P4 also adds, "We all have our respective specialties and main product groups, and then we're also being given tasks

outside of those, so we learn to branch out and learn more." These statements feature a standardized method of knowledge acquisition coupled with informal or semi-formal team learning via discussions and cross-training. P3 further emphasized the value of being more proactive in knowledge acquisition (P3: My main issue is that it would have been better if it was started sooner, okay, then later, right now, because we all know it's a very tedious process of standardizing our formula. So maybe, if we had developed that earlier, we would have had fewer problems.) Here, we observe the Socialization-Externalization-Combination-Internalization (SECI) model at play in the cross-training, informal and formal exchanges, and proactive knowledge acquisition efforts of the participants (Nonaka, 1994).

Organizational Support and Incentives

Commonalities:

There is a collective acknowledgment of the lack of formal incentives for documenting and sharing knowledge. P3 perceived documentation as "just part of your job" and thought that "there's no rewarding activity." P1 simply stated, "I haven't encountered any." P4 added, "None that I can think of other than that we're able to communicate." However, informal incentives exist, such as positive feedback (P1: I also count praise or comments or good feedback from the people I work with as incentives.), the ability to communicate and work better (P4: The ability to document allows you all to do your jobs better.), and the accessibility of a clear record (P4: I need a clear record so that I can access it if it's needed.) Incentives have been acknowledged as an important motivational tool in KMS implementation (Kulkarni et al., 2006/2007; Asiedu, 2015).

Contradictions:

P2 remarked that documentation is “one of the criteria for performance evaluation…as sort of our contribution to the team…somewhat incentivizing it since it's part of how we are evaluated”. The tie-in of documentation to performance evaluation is a form of formal incentivization that may not be consistently communicated across the unit. This presents a disconnect between a company program and employee perception.

Complementarities:

The lack of strong formal incentives and the presence of informal motivations indicate that intrinsic motivation is the key driver for the current knowledge documentation and sharing practices. P3 suggests having a “standard rule or good or better implementation…that would encourage you to record some guidelines.” This is supported by P1 saying, “that there would be some improvement if there were additional restrictions or guidelines that are implemented strictly with regard to the documentation of knowledge.” These statements, in combination with P2’s acknowledgment of a performance evaluation system, point out that a stricter implementation may have some positive impact on the motivation of the members to document and share knowledge. This can be combined with recognition and rewards, which were recognized as an important component of enhancing personnel motivation (Shettar, 2007).

Facilitating and Hindering Factors in the Current KMS of the Private R&D Unit

In this section, we will identify the facilitating and hindering factors of KMS in the private R&D unit from the themes above. Under the theme of KMS Effectiveness

and Challenges, we find a facilitating factor in the form of established tools such as Teams, Outlook, and Excel. These tools are already integrated into the unit's daily workflow and are what allow them to perform knowledge management processes. However, from this scenario arises the hindering factor of fragmented knowledge storage. Given the multiple tools used in the KMS, the researchers have to check multiple sources to find what they need. This makes the process difficult and time-consuming.

In the theme Knowledge Quality and Documentation Practices, the existing documentation functions as a facilitating factor by being a starting point in the researchers' projects. It shows that the knowledge in the documentation has some utility, despite the perceived lack of standardization. The gap in documentation guidelines is a hindering factor because inconsistent naming, formatting, or incomplete information slows down retrieval and knowledge absorption. In addition, the heavy workloads make it hard for researchers to allocate time for documentation. This is another hindering factor because the researchers know that they should document, but are seemingly unable to do so.

Under Knowledge Sharing and Collaboration, an atmosphere of effective team collaboration is a facilitating factor, as members view their daily team meetings as productive and strategic. The participants also see each other as cooperative and responsive to questions, indicating a strong foundation for collaboration. Another facilitating factor is the team's openness to informal knowledge sharing, where participants prefer conversations over emails for concepts requiring clarification. This approach was indicated to build a better understanding and shared knowledge. A hindering factor was observed in formal settings like weekly meetings when a participant expressed a "fear of voicing out" in that environment, despite the sentiment

of supportive leadership from the rest. This psychological barrier prevents effective knowledge sharing among the members affected by it.

For the theme of Knowledge Acquisition and Learning, there is a clear hindering factor in the form of insufficient and misaligned training. According to the participants, there was no training on the use of the KMS tools, forcing them to learn on their own. Some participants perceived that the existing trainings were not aligned with the strategic goals and the knowledge gaps of the unit.

Finally, under Organizational Support and Incentives, a supportive leadership functions as a facilitating factor by encouraging the participants to report relevant information and discuss it in detail. The reported lack of formal incentives, however, serves as a hindering factor by not motivating the participants to the desired level of KMS use and culture.

A summary of these facilitating and hindering factors in the current KMS of the private R&D unit is found in Table 4.2.

Table 4.2

Summary of Facilitating and Hindering Factors of the Current KMS

Facilitating Factors	Hindering Factors
Established Tools	Fragmented Knowledge Storage
Effective Team Collaboration	Lack of Standardization
Informal Knowledge Sharing	Time Constraints and Workload
Existing Documentation as Starting Point	Insufficient and Misaligned Training

Facilitating Factors	Hindering Factors
Leadership Support	Perceived Psychological Barriers
	Lack of Formal Incentives

Combined Actionable Proposal for KMS Enhancement of the Private R&D Unit

We will now discuss the participants' proposals to resolve the gaps of the current KMS and supplement it with literature recommendations to arrive at a combined, actionable proposal for KMS enhancement.

The participants recommended implementing a centralized KMS platform to overcome the hindrance of fragmented storage. This platform is intended as an integrated knowledge storage where members can retrieve and revise information as needed. A centralized storage mechanism or memory is the means by which an individual is connected to a group, and a group is connected to another group (Alavi & Leidner, 2001). A fitting KMS platform for modern R&D is capable of doing the following functions: Portal, Information Retrieval, Document Management, Workflow Management, Collaboration, and Analysis (Park & Kim, 2006). MS Teams is capable of these functions since it is a repository of various tools, such as Microsoft Excel and Power Automate. For the private R&D unit, they can opt to use Teams as the centralized platform by storing all the files there and revising them there directly. Then, email communication that requires reference to the data can simply make use of hyperlinks to the relevant file in Teams. In this way, memory use is optimized and information is kept in one primary space. Mobile phone access to the MS Teams files may also be given to personnel so that information can be accessed even off-site.

The interview results also brought up the use of AI technology for documentation to overcome the hindrance of time constraints due to a heavy workload. By taking advantage of AI to draft write-ups, researchers can focus on data recording and review. In complex R&D projects, portals using groupware technology achieved faster outputs when augmented with cognitive agents (Barthes & Tacla, 2002). In the R&D unit, the use of Teams can be supplemented with AI tools like Google Gemini, OpenAI ChatGPT, and Microsoft Copilot. Writing guidelines and data can be fed to the AI tool to generate the draft technical articles. These articles are then reviewed by the team before they are marked as final. Files may be suffixed differently to signify their status (e.g., [File 1 name]- for review, [File 2 name] - reviewed). It is recommended for each member of the team to review every new file to ensure that new lessons are learned by all. This follows the principle of the Lessons Learned Sessions of the US Army (Talisayon, 2014). This peer-review system would not only check potential mistakes by AI, but also enhance group learning.

Guidelines for file naming, keyword setting, and document formatting were seen by the participants to facilitate easy retrieval. These guidelines are part of the belief and boundary systems of organizations, which are important in knowledge management control (McCarthy et al., 2011). For the private R&D unit, it is recommended that the team discuss these guidelines and update them as needed. Regularly implementing the evaluation component of the PDCA framework would ensure that these guidelines remain relevant and useful with changing scenarios (Abualwafa et al., 2023).

Participants recommended more structured meetings to address the psychological barriers perceived in formal knowledge-sharing sessions. Examples of improved meeting structures would be the introduction of guide questions to reduce

the guesswork on expected reporting or the implementation and improvement of a pre-meeting report. Encouraging inquiry is also a proven facilitator of knowledge flow (Jayawarna & Holt, 2009). This can be done by implementing training towards improved communication and knowledge management. The psychological barriers can be reduced when the meeting participants understand what behaviors facilitate and hinder knowledge flow.

It is also recommended to align all training by conducting a training needs analysis targeting the gaps pointed out by the members. Opportunities for external knowledge acquisition, such as supplier training or customer visits, should be increased if they are aligned with strategic goals. These external opportunities could be incorporated as performance indicators in the corporate scorecard. Staff motivation and development, as well as information systems training, were proven effective in facilitating knowledge flow (Asiedu, 2015). Existing engagement programs should be evaluated for their motivational impact.

Finally, the participant responses revealed a lack of formalized incentives. While the existing performance management somehow accounts for KMS processes, its motivational effects or benefits are not that visible to the participants. A study showed that a lack of effective interaction between knowledge sources and recipients, and a lack of a transparent incentive system were hindering factors for knowledge flow (Lajcin & Guzonova, 2023). The incentives must be continually communicated by conducting more frequent appraisals (e.g., quarterly). The performance appraisal system may also be redesigned to present a more transparent performance to reward chart.

The combined actionable proposal is summarized in Table 4.3.

Table 4.3

Combined Actionable Proposal for the Private R&D Unit

Proposal	Action Steps
Employing a Centralized KMS Platform	• Opt to use MS Teams as the integrated storage • In email communication, use hyperlinks that refer to files in MS Teams • Explore providing mobile phone access to the MS Teams file for off-site access
Creation and Maintenance of Documentation Guidelines	• Discuss file naming, keyword setting, and formatting with members to come up with documentation guidelines • Employ a regular feedback system on the guidelines for continuous improvement
Leveraging AI tools in Documentation	• Create writing guidelines for uniformity and easy searchability • Feed the guidelines to AI tools such as Gemini or Copilot, together with experimental data for article drafting • Subject outputs to peer review before finalization
Addressing Psychological Barriers in Formal Settings	• Provide and improve a pre-meeting report that stakeholders can easily understand

Proposal	Action Steps
	• Engage all meeting participants in communication and KMS training
Aligning and Increasing Formal Training Opportunities	• Conduct a training needs analysis with the team, with strategic goals as a reference • Evaluate motivational impact of existing engagement programs • Incorporate knowledge acquisition opportunities as performance indicators in the corporate scorecard
Implementing a Visible Formal Incentive System	• Redesign the performance appraisal system to achieve a transparent performance to reward chart • Conduct performance appraisal more regularly (e.g. quarterly)

Chapter V

CONCLUSION

This study aimed to paint a picture of the KMS landscape of a private R&D unit in the Philippines, highlight its facilitating and hindering factors, and propose potential KMS enhancements to improve the unit's R&D-to-sales conversion and retention of knowledge and talent. By exploring the views of four participants through semi-structured interviews, the following main themes were explored: KMS Effectiveness and Challenges, Knowledge Quality and Documentation Practices, Knowledge Sharing and Collaboration, Knowledge Acquisition and Learning, and Organizational Support and Training.

In the themes presented, a number of facilitating factors were identified. There were established tools such as MS Teams, Excel, and Outlook, an effective atmosphere for team collaboration during daily and informal meetings, and an existing documentation that was useful for the participants as a starting point in their projects. There was also a general sentiment that the leadership was supportive.

In addition to the facilitating factors, hindering factors also surfaced. While multiple KMS tools were already integrated to the workflow, their current use resulted in fragmented knowledge storage. This, coupled with a lack of standardization in documentation, developed a difficult experience in file retrieval and information absorption. Time constraints stemming from heavy workload was pointed out as a reason for being unable to document thoroughly. The participants also highlighted a lack of formal KMS tools training, and discussed the misalignment of existing training to strategic goals. In the formal sharing setting, a psychological barrier was found to hinder open sharing and inquiry. There was also a perceived lack of formal incentives with regards to knowledge processes.

The participants presented some proposals to combat the gaps mentioned in the interview. These proposals were compared with literature to arrive at a combined actionable proposal for the R&D unit. This proposal is composed of the following items: Employing a Centralized KMS Platform, Creation and Maintenance of Documentation Guidelines, Leveraging AI tools in Documentation, Addressing Psychological Barriers in Formal Settings, Aligning and Increasing Formal Training Opportunities, and Implementing a Visible Formal Incentive System. These steps are the result of combining the perspectives of the participants themselves with recommendations from literature to arrive at a solution specific and adaptable to the private R&D unit's KMS.

Chapter VI

RECOMMENDATIONS

Proposal for the R&D Unit

These recommendations are designed to address the hindering factors while leveraging the unit's current strengths.

- Centralize and Standardize Documentation: The R&D unit can overcome fragmented knowledge storage by centralizing and standardizing documents. It is recommended to use MS Teams as the sole repository for R&D-related information. In addition, the team must establish a clear documentation guide for file naming, keywords, and formatting to facilitate easy retrieval.
- Leverage AI to Enhance Efficiency: The unit should use AI tools such as Microsoft Copilot or Google Gemini to assist with writing technical reports in light of heavy workloads and time constraints. This allows the researchers to allocate more time to analysis and learning, while the AI tool handles the initial write-up. This practice should be coupled with a peer-review system by the team to countercheck potential errors.
- Nurture a Culture of Openness and Inquiry: While the team has strong informal collaboration, there were psychological barriers in formal settings that must be addressed. An improved meeting structure is recommended in the form of pre-meeting reports. The unit should also provide communication training to improve speaking and listening skills, and encourage open inquiry during formal sessions.
- Align and Increase Training Opportunities: The unit must reassess the existing training programs and their lack of alignment with strategic goals. It is recommended to conduct a training needs analysis as part of the strategic

planning to incorporate it in the corporate scorecard. The company must also address the lack of formal KMS training presented by the participants. Opportunities for external knowledge acquisition, such as supplier training and customer visits, should also be increased and monitored.

- Formalize and Communicate Incentives: The participants agreed on the lack of a well-communicated incentive system. The existing performance management system should be improved to emphasize linkages between knowledge sharing practices and tangible rewards. The unit should also increase the frequency of appraisal sessions to make the system more visible and motivating.

Recommendations for Future Research

This study provides a qualitative understanding of the private R&D unit's KMS landscape. To contribute further to the body of knowledge, the following are recommended for future research:

- Quantitative Validation: A future study could employ a quantitative approach to validate the identified facilitating and hindering factors across a broader sample of R&D units in the Philippines. This would provide a statistical perspective for more holistic findings.
- Longitudinal Impact Assessment: A study monitors the R&D unit over a period of time to assess the impact of the proposed KMS enhancements on key performance indicators such as R&D-to-sales conversion, or talent and knowledge retention.
- Cross-Organizational Comparison: A future study could compare the KMS of different R&D units within the same industry to determine industry-specific best

practices and challenges. This may also highlight the effect of differences in culture, population, or structure.

- Focused AI Implementation Study: Future research could deepen the understanding of the role of AI in R&D documentation and knowledge creation. Using a controlled environment, the benefits and challenges of the tools could be evaluated, including their effects on the researchers who use them.

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Appendices

APPENDIX A

Interview Guide Questions

Description of the KMS

- What software/tools does your R&D unit use to store and retrieve knowledge? How easy are these tools to use? How accessible is the knowledge?
- How does your R&D unit manage documents?
- How are tasks assigned in your team?
- How does your unit engage in collaboration?
- How does your unit analyze the knowledge from the market, the system, and the development process?

Facilitating and Hindering Factors of the KMS

- How supportive is your leadership when it comes to acquiring, disseminating, and utilizing knowledge?
- How helpful is your team when it comes to using software to record and access knowledge?
- What is your assessment regarding the quality of knowledge in your database?
- How useful is your current knowledge system in achieving work success?
- What are the current incentives in your organization for recording and utilizing knowledge well?
- What training is provided for using this knowledge management software?
- How do you feel about the policies of the organization concerning knowledge management?

- What do you think about your unit's methods of learning from experience?
- What difficulties do you encounter in acquiring, sharing, and utilizing knowledge in your unit?