Unveiling Dynamics Between Robotic Process Automation and Process Knowledge Loss

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Abstract

As organisations execute robotic process automation (RPA) enabled processes over time, a vital but less conspicuous challenge arises: process knowledge loss (PKL). PKL signifies the loss of essential process knowledge that employees need to perform tasks independently in the absence of automation. PKL brings significant negative organisational impacts, like hindering continuous process improvement, reducing productivity, and limiting the realisation of expected benefits. While scholars and industry practitioners hint at the symptoms of RPA-related PKL, studies do not specifically focus on investigating this phenomenon in depth. Thus, this PhD research seeks to explore the impact of the use of RPA technology within organisations on PKL. A qualitative case study methodology is used to interpret the phenomenon of RPA-related PKL through the experiences of process participants. Findings to date highlight that PKL is a contemporary phenomenon within the RPA context, identifying a set of factors and their interrelationships. The overall findings will contribute to developing a theoretical framework that explains the complex dynamics between RPA and PKL. The findings will also offer practical guidance for organisations to devise strategies that address and mitigate PKL during RPA implementation.

Keywords

Robotic Process Automation (RPA), Process Knowledge Loss, Conceptual Model, Work System Theory (WST)

1. Introduction

Robotic process automation (RPA) is gaining traction in the corporate sector as a task-level approach to business process automation (BPA) that uses software bots [1]. RPA is globally adopted by organisations from telecommunication companies [2] to companies from the forestry sector [3]. The global RPA market projects growth of USD 64.47 billion by 2032 from USD 18.18 billion in 2024 [4].

RPA stands out from other BPA technologies due to three distinct features: it is non-invasive, allowing seamless integration with existing systems through user interfaces; it is user-friendly, requiring minimal technical expertise to develop; and it can replicate human actions, making it particularly versatile [2, 1].

Prior studies highlight several benefits of RPA, including cost reduction, improved employee satisfaction, enhanced traceability of business processes, greater operational efficiency, and support for business continuity [1, 2].

Although RPA offers substantial benefits, recent academic literature and practice commentaries have drawn attention to various challenges associated with its use [5, 3]. One prominent concern is process knowledge loss (PKL), which has been emphasised in both scholarly literature [6, 3, 7, 8, 5, 9] and by RPA practitioners [10]. This study examines the impact of RPA on PKL, a phenomenon that occurs within process participants due to the loss of process knowledge [3, 10].

Research emphasises that RPA-related PKL is a critical concern due to its significant threat to organisational performance [3, 7, 5]. The decrease in employee productivity due to difficulties in retaining end-to-end process knowledge is a significant consequence highlighted in the literature [5]. Process execution delay is another consequence [5, 9]. Oshri and Plugge [5] identified that task visibility issues result in employees losing their understanding of the automated tasks. Consequently, employees struggle to troubleshoot errors and handle exceptions if a bot fails, due to insufficient process knowledge [5]. Reversing the impacts by *"introducing employees to the same process will cost the employer additional*

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working hours", reducing the cost-effective benefits of RPA [3]. Given the criticality of organisational consequences of RPA-related PKL, it demands both scholarly and practical attention.

RPA-related PKL is an emerging topic in the literature. Scholars [6, 3, 7, 8, 5, 9] and industry practitioners [10] have only hinted at the symptoms and impacts of PKL in the context of RPA. There are several calls for research in this area. Vu et al. [11] argued that knowledge loss is a significant cause of increasing complexities in RPA maintenance. Therefore, it is suggested that a theory be developed to explain the varying impacts of BPA technologies, such as RPA [11]. Zelenka and Vokoun [8] emphasised the importance of researching the challenge of losing employees' knowledge and skills after RPA is implemented. Eulerich et al. [7] call for research on the negative impacts of using RPA, emphasising PKL as a critical area that requires scholarly attention. Although there was no specific research on this topic exploring RPA-related PKL, scholars have recognised the importance of studying this topic.

1.1. Problem Statement and Research Questions

As organisations implement RPA-enabled processes over time, a crucial yet less conspicuous challenge emerges - PKL. PKL occurs when RPA software bots replace repetitive and rule-based tasks that have been performed by process participants over a period of time. PKL impacts organisational performance by undermining productivity, process adaptability, and long-term improvement efforts. Despite its significant implications for the long-term effectiveness of automation efforts and several calls for research in this area, research on RPA-related PKL is still at a nascent stage. There is a critical need to investigate how PKL occurs in the RPA context and to identify strategies organisations can use to mitigate its impact. Therefore, this study aims to address the following overarching research question (RQ) and three sub-questions.

RQ: How does the use of robotic process automation technology within organisations impact process knowledge loss?

RQ1: What are the factors impacting RPA-related PKL?

RQ2: What are the interrelationships between RPA-related PKL factors and PKL categories?

RQ3: How can organisations mitigate the risk of RPA-related PKL?

1.2. Contributions of the Study

- **Theoretical contribution**: A theoretical framework will be developed, extending the notion of roles and facets of work in work system theory (WST) (refer to section 5.1 for more details on WST), contextualizing these components to low-code automation technologies. As per [12], a type IV (explanation and prediction) theory will be developed to understand the underlying causes and predict 'how' PKL occurs when process participants and RPA bots play various roles and perform various facets of work.
- **Practical contribution**: This study informs organisations that RPA-related PKL is a contemporary phenomenon that compromises the intended benefits of RPA implementation. The overall findings of this PhD research will help organisations to develop effective RPA governance policies and mitigation strategies to prevent or overcome PKL.

2. A Brief Summary of the Related Work

Recent studies both in academia [6, 3, 7, 8, 5, 9] and industry [10] suggest that RPA-related PKL is a contemporary phenomenon that surfaces with extended use of RPA. For example, Asatiani et al. [6] argue that PKL surfaces when employees lose the logic behind executing a process once the tasks are allocated among employees and bots for a period of time. A study by Oshri and Plugge [5] in the banking sector indicates that a prolonged end-to-end implementation of RPA may lead to employees losing their comprehensive understanding of the overall process.

A few scholars offer fragmented insights into the causes of RPA-related PKL. For instance, Marciniak and Stanisławski [3] and Clair [10] link PKL to weak governance and documentation, while Oshri and

Plugge [5] and Asatiani et al. [6] emphasise that task division reduces employees' understanding of overall processes. Yet, no study has comprehensively examined these factors or the interrelationships. Consequently, the existing studies do not provide a comprehensive understanding of how to mitigate PKL and sustain the benefits of RPA. Furthermore, the existing literature does not offer a detailed, theory-driven explanation of PKL factors or their connections to different PKL categories.

3. Research Design

This study takes an exploratory approach, as little is known about the phenomenon of RPA-related PKL. As Eisenhardt [13] elaborates, case studies are appropriate when little is known about a phenomenon to build more powerful theories incrementally. Therefore, to interpret the phenomenon of RPA-related PKL through the experience of people (i.e., process participants), the case study approach [14] in qualitative research is chosen [15].

The overall research design includes three (3) sequential stages: stage 1 – problematisation, stage 2 – development of contextual understanding and conceptual model, and stage 3 – theorisation. The research has now progressed to the completion of both stage 1 and stage 2.

Stage 1: Problematisation: This study used the problematisation methodology of Alvesson and Sandberg [16] over a gap-spotting approach, challenging fundamental assumptions necessary for generating innovative questions as presented in section 1.1.

Stage one of the research design aligned with the six (6) principles of the problematisation methodology, namely, 1) identify a domain of literature, 2) identify and articulate assumptions, 3) evaluate assumptions, 4) develop alternative assumptions, 5) relate assumptions to the audience, and 6) evaluate alternative assumptions [16]. In line with the principles 1 and 2 [16], a preliminary literature review was conducted, identifying key papers on RPA-related PKL. It was identified that there is a dearth of literature specifically focusing on this phenomenon. To avoid the risk of a wasted effort, it was decided to further explore and validate the literature findings using industry insights. Hence, seven (7) exploratory interviews were conducted with RPA experts across several industries. Principles 3 to 6 [16] were followed here. The findings of exploratory interviews confirmed the primary assumption that PKL exists in the context of RPA. Then, alternative assumptions linking BPA and PKL were generated. This process allowed us to develop a clear problem and research questions that can significantly contribute to the existing knowledge on a contemporary phenomenon: RPA-related PKL.

Stage 2: Development of contextual understanding and conceptual model: Stage 2 focused on iteratively developing a conceptual model in two phases, answering RQ 1. First, a systematic literature review (SLR) was conducted using the RPA, BPA, and general knowledge management literature on knowledge loss, following the guidelines of Bandara et al. [17]. The SLR facilitated prior specification of constructs/themes. This phase led to the development of an initial conceptual model that includes ten (10) themes.

A priori specification of constructs informs the initial design of the theory-building studies [13]. Thus, following the guidelines of [13], the case study and interview protocols were designed to align with the themes in the initial conceptual model. An exploratory case study was conducted with a global apparel manufacturing company [18], allowing new insights to emerge that were not readily apparent with other research methods [14]. Then, the conceptual model was further refined as shown in Figure 1.

Stage 3: Theorisation: The objective of this stage is to conduct multiple case studies following the guidelines of Yin [14] for theorisation, answering RQ 2 and 3. Case studies are appropriate for theory building under situations where there is a lack of empirical substantiation related to a phenomenon [13]. Despite advocating the use of a single case study to describe unique, under-researched, and extreme phenomena [19], multiple case studies were chosen to allow comparisons [14]. The research is currently in the data collection phase for the second case study. The data analysis of the first case study is currently in progress. In phase 2, it was revealed that PKL differs across various types of processes and process participants. Hence, WST, particularly the roles of algorithmic agents, facets of work [20], and mode of engagement [21] are selected to explain the findings of the multiple case studies.

4. Findings to Date

First, a clear definition of 'what is PKL' was established to address the inconsistencies in the existing explanations of PKL in the literature. Eulerich et al. [7] define PKL as the inability of employees to perform tasks independently once bots take over, while Marciniak and Stanisławski [3] explain it as the 'organisational amnesia' resulting from full automation. However, these views focus narrowly on full automation and overlook hybrid contexts where both bots and employees are involved. To address this limitation, the first publication of this PhD offered a more comprehensive definition; *"the intentional or unintentional loss of knowledge related to the processes"* [22]. The same study [22] also discovered that process knowledge is not entirely lost due to RPA, and various elements of it are still being preserved. Hence, building on prior literature, the second publication of this PhD research [18] further enhanced the definition, incorporating three types of process knowledge: coordination knowledge (sequence of activities), contextual knowledge (influences from other contingency factors), and experiential knowledge (practical, hands-on experience). Earlier PKL definitions did not distinguish between these types. Therefore, PKL was redefined as "the intentional or unintentional loss of coordination, contextual, and experiential knowledge from extending RPA use in end-to-end and task-level automation" [18].

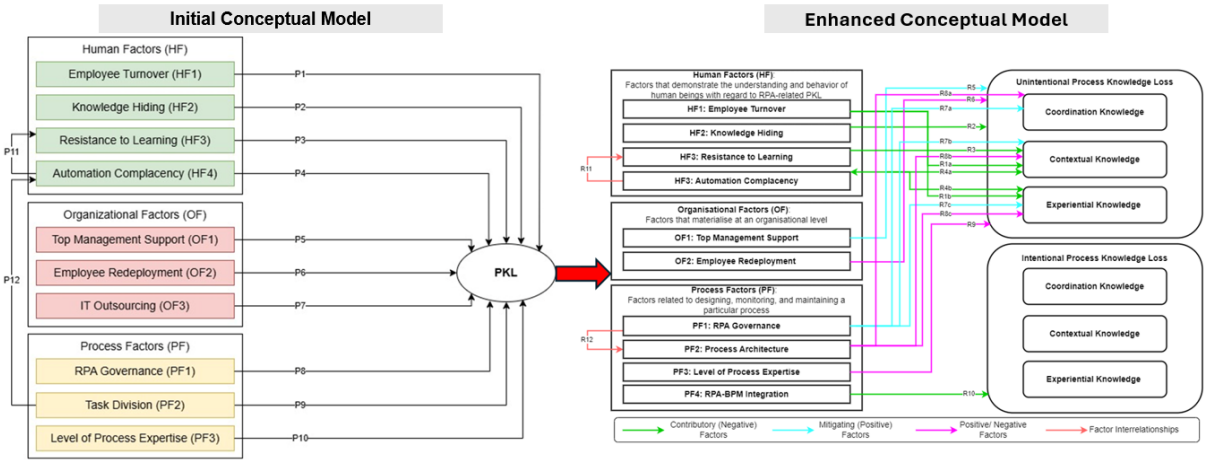

Figure 1: Initial conceptual model Vs. enhanced conceptual model [18]

To address RQ1, an initial conceptual model was developed through SLR. Drawing from the overall literature, ten (10) factors were discovered, namely, 1) employee turnover, 2) knowledge hiding, 3) resistance to learning, 4) automation complacency, 5) top management support, 6) employee redeployment, 7) IT outsourcing 8) RPA governance, 9) task division, and 10) level of process expertise. The literature demonstrated that process knowledge is accumulated and retained by employees through the hands-on execution of processes [5, 9] and learning [23]. Thus, in many cases, PKL was characterised as a phenomenon that occurs due to task division among employees and bots, as a result of reduced employee involvement in automated processes [6, 7, 5, 9]. Figure 1 depicts the initial conceptual model.

The initial conceptual model was enhanced via the findings of an exploratory case study. The enhanced model incorporates additional factors (e.g., process architecture), new sub-factors (e.g., task control, process segmentation), ten (10) relationships to PKL, and two (2) factor interrelationships as shown in Figure 1. The previous model did not specify which process knowledge types were affected. To address this, the enhanced model incorporates three key types of process knowledge: coordination, contextual, and experiential. It builds on the PKL categories (i.e., intentional and unintentional), identifying relationships between factors and PKL categories. Findings revealed that RPA-BPM integration is linked to intentional PKL, whereas the remaining factors are associated with unintentional PKL.

A further look into how RPA impacts PKL through the data analysis of the multiple case study 1 (stage 3 in progress) revealed that PKL varies based on the 'levels of automation', and different roles played by employees and RPA bots.

5. Work in Progress and Future Steps

In stage 3 (theorisation), data collection is in progress for the second case study, and data analysis is underway for the first case study. A cross-case analysis [14] will be conducted to allow comparison of the findings of the two case studies. The following is an overview of the publication plan:

- Published: (1) Is RPA-related process knowledge loss real? - ECIS 2024 [18], and (2) Is RPA Causing Process Knowledge Loss? Insights from RPA Experts - BPM RPA Forum 2023 [22]
- Accepted: Automation to Agitation: Unveiling RPA-induced Technostress - BPM Forum 2025
- In progress: Unveiling the Factors Impacting RPA-related Process Knowledge Loss: A Systematic Literature Review - Business Process Management Journal, The Impact of Robotic Process Automation on Process Knowledge Loss: A Theoretical Framework (Conceptualising)

5.1. Application of the Theory

The WST [20, 21] will serve as the theoretical lens for explaining the findings.

- Roles of the algorithmic agents: There are six roles defined by [20] that are delegated to information systems by work systems (WS). This study will use/ extend the roles defined by Alter [20] contextualising in the RPA domain.
- Facets of work: There are 18 facets of work derived by Alter [20]. The facets of work will be used/extended to identify and categorise various facets done by bots and process participants when performing each of the six roles listed above.
- Mode of engagement: Findings to date of the first case study (stage 3) revealed that PKL varies with the level of automation. Thus, the modes of engagement are aligned to reflect the level of automation. Accordingly, how PKL occurs when bots and process participants play various roles, conducting various facets of work at each mode of engagement, will be explained in this research.

At the BPM doctoral consortium (DC), it is intended to discuss the conceptualisation of using WST in this PhD research. Specifically, it is aimed to gather feedback on using WST (particularly the roles, facets of work, and mode of engagement) as the theoretical lens to explain a phenomenon in the RPA context, which is a form of BPA, including its weaknesses and challenges. The outcomes of this discussion will inform my next publication and the theoretical underpinning of the entire research.

6. Conclusion

This PhD study explores an emerging organisational challenge - PKL, which arises when bots take over tasks previously conducted by employees. The case study approach in qualitative research is used to explore the phenomenon. Findings to date highlight that PKL is a contemporary phenomenon within the RPA context, developing an enhanced conceptual model. Future work will focus on theorisation using multiple case studies. This PhD research will contribute to theory building in the RPA domain, explaining the dynamics between RPA and PKL. The research will also provide practical guidance for organisations to create strategies that address and mitigate PKL during RPA implementation.

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Declaration on Generative AI

The author(s) have not employed any Generative AI tools.

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