From Manual to Automated: A multi-case study of utilizing Robotic Process Automation and Intelligent Automation in Healthcare Operational Processes

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Abstract

Healthcare organizations are applying digitalization to the constantly increasing amounts of different administrative processes. Automation of digital workflow processes using low-code solutions, such as Robotic Process Automation (RPA) and Intelligent Automation (IA), has emerged to increase process efficiency in healthcare. Although automation has the potential to offer significant efficiency benefits, it is still unclear what factors should be considered when implementing automation solutions. This research investigates the impact of automation in two Finnish healthcare districts through a comprehensive multi-case study. Findings reveal that while RPA and IA can significantly enhance process efficiency and reduce repetitive tasks, technical faults, process readiness, and unmet user expectations hinder their successful implementation. The study underscores the need to manage expectations, ensure process readiness, and foster open communication to realize the full potential of automation in healthcare.

Keywords: Robotic Process Automation, Intelligent Process Automation, Healthcare

1. Introduction

Digitalisation is one of the biggest challenges and opportunities healthcare organizations have faced in recent years (e.g. Viale and Zouari 2020; Ratia et al. 2021). However, to tackle those challenges and redeem the opportunities, two main approaches can be followed. One way is to implement digitalization into the organization and automate processes from the top down, for example, by creating a digitalisation vision and strategy. The other way is to focus on less coordinated digital tasks developed on an ad hoc and needs-based basis (Osmudsen et al. 2019). Both approaches are necessary and mutually supportive (Ratia et al. 2021).

In the past decade, there has been a growing trend toward automating business processes through software (Ratia et al., 2021; Ratia et al., 2018; Davenport and Kirby, 2016). Automating business processes often requires application programming interfaces (API) to connect with legacy software, which might not be feasible due to technical limitations in health systems or vendor restrictions (Herm et al., 2023; Syed et al., 2020). Thus, lightweight non-invasive automation methods, such as *robotic process automation* (RPA) and *intelligent automation* (IA) can offer a chance to enhance operational processes in both care delivery and administrative tasks (Ferris, Ackers & Borhani, 2022; Zayas-Caban, Okubo & Posnack, 2023).

RPA robots are not physical robots, but “an infinitely scalable virtual human that can be instructed very quickly in order to carry out operational procedures at the speed of a machine” (Willcocks, Lacity & Craig, 2015). More precisely, RPA robot replicates the tasks performed by human employees by interacting with existing user interfaces (Herm et al., 2023). For example, RPA can be used to log into various systems using "robot" credentials, mimic actions such as clicking and moving a mouse, fill out reports, verifies data quality, and sends different types of messages (Hallikainen et al., 2018; Kedziora & Smolander, 2022). RPA can provide significant benefits when implemented in suitable workflows, such as cost savings, improved compliance, higher process quality, reduced employee workload on repetitive tasks, and faster process times (Kedziora and Smolander, 2022; Ratia et al., 2021; Kedziora and Kiviranta, 2018).

While RPA is a powerful tool, its applications are restricted to highly rule-based, structured, repetitive, and well-documented tasks (Ng, 2021; Aguirre and Rodriguez, 2017). IA has emerged to replicate human cognitive functions, handling tasks that typically require human intervention (Coombs et al., 2020). More specifically, IA integrates RPA with AI elements such as machine learning (ML), natural language processing (NLP), voice recognition, and optical character recognition (OCR) (Kedziora & Hyrynsalmi,

URI: https://hdl.handle.net/10125/109241
978-0-9981331-8-8

2023). IA solutions can support healthcare professionals in evidence-based clinical decision-making and enhance operational efficiency, thereby contributing to the delivery of value-based care (Chen & Decary, 2020).

Despite the potential of automation, many organizations face significant implementation challenges; up to 30-50% of RPA projects fail due to misapplication (Ravn et al., 2016). While early RPA efforts focused on straightforward processes, it is now harder to identify suitable tasks for automation (Vukšić et al., 2018). Although IA solutions have expanded the automation possibilities to more complex workflows, there is still no one-size-fits-all framework for their utilization (Ng, 2021). Avoiding mistakes early on is essential, as faulty or unsuitable automation can escalate costs that may outweigh the expected savings and benefits (Hindel et al., 2020; Geyer-Klingeberg et al., 2018).

While the interest in automation has grown, there is still limited research on its application in medical and healthcare services (Patrício et al., 2024). Often there is a difference between what healthcare professionals believe could and should be automated (Früehwirt & Duckworth, 2019). Additionally, a major barrier to adopting automation is the lack of awareness about available solutions (Scott et al., 2021). Given the fragmented research on automation, clear "guidelines and recommendations" are needed for managers who want to implement automation in healthcare operations (Patrício et al., 2024).

The primary objective of this study is to identify the potential challenges when implementing and utilizing automation technologies in healthcare. This study examines the use of RPA and IA in two Finnish public healthcare districts: the Wellbeing Services County of Pirkanmaa (PIRHA) and the Helsinki and Uusimaa Hospital District (HUS). Based on the findings from the two cases, the aim is to identify the key focus areas when implementing automation solutions in healthcare operational processes. The research questions are:

RQ1: *What are the challenges in implementing RPA and IA in healthcare operational processes?*

RQ2: *What strategies can be employed to manage possible risks when implementing automation solutions in healthcare?*

2. Background literature

2.1. Improving healthcare operations with automation

In essence, *automation* describes "the execution by a machine agent (usually a computer) of a function that was previously carried out by a human" (Parasuraman & Riley, 1997). Thus, *workflow automation* means the identification of sequences of tasks that can be streamlined using technology (Zayas-Cabán, Okubo, and Posnack 2023). Automating simple workflows is needed in healthcare, where repetitive and distracting administrative tasks burden professionals. The high administrative burden of these routine processes makes tasks in the healthcare sector especially difficult to manage (Patrício et al., 2024).

Broadly, RPA can help healthcare organizations in data management, system integration, and process enhancement (Hofmann et al., 2020). Specifically, RPA can improve back-office efficiency and accuracy in physician credentialing, patient scheduling, coding, claims administration, billing, and compliance (Jain and Bhatnagar 2019). RPA can also offer solutions for the industry's regulatory and reporting challenges. For example, during the COVID-19 pandemic, RPA was crucial in speeding up patient diagnosis, sending targeted health information, and updating data on quarantined individuals (Doğuç 2021). In Finland, RPA was used to record up to 2,000 COVID-19 vaccinations per day, a task that previously required 10-15 personnel (Adolfsson 2021). Similarly, the capital region's hospital district HUS reported that RPA saved nearly 13,500 workdays in 2021 (HUS 2021).

Unlike RPA, which focuses on performing routine tasks, IA can extend use cases to situations where predictive support is needed (Kääriäinen et al., 2018). The benefits of IA are extensive; it can optimize scheduling, hospital admissions, capacity management, and patient flow (Garcia et al., 2020). IA can also coordinate patient information, issue health risk alerts, and streamline logistics, such as managing drug and equipment supplies using real-time data (Secinaro et al., 2021). In Finland, for example HUS has explored IA to optimize operational processes, such as handling specialized healthcare referrals. HUS has automated, on average, 75 percent of all special healthcare referrals arriving at HUS, and about 50 percent of the referrals sorted by RPA are checked by an IA solution (Ahlskog, 2022).

3. Research method

This study aimed to identify the challenges associated with implementing automation in healthcare and to develop strategies for managing these risks. The study was conducted as a multi-case qualitative study, investigating the utilization of automation solutions in two major Finnish wellbeing counties: *The Wellbeing Services County of Pirkanmaa* (PIRHA) and *the Joint Authority of the Helsinki and Uusimaa Hospital District* (HUS). The two organizations were selected based on practical needs, size, experience, and existing contacts. Both had implemented various automation solutions but had not fully assessed their overall impact. Additionally, they are among the largest healthcare organizations in Finland. Moreover, PIRHA had primarily focused on RPA, while HUS had experience with both RPA and IA solutions. Finally, the research team already had established contacts with these organizations, making them easily accessible for the research purposes.

This research used a qualitative design to explore a relatively new topic. A qualitative approach is ideal for gaining an in-depth understanding of a phenomenon within a specific context and when little is known about the subject. (Saunders, 2018; Antwi and Hamza, 2015). It is also suitable for studying the nature of a specific phenomenon and focusing on improving interventions (Busetto, Wick & Gumbinger, 2020).

This research was conducted as an embedded multi-case study, meaning it investigated "a contemporary phenomenon in depth and within its real-world context" (Yin 2018). More precisely, a case study approach is often justifiable when research delves into a real-world phenomenon that includes meaningful contextual conditions. It is also useful when the desire is to investigate different situations and have subgroups of cases covering each type. (Yin 2018.) The researchers adopted a multiple case study approach to collect data on various automation solutions, specifically focusing on RPA experiences from PIRHA and IA experiences from HUS. Furthermore, an embedded strategy was selected, meaning it contained more than one sub-unit of analysis. In other words, the study investigated stakeholders' experiences with various automation implementations across multiple units.

3.1. Data collection

The empirical data was collected through 32 semi-structured thematic interviews. The selected participants were employees and external software providers in PIRHA and HUS with experience in RPA and IA. The employees interviewed included department secretaries, nurses, doctors, pharmacists, digitalization experts, and head physicians. For both HUS and PIRHA, an external IT company had provided the automation solutions. To include the external developers' point of view, the research also interviewed these service providers. Table 1 lists all the participants.

Region	Role	Number of participants
PIRHA	Department Secretary	5
	Nurse	2
	Chief Physician / Director	2
	Medical Doctor	2
	Digitalization Specialist	2
	Head / Deputy Head Nurse	2
	Product Owner (External)	1
	Midwife	1
	Service Provider (External)	1
HUS	Pharmacist / Senior Pharmacist	5
	Digitalization Specialist	2
	Department Secretary	2
	Nurse	1
	Product Owner	1
	Deputy Chief Physician	1
	Product Owner (External)	1
	Data Scientist (External)	1
Total		**32**

Table 1: Participants from both case organizations

The interview data was collected in two phases: with PIRHA during Spring 2023 and, subsequently, with HUS during Autumn 2023. Interviews in PIRHA focused on RPA-based solutions and in HUS on IA processes. Participants were selected based on their role, unit, availability, and previous experience with automated processes. Thus, the research utilized purposive sampling, meaning such participants were selected whose characteristics aligned with the research objectives (Etikan et al., 2016). However, while the research team had a say in selecting the appropriate units, the influence on participant selection was limited. Due to research guidelines in both organizations, the sampling was done mainly by one designated contact person from each organization.

All interviews followed the same structure and were conducted remotely via Microsoft Teams. Interviewees were asked e.g. about their perception of automation benefits, risks, and future potential from four perspectives: employees, patients, costs, and processes. Moreover, for further research initiatives, participants were asked about their experience and opinions on impact assessment regarding automation benefits. All the interviews were recorded and transcribed with the permission of the participants. Furthermore, before the analysis phase, all the interviews were pseudonymized.

The interviewees discussed various automated processes, focusing mainly on referral handling and dosage building. Both organizations used a *referral sorter* to shift manual tasks from nurses to department secretaries. The sorter mimicked human actions for the repetitive sorting tasks through the user interface. PIRHA's RPA-based solution used predefined rules and structured data for automating referral sorting. For exceptions, such as if a referral was sorted incorrectly, an employee had to correct it. Additionally, HUS had enhanced the referral sorter with AI, using machine learning to interpret symptoms and diagnoses from doctors' referral texts.

In addition to referral handling, HUS had implemented an automation solution to help fill patients' dosage information in the electronic health record system, Apotti. The *medical dosage builder* was primarily used by nurses and pharmacists to transform free-text medication information into the required structured format. Based on the text input, the solution provided the user with code suggestions, eliminating the need for manual entry of the patient's entire medication list.

Furthermore, PIRHA had implemented three other automation solutions that were within the scope of this research but with a minor focus: the treatment-ending robot, eMonitoring, and the reminder robot. The *treatment-ending robot* helped with treatment closure by handling the billing and related information for the particular care path. Moreover, *eMonitoring* automated medical surveys and reviewed upcoming appointments, providing patients with an online pre-consultation survey. Based on the survey, it scheduled virtual appointments if needed or re-queued patients for future monitoring if no urgent issues were found. Lastly, the *reminder robot* was used to organize critical reminders, such as new imaging reports, from a cluttered general list and to create a specific list for relevant doctors. It also highlighted urgent cases with a red flag for immediate review by physicians.

Region	Solution	Description
PIRHA	Referral sorter	Utilizes predefined business logic, rules, and structured data for automating the referral sorting process.
	Treatment -ending robot	Performs treatment closure, meaning it manages the billing and other related information for the visit.
	eMonitoring	Reviews queue reservations, publishes a pre-consultation survey, and schedules a remote appointment based on the survey. If no urgent issues are found, the patient is re-queued for future monitoring.
	Reminder robot	Organizes a general list into a specific one for easier access by doctors and flags urgent cases for quick review.
HUS	Intelligent referral sorter	An IA solution for referral handling in specialized healthcare. Uses AI to interpret the doctor's referral text.
	Medical dosage instructor	An IA solution that converts free-text medication information into the health care record's required structured format. The solution offers automated suggestions to reduce manual entry. However, the outputs still need to be verified by a human.

Table 2: The investigated automation solutions.

3.2. Data analysis

The data analysis was done following qualitative content analysis with the QDA software ATLAS.ti. The study was conducted as a directed content analysis (e.g. Hsieh and Shannon, 2005), starting with relevant research findings and preliminary theory-based categories for automation benefits and risks. The empirical data consisted of two datasets, one for each case. The researchers divided the task of data collection among themselves. Therefore, none of the researchers took part in all the interviews. As a result,

the final dataset was a mix of primary and secondary data for all the researchers involved.

Due to the mix of primary and secondary data, the research followed the set of tactics for an abductive content analysis provided by Vila-Henninger et al. (2024). In the first step, a deductive theory-based codebook was created, which was expanded further with inductive codes. Additionally, the "AI coding" feature of ATLAS.ti was utilized as an additional exploratory method for coding. Secondly, to reduce the amount of data, two or more codes were combined into more extensive categories. For example, benefits or challenges specific to one automation solution were merged into broader categories. Furthermore, the Query Tool was used to group codes according to the four investigated perspectives (e.g. employees, patients, costs, processes). Finally, an in-depth manual qualitative analysis was carried out to identify the broader insights.

4. Findings and discussion

In both case organizations, the overall perception of automation was positive. Most participants shared the perception that automation has increased process efficiency and availability of services and positively impacted employee experience. More precisely, the main perceived benefits were related to time savings, increased process speed, and an increase in the meaningfulness of work. *"Certainly, all secretaries feel that the robot speeds up the process and at least reduces some processes that a secretary is supposed to do, thus leaving time for other tasks,"* as one department secretary in PIRHA describes.

Interestingly, participants in HUS identified broader organizational benefits that were not mentioned in PIRHA. IA solutions have created benefits across units through standardization and data transmission. Employees in HUS frequently mention that automation has helped to achieve "greater unity across different specialties." Especially the medical dosage builder and the system where it is used have driven the units to "standardize practices across different areas of healthcare".

While automation was found beneficial, the interviewees also highlighted several issues. The research found key focus areas that need attention to address potential challenges in implementation: building trust, managing expectations, balancing efficiency and quality, ensuring process readiness, promoting open communication, and showcasing the added value of automation. These issues are discussed in detail in the following sub-sections.

4.1. Build trust – but not too much

Building trust appears as critical to automation success in both case organizations. The interviewees stress the importance of automation solutions producing reliable results with operational consistency. In simpler terms, users expect these solutions to consistently deliver accurate results without frequent downtimes. The interviewees even recount instances where employees refused to use automation solutions due to losing trust. *"It would be nice to know the extent to which one can trust it and how much one can actually utilize it,"* one of the participants concludes.

On the other hand, automation shouldn't be trusted too much. Automation that works in most cases may nudge towards *automation bias*, the behavior of being overly confident with automation output (Goddard, Roudsari & Wyatt, 2012; Lyell & Coeira, 2017). Medical errors resulting from automation bias threaten patient safety and can affect practitioners' skill levels and situational awareness (Abdelwanis et al., 2024). For example, in the case of e-prescribing, Lyell et al. (2017) found instances of omission errors, where participants overlooked prescribing mistakes that the automation system did not highlight, and commission errors, where participants acted on clinically incorrect alerts.

Automation bias affecting patient safety is a trust concern raised by interviewees, especially with the medical dosage builder. For instance, the dosage builder provides users with automated medical code proposals, which may contain errors. The solution is particularly prone to mistakes when dealing with variable dosage instructions. As a result, there is a risk of inaccurate medication entries if users are overly confident in the automation output. Interviewees noted that medication instructions might remain in the system for years without changes. Therefore, in the worst case, unnoticed errors in medication entries could have a long-term impact on treatment. "*Medication safety is a significant concern as there is a high risk of recurring long-term errors. If structuring goes wrong in the first step, then the incorrect guidance remains permanently in the system. Retrieving the correct original guidance is challenging and requires a deeper understanding of the system,*" summarizes one pharmacist.

4.2. Manage expectations, especially in the early phase

The performance of automation solutions varies greatly between the two organizations. PIRHA views itself as being in the early stages of automation, with its RPA described as being in an "infancy stage", needing further development. In contrast, HUS has reached a more mature stage in its automation efforts.

According to Davis (1989), a user must have motivation – an "attitude towards using" a system – to create a behavioral change to use the system. Furthermore, Davis (1989) argues that key factors influencing users' intentions to use a new technology are the perceived *usefulness* and *ease of use*. The solution's perceived usefulness appears crucial for adaptation in these two cases, where the back-office automation requires minimal user input. For instance, in HUS, although the solutions have increased the workload for doctors, the overall perception of automation's usefulness remains positive. *"The doctors don't see the advantage yet in the referral handling work. However, when I try to consider it from the perspective of the clinic's operation, I see that it still creates a positive impact,"* describes one participant. On the contrary, in PIRHA, some employees feel that they don't want to adopt automation because they perceive it as an "additional burden."

In PIRHA, while RPA solutions are seen as useful at the organizational level, perceptions vary widely among user groups. Employees report that RPA has required "a substantial amount of manual checking," consuming work hours and even "taking away time from patient care." Those who highlight these issues are primarily the direct users of the technology, such as nurses and department secretaries. In contrast, the referral sorter at HUS is viewed as more beneficial at both the organizational and individual levels, offering clear time savings for nurses and secretaries. Additionally, in HUS, issues are consistently reported across all job roles without major differences.

In essence, the issue in PIRHA appears to be that the reliability of the RPA robots is not at a level that matches most employees' expectations. Clearly stated expectations can significantly shape the initial perception of automation reliability, sometimes even more than actual experience with the technology (Barg-Walkow & Rogers, 2016). In PIRHA, employees expect automation to handle "over 50% of the processed referrals to be considered useful." However, for instance, one participant reported a success rate of only 27 percent during a two-week test period, stating that "there's still a lot of work to be done." The perception is similar among other interviewed secretaries and nurses, *"There is still a substantial amount of manual checking required, especially from the last report, where more than 3/4 of the errors occurred,"* continues one participant. "*On a scale from one to ten, perhaps give it a seven, indicating that the robot still faces challenges,"* concludes another interviewee. The focus is mainly on how well these solutions work for employees, with most reported issues being technical faults and errors that increase their workload. In contrast, problems directly impacting patients, such as treatment delays or long processing times, are mentioned less frequently.

The successful implementation of new technologies relies heavily on the target users' willingness to adopt the new system (Buschmeyer et al., 2022). As shown in both of the researched cases, a key factor influencing whether users find technology useful is their initial expectations of it. Expectations management is crucial, as user expectations significantly affect the success of IT projects (e.g. Petter et al., 2013; Gursel, 2015; Szajna and Scamell, 1993). A key approach to managing expectations is to systematically plan communication (Gerkhardt and Frey, 2006). As the results show, managing expectations early on should be considered to reduce negative perceptions, build acceptance, and support the successful adoption.

4.3. Note the tradeoff between efficiency and quality

Improving process efficiency does not necessarily also increase quality. Often, automation replaces a portion of the previous system, making it challenging or even impossible to revert to the "old way" of doing things. When automation is integrated with system operations, key functions become vulnerable to potential automation failures. (Perry et al. 2005.) Thus, automation failures test the adaptive capability of both healthcare professionals and the operational process.

Several interviewees in both organizations describe that "the process is less precise" and "errors occur more frequently than with a human." Also, while the IA referral sorter is more accurate than its RPA counterpart, it still doesn't perform at the level of a human secretary. However, with IA-based solutions, the decrease in quality appears to be less steep. In other words, the tradeoff for increasing process efficiency

with automation solutions is a decrease in quality: "*I don't believe it [intelligent referral sorter] has improved quality. But it has shifted the mechanical work away from humans. Thus, human work time can be freed up from mechanical sorting for more demanding tasks,"* as one interviewee describes.

Especially for IA solutions, interpreting complex or varying data appears to be an issue. For instance, the medical dosage builder often failed to accurately identify situations where dosage amounts varied throughout the medication period, providing patients with only one dosage instruction. "*Well, often if there is a variable dosage, like one tablet in the morning and two in the evening... It can't handle such situations properly, so it just makes a guess,"* describes one pharmacist in HUS. The intelligent referral sorter also faced similar challenges when processing complex data. The referral sorter could not recognize scenarios in which a patient required treatment outside of their regular municipality, even if it was explicitly stated in the referral text.

4.4. Assess, if the process is ready to be automated

Automation solutions should only be implemented in processes ready to be automated. Specifically, the automated process should be stable and have limited variation (Ferris, Ackers, & Borhani 2022). In both RPA and IA cases, participants describe a lacking process as the core issue. These process-related issues were not caused directly by the robot but rather by the shortcomings in the process itself. These included issues such as the availability of data or ineffective communication. For instance, one participant in PIRHA highlighted that RPA solutions cannot work correctly if the information system around it isn't working. A poorly designed system with connectivity issues creates an unstable ground for automation solutions: *Usually issues are somewhat independent of the robot and humans. They are often more related to the patient information system. If the system isn't functioning or there are connectivity issues, then the robots can't work either.*

Not all processes need to be automated. More precisely, automation goals may not be met if selected processes are not suitable for automation or if there is a deviation from the "ideal" workflow (Zayas-Caban et al, 2021). For instance, PIRHA conducted an automation experiment with the pulmonary clinic. The robot's task was to verify whether the patient had completed the required lab tests. If the tests were not done, the system would notify a professional to reschedule the appointment to review the results. However, after being implemented, it was discovered that the system's notifications were not beneficial to the workflow and only added extra work. As a result, the use of the automation solution was discontinued. Although the system is still functional, it was determined that the process at the pulmonary clinic needs improvement before automation could be effectively utilized.

4.5. Instruct and encourage open discussion

The role of effective communication is crucial in supporting the success of automation. In PIRHA, some department secretaries and nurses have expressed the need for clearer instructions. They have described the current communication as 'vague' and the understanding of what working with the robot entails as 'somewhat lacking'. More precisely, support has to match user needs: *"The information about the robots has been quite vague.We secretaries are quite detail-oriented people, so we would require much more granular, structured, and precise information about how the robots function,"* summarizes one participant.

Moreover, even with effective automation implementations, the benefits might get hidden. The work atmosphere can influence how transparent the discussion of automation benefits is. For instance, one interviewee had noticed in HUS that benefits are only discussed if it is encouraged by the unit's work culture: *If you have a difficult work atmosphere, you don't go tell your boss, "Hey, now I have a bit more bandwidth." You enjoy having more breathing space, but you don't report that you saved 5 hours of time that week. On the other hand, there are units that better understand how much time has been saved and how enjoyable it has been.*

4.6. Communicate the value of automation

Employees must feel that automation brings them value. Showcasing value is especially important in the early phase of implementation. If employees do not see value in automation, it might create resistance to change. In PIRHA, some employees didn't want to adopt automation because they perceived it as an "additional burden" or that they "don't have time for it." Moreover, the benefits should be visible to all potential users, not only to a few: *"Do we really need to develop this when only a few of us use it?"* as one participant in PIRHA summarizes the problem.

As an example, the eye center in PIRHA receives approximately 9,000 referrals each year. Contrary to the organizational guidelines, the employees in the unit have not integrated automation into their workflow. The issue is that they believe it adds extra steps. "*They've optimized their process so efficiently that they don't want to engage with robotics and digitalization."* As a result, the eye center still prints referrals and handles them on paper.

Key consideration	Description	Action steps
Build trust – but not too much	Employees expect automation to deliver accurate results without frequent downtimes. However, over-reliance may lead to automation bias, compromising patient safety.	- Monitor employees' expectations. - Provide training to avoid over-reliance. - Ensure automation delivers consistent, reliable outcomes. Implement robust error-checking and validation mechanisms.
Manage expectations	Aligning the user expectations with the capabilities and limitations of the technology.	- Clearly communicate the possible limitations of automation. - Set realistic performance goals and success metrics.
Note the tradeoff between efficiency and quality	Automation can improve efficiency but may not always enhance quality.	-Automate processes that are not sensitive to errors. -Acknowledge the possible errors in output quality.
Assess process readiness	Not all processes are suitable for automation. Automation should only be implemented in processes that are stable and ready to be automated.	- Evaluate the process stability and suitability before automation. - Ask the employees'opinion if the process needs to be automated.
Instruct and encourage open discussion	Effective implementation requires detailed instructions and fostering open dialogue to identify issues.	- Provide detailed instructions and support, especially in the early stage. - Create channels for ongoing feedback. - Address concerns promptly and use feedback to refine automation strategies.
Communicate the added value	Demonstrating the tangible benefits of automation to employees.	- Use automation data to highlight time savings and efficiency improvements. - Share success stories and use cases to reinforce the value of automation.

Table 3: The key considerations when implementing automation in healthcare processes.

5. Conclusions

This research investigated the use of RPA and IA solutions in healthcare operations. The study focused on automation implementations done in two well-being counties in Finland. Despite the perceived improvements in process efficiency and employee experience, the research found several critical areas requiring attention for successful implementation.

Healthcare managers can leverage the findings to strategically plan automation projects and address possible challenges early on. The key learnings include, that active expectation management can help to align staff expectations and reduce resistance. Moreover, organizations should pay attention to what are the processes ready for automation and monitor automation performance closely. Lastly, having a clear communication plan to both instruct and gather feedback can build trust and encourage adoption, ultimately improving efficiency and employee satisfaction.

The study has several limitations. It primarily relied on qualitative data, leading to subjective interpretations. Due to the project's scope, quantitative methods like surveys were not used, though they could help validate key findings in future research. Additionally, purposive sampling without randomization may have introduced sampling bias, resulting in a sample that might not be fully representative, thus, potentially affecting the study's external validity. Lastly, the research focused mostly on employees familiar with the automation solutions, excluding patient interviews. This limitation was due to the challenges of obtaining research permits for patient-focused studies, which would have entailed a more complicated permit process.

Further research is needed to explore adoption barriers in different contexts, such as technical challenges and organizational culture. Moreover, comparative studies across healthcare settings could help to validate the findings and also examine automation's possible effects on patient outcomes. Additionally, developing a framework to assess automation's impact would help organizations optimize workflows and address potential issues early.

In conclusion, RPA and IA have great potential to improve healthcare operations, but their successful implementation requires careful attention to technical, organizational, and human factors. By addressing these challenges early, healthcare organizations can maximize the benefits of automation, enhancing efficiency, employee satisfaction, and care quality.

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