The Continued Innovation-Decision Process – A Case Study of Continued Adoption of Robotic Process Automation

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Abstract. Robotic Process Automation (RPA) originally entered the field of information systems as one of those disruptive innovations that will, among other automation solutions, have a profound effect on job descriptions and work itself in near future. One of the sectors that will be revolutionized – and are in fact already changing – are financial and human resource (HR) services, such as accounting, billing, and payroll services. According to statistics, Finnish companies operating on the administrative and support services sector make little use of service robots. Companies that have initially adopted the technology do not necessary reach its full potential. We explore what factors create challenges for the continued adoption of robotic process automation by investigating two companies and using interpretive case study as our research method. The two companies are service centers. They operate on the public sector in Finland and provide financial and HR services for their owner-clients. The findings of this study include insights into the key factors that affect continued adoption of RPA, and these point towards an expanded model of Innovation-Decision Process where iterations of a new decision are triggered by new ideas on how to use the innovation.

Keywords. Robotic Process Automation, technology adoption, Diffusion of Innovations, adoption continuance, information systems

1 Introduction

Workplace forecasts have for years now stressed that automation will in the very near future have a substantial effect on jobs in several industries. Accountants and auditors have been viewed as one of the professions in the non-manufacturing sector which will decline considerably due to the adoption of automation technologies, such as robotic process automation (RPA). When RPA was introduced into financial and payroll services in Finland, a common theme in the news, professional journals and seminars was that accountants and other similar professions would be replaced by robots in the near future. However, certain public sector organizations which already adopted RPA some years ago during its first hype are still actively recruiting accountants, payroll specialists etc. According to statistics, Finnish companies in the administrative and support services sector utilize service robots to a low degree [1]. Out of these

observations rose the question: *How has the adoption process been continuing after the initial decision to adopt a technological innovation?* And secondly, if change has been slower than originally anticipated or the adoption rate is slower in terms of the number of the robots in production, *what factors are influencing the continued adoption of RPA?* In this paper we try to find answers to these questions and explore the main challenges the companies have been facing.

In order to find out how the adoption of RPA has been continuing after its initial adoption within accounting and HR services we visited two publicly controlled Finnish companies (service centers). While the underlying goal was to explore and understand the phenomenon, we also hoped to gather new knowledge which could deepen the theory of innovation adoption process, particularly information on the different stages of continued or discontinued adoption. This paper contains a brief discussion of earlier literature followed by an introduction to the case study and a description of the methodology used in gathering and analyzing data. The main body of the paper discusses the key findings of the thematic analysis of the interviews. Finally, we summarize the conclusions of this research and its limitations and put forward recommendations for further study.

2 Adoption of Technology and Robotic Process Automation

In this section we aim to summarize and illustrate the existing theory of the adoption of technology in a few words and discuss some recent RPA studies related to the phenomenon. Different theories on the adoption of technology and its acceptance, such as Technology Acceptance Model (TAM) [2], Theory of Reasoned Action (TRA) [3], Theory of Planned Behavior (TPB) [4], Diffusion of Innovation (DOI) [5] and its modifications [6] and Unified theory of acceptance and use of technology (UTAUT) [7] are widely used in the IS research field to explain how organizations or individuals adopt and accept technological innovations. Conceptualized factors behind the adoption can, according to these theories, be generalized as being related to a) the technology itself and its characteristics; b) the characteristics of the individual (as an adoption unit), such as demographics, norms, and innovativeness; and c) the characteristics of the organization as an adoption unit and its prior conditions. When revisited and re-evaluated, these popular theories and *a priori* study would appear to provide a good starting point for research, this one included, but nevertheless they seldom cover the continuance or discontinuance stages of the adoption of technology. Existing literature is even more limited in terms of organizational studies; hence we have explored the theoretical framework from the perspective of both individuals and organizations.

2.1 Different Elements of Adoption and Acceptance Decisions

In this study, the adoption process base framework is founded on the Innovation-Decision process of the Diffusion of Innovation. The Innovation-Decision consists of five main stages: 1. Knowledge, 2. Persuasion, 3. Decision, 4. Implementation and 5. Confirmation [5]. This process is impacted by the characteristics of an innovation. The

DOI itself recognizes five key attributes for the innovation, which are *relative advantage, compatibility, complexity, trialability* and *observability*. Other studies have identified several other key elements, such as *attitudes, norms,* and *perceived behavioral control,* to explain the intention to **accept** the technology [4], or attributes such as *image, voluntariness, ease of use, visibility, trialability* and *result demonstrability* among other characteristics to be considered [6]. While *trust* and its narrower subcategories, such as *security* and *privacy* have been seen as influencing key factors in adopting such technologies as web-based shopping and internet banking [8-9] on the consumer level, trust or *reliability* does not always affect an organization's intentions to adopt a technology [10].

The different elements mentioned earlier are related to the initial adoption of a given technology. In this case they might be relevant when our case organizations took the first decision to invest in RPA technology and put the first robot into service. Recent organizational studies emphasize somewhat different elements. One of them to be considered is *economic efficiency* [11]. In organizational motivation, *legitimacy-oriented motives* predict initial adoption and *efficiency motives* predict continued adoption [11], meaning that organizations with efficiency motives tend to adopt technologies in line with their objectives of economic efficiency. There was also a relation to be found with high *searching efforts* influencing positively on *satisfaction,* and satisfaction in turn influencing positively on continued adoption. However, the influence of *satisfaction* and *perceived usefulness* on continued adoption has also been argued to be less significant today and **organizational context factors,** such as *subjective norms,* and **environmental context factors,** such as *competitive pressure,* more significant [12].

The findings of some recent studies support the view that change within organizations needs to be managed as a continuous process instead of concentrating exclusively on the initial stage of adoption [12], [13], [14]. A behavioral approach to organizational adoption of innovations suggests that in companies involved in the development of their own technology and environment these factors (innovation characteristics in DOI) "*are not a given but emerge as a result of the company's own action*" [14]. In that case 1) *goals and technical infrastructure,* 2) *business relationships*, and 3) *key individuals* influence the continuous adoption activities and how these activities interplay and "*comprise micro-foundations of organizational innovation adoption behaviour*" [14].

When we reviewed the literature, we did not find that such factors as trust or image play a role when continued adoption progresses at a slow rate, but when it comes to the initial decision to adopt, especially when it is a question of late adoption, there is some evidence (e.g. in consumer studies) that late adoption may be related to a *negative word of mouth* [15]. If we remain on the level of individuals, *social influence* (of a more positive character) has been seen as a potential influencing factor on intentions to adopt, albeit a more potential factor with earlier than later adopters [16]. Theories which focus on organizations instead of individuals include such concepts as *mimetic behavior/isomorphism* or *institutional pressure* in the list of factors that influence the intention and the final decision to adopt an innovation. However, there was no evidence that they would have any significant influence on decisions to discontinue [18]. A survey on continued adoption conducted among purchasing managers suggests that *mimetic competitor pressures* have a negative effect on the continued adoption of a technological

innovation within an organization (the firms) [11]. Among social factors, there is evidence of **technical and economic influences** in continuation inertia like *system investment* (earlier investments to other technologies) and *technical integration*, and finally research has found among forces of change such factors as *shortcomings in system performance* or *environmental changes*, which include increasing costs of system support and support being no longer available [18].

Finally, when considering whether the size of the adoption unit (organization) is related to the adoption, the literature suggested that the decision to adopt or the factors influencing the adoption are not necessarily dependent on the organization's size. This was seen in the phenomenon of adopting open-source office applications and factors influencing the adoption decision [10] as well as in the adoption rate of web services in municipalities [19]. These studies suggest that smaller organizations may be more agile, and innovativeness of individuals has a greater impact on the adoption rate in small organizations, but they often lack the necessary funds to adopt the technology.

2.2 The Adoption of RPA

There are several, if not exactly plenty of, recent articles covering general themes related to software robotics, the RPA implementation process and why RPA is initially adopted. However, the actual level of RPA usage or the stages of the process after the initial adoption do not appear to have been studied systematically. From earlier studies we can for instance find suggestions what may be success factors and risks in automation projects, including RPA [20], whereas there were very few indications on how organizations have continued adopting RPA in the years following the initial decision to adopt RPA or its implementation.

Organizations often adopt RPA with the aim to gain such benefits as operational efficiency (in terms of time, money, human resources) and to increase the quality of their services (fewer mistakes, more rule-based error checking). The Big Four accounting firms estimated in 2017–18 that between 10 to 30 per cent of accounting processes can potentially be automated [21]. They concluded that a business process is suitable for RPA if two conditions are met: 1) it involves only structured, digital inputs, and 2) it is entirely rules-based. Studies show that reducing manual tasks and workloads can lead to significant time-saving in processes [22]. RPA is often used as an automation tool due to inadequacies in information systems and their capabilities. In accounting, RPA may be used in a wide range of tasks, from completing complex parts of processes to carrying out small automation tasks, such as running a report from an operative system. The purpose is to shift manual and standardized high volume routine tasks from humans to robots hoping to improve their accuracy and allowing experts to focus on tasks that involve interaction and problem solving [21]. The literature provides general and reasonably up-to-date information on the use of robotics in accounting and HR services [23-25], whereas scientific research articles on the topic are more scarce, but to be found such as Lacurezeanu et al. 2020 [26]. Syed et al. [22] presents a very comprehensive review of what has been written on the characteristics of tasks deemed suitable for RPA, and the paper also includes the results of different types of RPA research and identifies possible gaps in current literature on RPA.

Adopting RPA in an organization does not necessarily mean that it will meet the goals commonly associated with RPA, such as operational efficiency. Systematically composed guidelines for the benefits realization of RPA deployment are currently scarce [22]. However, an early involvement of both IT and business division in adopting technology has been found to be critical in the long-term success of RPA, as [22] posited on the basis of the literature reviewed. RPA adoption has been studied earlier in the context of service centers in Portugal [**Virhe. Viitteen lähdettä ei löytynyt.**]. The study of six Portuguese shared service centers (SSC) found that important factors leading to the initial adoption of RPA included the influence of *external forces* (through a process of "normative isomorphism") and that *mimetic* ("everybody does") *isomorphism* was also a key factor. In the case referred, all the SSC's used the same consulting firms in the implementation and the same RPA technology [**Virhe. Viitteen lähdettä ei löytynyt.**]. This led to the outcome that the decision to *"introduce robotization was not backed up by 'a number', such as the number of hours of human labour that could be saved, but by a normative rationality"*. The **main challenges** facing the implementation of robotics included a *lack of resources* to carry out robotization tasks and *insufficient training* to develop RPA solutions internally. Due to these challenges the SSC's had established RPA core teams that required both the necessary technological skills and a full knowledge of the processes.

We mentioned in our introduction the theme of "robots taking the jobs of accountants". This theme appears to come up often when searching for news articles and other online material. Often the theme seems to origin from a study by Oxford Martin School, which was published already in 2013 [29]. Yet accountants and HR personnel (or developers) have not been seen as a source of possible resistance towards change in the reviewed literature on RPA research. When New Zealand researchers studied the future of work and employees' views in the service sector [31], they found that automation was not seen only as a threat. Respondents of this study saw "automation as providing new opportunities, perhaps even enhancing their current jobs", which may be considered a key finding. It was quite clear that younger respondents saw automation as something that would affect their careers significantly, whereas older employees did not necessarily believe it would affect their career prospects anymore as they were able to retire soon. The study however suggested, that for older participants it would be difficult to remain competitive in work as they presumed that the adoption of new technology would not be easy, thus much work would be needed in training systems.

As will be seen later in this study, RPA is not the only automation solution for accounting and HR services. As mentioned earlier, RPA-based robots are often used to fill out the insufficient capacities of an enterprise's IT. Firms may consider other technologies as solutions and adopt several practices to digitalize and automate their processes. In general, it is not uncommon to aim to maximize the value of the current IT and to discover new technologies at the same time. Similar hybrid models have been found in other technologies, e.g. cloud computing strategies [17]. The next step after adopting RPA on a basic level is sometimes considered to be integrating AI with robotics, and, although there have been recent studies on the critical success factors and challenges related to it, e.g. [30], the focus of research is mostly placed on robots other than software-based (such as physical service robots) and on intelligent artificial

systems. Searches from research databases suggest that AI is not yet an active topic in accountancy. A recent case study [27] has examined successful implementation of RPA and AI systems in accounting and auditing, including both existing RPA systems and the implementation of new ideas. However, its findings were mainly based on business and technical approaches, excluding the social factors. The study also concluded that "*the amount of identifiable challenges and risk factors are many and of various consequence*" as they also identified this domain to be relatively new [27]. Because of this, we have chosen to refrain from further examining RPA and AI adoption studies, and while the topic came up later in some of the interviews, we do not include this theme either in our theory or in our findings, since AI was not yet adopted in the case organizations.

3 Case Introduction in Short

The case study was conducted in two publicly-controlled service centers. These were in-house companies which provide financial and HR services, such as accounting and payroll services to their customer-owners: municipalities, social and health care districts and other public utilities. While the two organizations which participated in this case study had similarities in terms of their business model, clientele, financial and payroll services and operative systems, they also had significant differences related to their other service offerings and how they had arranged their internal IT-services.

One of the events that triggered the initial decision to adopt RPA was a "Robots for Service Center" project run in 2017 and 2018 [see 32]. This was a co-operative project between seven publicly-controlled service centers, its goal to ensure their personnel's wellbeing at work in the near future when digitalization and robotics would change the nature of their work. Both companies had acquired their first robots approximately 4 years earlier, but their rates of continued adoption differed considerably. Their production models were also different: whereas in Company 1 its internal teams took care of the RPA infrastructure and the evaluation and coordination of the project, the actual design and implementation of it were outsourced. They also serviced their robots in-house, and their infrastructure and projects services included robotic projects for their owner-clients as well. Company 2 had outsourced the infrastructure but had made the decision to form an RPA team and hire both internally and externally the team members who would take care of the actual design, implementation and maintenance of the robots. Company 2 did not provide RPA as a service for their owner-clients.

Both companies had also experienced a merger some two years earlier, and this had changed their organizational structures and caused a considerable need for harmonized processes. However, neither the service processes nor the information systems of the financial and HR services were harmonized as yet.

4 Methodology

Case study was chosen as the research method with the purpose of exploring the contemporary phenomenon of inertia affecting continued RPA in accounting and HR

services and to understand it in its context [33]. The data was gathered through individual interviews of 21 key members of the case organizations (see **Table 1**). Each interview lasted between 40 and 90 minutes – longer interviews encompassed more detailed discussions of the actual robots and technology. Interviews were preceded by informal discussions with contact persons from each company. We explored during these preliminary, informal and unstructured conversations the utilization rate and targets of robotization and sought to identify the key persons to interview. These conversations were noted down in brief memos, but they are not used as a base for analysis but rather as an additional reminder of the RPA targets.

Other data included process documentation from one of the companies and public news pages and press releases. The interviews were held online due to the concurrent COVID-19 situation. Semi-structured questions were used as a starting point, although the interviews were meant to follow a free course according to the interviewees' own initiative. The interviews took place between February and May 2021, one organization at a time. They were recorded and immediately written down as memos. Transcription and deeper analysis were to follow afterwards. Before each series of interviews were conducted, informal online meetings were held between the researcher and contact persons, who were later interviewed in more depth. A one-month break followed after the interviews held at Company 1. This time was used to analyze the framework of the research – namely the structure of the interviews. Results from the first data set were also analyzed during this stage.

Table 1. List of interviewees at Companies 1 and 2 of the case study

Interviews	
Company 1	Company 2
One director (financial and HR services)	Two directors of financial services (one from group and one from a subsidiary)
Three service managers (both financial and HR services and IT services)	CIO (Group)
ICT architect	Head of IT (subsidiary)
Project manager	One service manager (financial services, subsidiary)
One IT specialist	Two RPA specialists (subsidiary)
Two accountants	Three financial specialists of accounting/controller of accounts receivable (subsidiary)
Two HR and payroll experts	

The data was analyzed using thematic analysis, i.e. themes were coded from the interview memos and transcripts [34]. The process was iterative: discoveries and conclusions were organized into preliminary findings, these were then compared again with the data, and the findings were then updated. The themes that were gleaned from the

interviews were also compared with the existing theory to understand what new knowledge – if any – might be drawn from these findings.

In the following chapter we present our focal observations from the analysis of the data and return to the Diffusion of Innovation theory and Innovation-Decision Process.

5 Findings

The six factors that follow below emerged from the interviews. While they may also play an important part when initial decisions are being made, they mainly manifest themselves at every new cycle of the decision-making process, and in the end they lead either to the continuation or discontinuation of the adoption. They are:

1. the role of competing technologies and compliance with Enterprise Architecture (EA)
2. the resourcing model of development
3. the incompleteness of the processes
4. interaction between IT and other teams
5. the amount of knowledge and ideas
6. resistance to change and trust

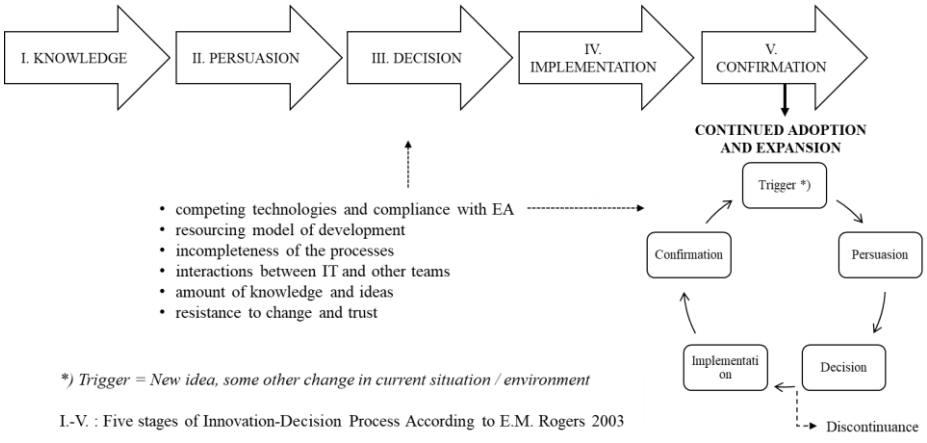

Fig. 1. Factors affecting the continued adoption of RPA

The factors affecting RPA continuation are explained in the following chapters and summarized in **Appendix 1.** It also explains briefly which factors have the greatest effect at each stage of the Innovation-Decision Process as well as their relations.

5.1 Competing Technologies and Compliance with EA

RPA competes with other automation solutions. It needs to be compatible with the existing information systems and match the overall enterprise architecture. At

Company 1, the specialists told that as part of the evaluation they first examine the underlying need for automation or the problem to be solved and then evaluate the possible technical solutions. The technical solutions which are considered among RPA include business intelligence solutions and integration solutions. Often the specialists may even hold up the automation and request their information system supplier to develop the system itself, even if a new release takes time. The IT specialists also seem to be more familiar to the competing technologies as they use them constantly.

Company 2 had invested in an internal RPA development team, and while they considered that other automation solutions would probably play a bigger part in the future, for the time being they focused on putting new robots into service. Company 2 also hoped that their information system suppliers would develop their systems in such fashion that robots would not be needed, but they were more willing than Company 1 to develop temporary robots as a short-term solution. The key differences between the two companies is lead to assume that this was because Company 2 had its own developers with time allocated on RPA, whereas Company 1 needed to outsource all the development.

" Even though robotics is a good tool for reducing manual work and in a sense, it automates processes, it is not the only instrument for digitalization and automation." – One of the directors

"I don't know whether one of the contributing factors is that the instruments in production [for financial services] have evolved so that they have started to meet the demand. And on the other hand, how much have we been able to provide solutions with integration tools in such cases which otherwise would have been implemented with robotics. The spectrum of reasons is wide. To be honest, what is the cause and what the effect has not been investigated particularly explicitly." – One of the managers

"As soon as we can have our software vendor implement certain things in the financial information systems, we can eliminate robots as superfluous." – One of the developers

Both companies reported problems in implementing RPA. These were caused by defects in the user interfaces of the information systems (compliance issues between RPA and the IS), and updates to these systems often made the robots malfunction. The maintenance and servicing of robots were consuming ever more hours – work hours which otherwise could have been used developing new robots. As mentioned earlier, the IS was not harmonized in the case companies and they both had more than one IS for same purpose (e.g. two systems for payroll service). Hence, they often needed more than one robot implementation to automate one task in the service process.

5.2 The Resourcing Model of the Development

Interviewees commonly spoke of change being poorly managed or about the lack of shared coordination. Company 1 had historically faced challenges trying to find the right people who would commit to managing the change and be able to find the time to do it. Establishing a cross-organizational virtual team had also taken time, and only after that progress had been made. The committed individual managers or directors did

not enough time to manage the change, and their responsibilities needed to be delegated. At Company 1 the challenge was an intra-corporate one, and at Company 2 the challenge was being faced at the corporate group level, as both the senior management and the developers indicated that the development of automation needed to be managed collectively for the entire group.

" It's just that this process, well, it does not work properly and has not worked even once. What you can say about it is that when you wait for ideas to emerge from the process, then it is very sluggish. They constantly invoke the urgency of the process as an excuse, that there is not enough time for the actual doing part of it. I don't know what the real reason is." – One of the developers [The interviewee uses term "process" both in context of a certain HR or financial service and sometimes also when referring to the actual development process from idea to implementation]

As mentioned in section 5.2, Company 1 had decided to outsource its development of RPA. It seemed to be very careful with cost-benefit calculations of ideas surrounding the use of robots, although it had already invested in sufficient infrastructure and licenses. Some of the interviewees also reported issues with the outsourcing model and contracts – at least in the past. While Company 1 did not possess strong RPA competence either in the number of specialists or hours allocated for it, it had firmer knowledge of other IT services and technologies, since they were part of its core services to its clients.

The management at Company 2 had also introduced a cost-evaluation model to be employed whenever new ideas for implementation were being evaluated, but the developers did not use it. The developers tended to implement any viable idea to a robot task, because they felt they did not receive enough ideas in the first place (this will be discussed later in section 5.5).

As again mentioned earlier, Company 1 seemed to be willing to wait for the new features of the operative information system to resolve automation issues, but Company 2 had chosen to build a robot while waiting for the updates, because developers had said that any change usually took longer than promised. Thus the company which relied on outsourcing did not prefer short-term, temporary robots. We assume as a conclusion that the barriers against continuing with a technology are lower when resourcing is not outsourced and that cost-benefit calculations play a relatively smaller role when the direct external costs of the technology are lower.

5.3 Incomplete Processes

The theme of incomplete processes comes up in our case organizations in two different ways: 1) robots are given only small segments of processes or single tasks in a process and 2) service processes are not mature enough and the documentation of the processes are not sufficient. In first case, automation does not cover complete service processes nor considerably large sub-processes, but tasks from here and there. The developers saw it only as a partial solution to fill the need of process automation, and they explicitly wished to have more complete processes automated. The underlying reason,

they suggested, had to do with the primary business processes that were to be automated and their maturity – see number 2 above. Business/service processes were incomplete in both companies. They needed companywide harmonizing and thorough documentation. Interviewees indicated that automation would have been executed differently, had the processes been better documented, the automation implementation would have been different and the level of automation altogether higher – regardless of the automation technology used. In particular, the CIO of Company 2 brought up the need for lean thinking in process development.

"We may robotize a section which could be completely unnecessary in the first place if we had invested in automation [elsewhere]." – CIO

While the number of robots was substantially smaller at Company 1, they had chosen to use robots to cover large or complex tasks. This, however, seemed to prolong the timescale of the project – in other words, it took several months to get a robot from design table to production. This led to other challenges, which are described in section 5.5. It appears to be highly probable that the delays in projects were also due to difficulties in resourcing, as explained in section 5.2.

5.4 Interaction Between Developers and Other Teams

The lack of a common language shared by the IT department or developers and the accounting and payment services and their personnel came up in the interviews conducted at both companies. This had a slowing effect on the definition and implementation stages of the development. Learning to understand each other and the jargon used by each team took time, and the learning curve may flatline if a mediator is not involved in the process. This was seen as a problem, especially when an outsourced contractor was used in an implementation project. People within the same organization found it easier and more flexible to interact and share knowledge when they could, for example, sit by the side of a substance specialist (e.g. an accountant) in an ad hoc situation and observe what they were doing. Changes within the development team slowed interaction repeatedly.

"Often there are too many changes in personnel here, one moves out, another comes in. Work cannot go uninterrupted with the same person and in the same team. Then the procedure may change every time as well and the ideas change, and you need to start all over again. Communication might be another issue." -One of the developers

However, one developer at Company 2 realized that when they had introduced in the team new developers who had earlier experience in automation of accounting or other services, the design phase became gradually easier. We suggest as a conclusion that when the resourcing of technological implementation is assigned to on an organization's internal teams, it may prudent to investigate whether any personnel outside the IT department have the necessary skills and willingness to have a career change and learn the technology which is being adopted.

" The more one knows about the software, the easier it is to make [robots]. When you are an outsider, [In matters of financial services] a complete clot, it means that someone needs to give you hands-on guidance on how the finance side of things work." – One of the developers

5.5 The Amount of Knowledge and Ideas

A common theme raised during the interviews held at both companies was the lack of good ideas (or any ideas whatsoever) about the use of robots. Ideas were gathered from the service teams. The interviewees thought that only those who are experts in the service process that was to be automated were expected to be able to suggest workable ideas. They also highlighted that all ideas were welcomed. This was also stressed in internal communications when ideas were being solicited.

The two companies and interviewees at all levels of hierarchy told that they did not secure as many ideas as they had hoped. At Company 2 this led to a situation where almost any technically feasible idea was developed into a robot, regardless of whether it really reduced weekly work hours or not. In contrast, IT specialists at Company 1 reported that they often had to turn down ideas because these were not feasible.

"I feel like our users have a somewhat incorrect notion of this thing [RPA]. And then they [the ideas] are given to the RPA team, even though they clearly should be addressed to reporting team." – One of the ICT specialists

Lack of knowledge can also be viewed in this context as a lack of general knowledge about and knowhow of the capabilities of RPA and business processes. One key group had the necessary technical knowledge and the other key group knew the processes that could be automated, but combining this knowledge turned out to be problematic. Both those who were expected to come up with the ideas as well as those who were to evaluate and implement these ideas mentioned challenges in the past.

"The greatest challenge for me was to understand. I'm the kind of person who needs to know the process in depth and understand it. I still don't understand it comprehensively, so I can't utilize all my knowhow." – One of the HR specialists

"If everyone could find the information easily, and if it were easier for the RPA team to gather the information, it would be easier to automate more and better robots. We in the RPA team know what a robot can do but we don't know the accounting process. An accountant knows their own processes but does not know what a robot can do." – One of the developers

Knowledge is the initial state in the Innovation-Decision Process. However, interviewees from both companies, especially specialists, told that knowledge and knowhow – particularly when they are lacking – constantly influence the continuation of the adoption process. In **Fig.1**, we have substituted the term 'knowledge' as the first stage of the adoption-continuation iterations with the term 'trigger'. The idea of a new implementation is seen as the trigger which starts a new iteration of the Innovation-Decision

process. When an organization runs out of viable new ideas in such technologies as RPA, continuation of the technology is endangered.

5.6 Resistance to Change and Trust

Resistance to change came up in most of the interviews within both companies. Views varied depending on how long an interviewee had worked for the company. For example, a director at Company 2, who had been worked there for a relatively short time, was astonished by how well the personnel welcomed robotics. However, other key persons (at all levels) had seen resistance, albeit more towards the beginning. At Company 1 almost everyone mentioned it, and a few stated that this may have been the reason for the lack of ideas (an opinion shared by the ICT specialists at Company 2).

"Directors, managers, they understood the ideology of what we were doing. But let's say on staff level it is understandable that if you come and say, could you teach a robot to take your place, it may have a negative effect on motivation. And I don't know how much of an actual effect it has had on implementing automation, but I would argue that if not explicitly, at least indirectly. The level of commitment may be lower. In my opinion management in many organizations has not realized well enough this point of view, namely that people are actually afraid of losing their jobs." – One of the managers

When interviewees were asked what kind of negative memories they had or what challenges they remembered from their journey to RPA, the most common themes were constant technological challenges and resistance from the personnel. They found the resistance milder now than before, but sometimes it still raised its head within some teams or sub-teams. When resistance was more evident, it seemed generally to be mostly passive and to be expressed as dithering, for instance through delaying decision-making at all stages of the innovation-decision process.

Lack of trust (or doubt) also came up when interviewees shared their observations on the robots' capabilities. Lack of trust cam in two types: 1) a general lack of trust in the robots' capability to handle their tasks without crashing, and 2) a lack of trust in the robots' capability of handling complete and complex processes.

This is merely a suggestion that requires further study, but nevertheless lack of trust in new technology may increase the tendency to favor competing technologies. These thoughts are a conclusion drawn from the two themes that came up repeatedly in conversation with those interviewees who had a background in other automation or IT solutions: 1) the suitability of RPA over other solutions for automation and 2) the perceived number of technical issues related to RPA. The tendency to favor solutions other than RPA may also be related to the ease and comfort of continuing with old customs and habits. However, this notion needs more in-depth examination before it can be confirmed.

6 Conclusion

We explored the continued adoption of RPA in two publicly-controlled in-house service centers in Finland, and our ambition was to understand how the innovation-adoption process had continued with RPA, whether there were challenges and why. As the available literature on continued and discontinued adoption of technology is very limited, the contribution of this research is not only to add knowledge of RPA adoption but also to provide insights on how the existing theory should be expanded to explain better the stages after the initial decision to adopt a technology innovation.

We expanded the Innovation-Decision Process with iterations of the decision during the continuation phase of the adoption of technology and suggested factors which may affect the rate of continued adoption of an innovation on organizational level. The expanded model is limited by the fact that these factors are based on researching only one technology, albeit in two organizations.

In terms of continued RPA adoption, six key factors were discovered to influence the decision to continue. These factors and their effect on one another can be summarized in general terms as follows:

1. The technology under examination may be in constant competition with other technologies that the organization has adopted. These other technologies may be preferred over the examined technology, especially when:
    a. Specialists involved in decision-making and development have more knowhow on other technologies.
    b. Compatibility issues with other technologies are more easily solved by the key personnel.
    c. Instead of allocating the development to an internal core team the organization outsources it, even more so if it faces challenges with the subcontractor's delivery models.
2. Even when the desire to accelerate the change exists, the rate of adoption slows down when:
    a. The technology cannot be utilized on the desired level due to incomplete business processes and lack of knowledge.
    b. Key personnel do not share a common language and knowledge about the change process.
3. When the continued adoption of a technology depends on a constant flow of new triggers for implementation, the decision to discontinue is predicts by a depletion of ideas. Ideas run out when:
    a. There is resistance to the technology.
    b. There is a lack of trust, or the reliability of the technology is in doubt.
    c. There is not enough knowledge on how the technology could be utilized.

The first conclusion in this summary is related to 'compliance', an element of innovation in the DOI theory. It also comes close to the element of 'relative advantage' as well as 'ease of use' in TAM. The second conclusion is related to the environmental factors

of the adoption unit, and the results might be different if these factors were removed. The third conclusion resonates with the element of 'attitudes' in acceptance models such as TPB and studies which highlight the need to incorporate factors arising from organizational context.

Thus it seems that a single adoption or acceptance theory alone does not explain whether the use of a technology is continued or discontinued, and DOI theory alone does not provide ready-made solutions for modeling the continuation and discontinuation stages. Also the characteristics of an innovation and adoption unit are key factors not only in the initial innovation-decision process but keep impacting the decisions to continue as well (see **Fig. 1**).

For the information systems managers this study highlights the importance of understanding 1) the full context and complexity of the IT environment and the underlying enterprise architecture, 2) the maturity or the organizational situation of the underlying processes and customs related to technology they are adopting, 3) the importance of solving resourcing issues at an early stage and finally 4) the importance of a shared language and early involvement of people from across the organization.

We have examined only one technology, and this has its limitations for theory building. We did not study whether these same adoption units would have similar results with other technologies. In terms of Diffusion of Innovation, this study does not take into consideration the innovativeness of an organization in general – the study did not explore the phenomenon from that point of view, and no national (or EU/ETA) statistics exist for determining the organization's position in view of the general situation of its peers. What we can depend on is how the organizations and individuals saw their current situation was related to their hopes and goals. Neither have we in this study delved deeper into the initial adoption decision made years earlier and whether for instance normative or mimetic isomorphism have played the most significant role in the initial decision and could have later influenced the decisions to continue. However, they faced external pressure from their owner-clients to search constantly for solutions bringing greater efficiency and lower costs.

Suggestions for further research include returning to a more in-depth case study or possible action research exploring business models and organizational decisions in these companies. We also suggest taking a deeper dive into the culture of an organization with the aim of understanding different rates of adoption more thoroughly through key differences in management decisions and interaction. In addition to interaction a more in-depth examination of EA is encouraged in further studies. The theory should be tested e.g. by collecting more data from other organizations, either concentrating on automation technologies or by exploring several technologies and keeping to a more general level of continuation inertia affecting the adoption of technologies.

7 References

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Appendix 1

Table 2. Factors influencing the continued adoption of RPA in accounting and HR

Factor	Description	Stages	Rel.
A. Competing technologies and the compliance with EA	• Other automation technologies, BI, development of operative IS and investments • Familiarity of other technologies • Heterogeneity of IS and multiple implementations of one idea • Technical compliance and other technical issues with robots	Decision	→ F
B. Resourcing model of the development	*In-house production vs Outsourcing* • Cost-benefit calculation emphasized in outsourcing • Short-term, temporary robots can be made more readily if the production model is intra-corporate • Finding those who can be committed and allocated time • Completeness of the supply chain delivery model	Persuasion, Decision, Implementation	→ A, E, F
C. Incomplete processes	1) Only small segments of processes or single tasks in process are given to robots 2) The maturity of the service processes and the quality of the documentation of the processes	Knowledge, Implementation	→ E
D. Interaction between developers and other teams	Namely *Lack of shared language* between IT developers and other key personnel involved in the process of adopting the technology.	Implementation	→ B
E. The amount of knowledge and ideas	*1) The lack of feasible ideas* or any ideas for the use of robots and *2) The lack of knowledge and knowhow* about the technical capabilities of RPA and business processes to be automated.	Knowledge, Implementation	→ A

F. Resistance to change and trust	*1) Resistance to change*, mostly passive forms of resistance, such as dithering. *2) Lack of trust*, as i) a general lack of trust in robots' capabilities to handle their tasks without crashing, and ii) a lack of trust in the robots' capability handling complete and complex processes.	All stages	→ A, E