The Fear of Losing Control - What Prevents the Automation of Business Processes in Sensitive Areas

Julian Koch
South Westphalia University of Applied Sciences, Hagen
Koch.Julian@fh-swf.de

Carolin Vollenberg
South Westphalia University of Applied Sciences, Hagen
Vollenberg.Carolin@fh-swf.de

Ralf Plattfaut
South Westphalia University of Applied Sciences, Soest
Plattfaut.Ralf@fh-swf.de

André Coners
South Westphalia University of Applied Sciences, Hagen
Coners.Andre@fh-swf.de

Abstract

This article explores the potential barriers and drivers of end-user adoption of robotic process automation (RPA) technology in particularly sensitive process areas. For this purpose, the grounded theory method was used within a health authority to determine which factors influence the intention to use and the benefits of such solutions. RPA enables the automation of repetitive and rule-based processes. The development and usage experiences of the respective employees as users of the technology were recorded and used for conceptualization. These found constructs were then compared with those from the established scientific literature. The results show that the obvious drivers can be described in terms of "transparency" and "explainability" and that these are novelty factors compared to established RPA-specific success factors from the relevant literature.

1. Introduction

Not only since the permanent burden of the Covid 19 pandemic has professional nursing been characterized by increasing work pressure, work compression, and growing physical and psychological stress [1–3]. This is accompanied by an increasing investment backlog in digitization and technologization in the context of sensitive care processes [1,4,5].

At the same time, administrative and documentation processes are important basic processes for needs-based, quality-oriented, and safe care [6]. These nursing processes are immensely important and are the prerequisite for the treatment of a patient. Since these nursing processes represent the main working time of nurses in hospitals, they can be defined as the core supportive processes of hospitals and therefore considered as so called sensitive business processes (SBP), as they are defined as "the heart of the activities of the organization" [7]. In the light of increasing complexity and gaining requirements in healthcare, digitization is very important in the provision of healthcare services and administrative processes. This is particularly true for hospitals.

In hospitals, the efforts involved in administrative work as well as the complexity of documentation increase enormously. Hospital staff spend a lot of time on data entry and transmission [8–10]. Currently, hospital nurses in Germany spend about 36 percent of their working time on bureaucratic activities, especially manual documentation and data input or output [11]. Particularly in connection with administrative documentation obligations for patient-related data, high expenses arise and workload is getting higher [12]. Hospitals are therefore actively seeking digital solutions to provide technical support as far as possible and to automate upstream and downstream processes.

However, there are numerous barriers, such as the lack of empowered staff, the lack of flexibility in volatile processes, or the lack of an infrastructural framework for implementing automation [2,5]. The scientific discourse describes that the possibility of self-service development of automation, preferably by the end-user, can allow to control the development costs and to deal more dynamically with changes in the overall structure and environment [13]. Syed et al. (2020) therefore call for further empirical investigations of possible success factors and their implications for the use and development of RPA [14].

This article intends to fill this postulated gap by addressing and investigating the hitherto unaddressed field of RPA use in the SBPs described. These SBPs are additionally characterized by special framework conditions and boundary constraints, which make it necessary to analyze these special operational boundary conditions and their effects on the intention of the use of process automation technology such as RPA in more detail. Especially the sensitive and critical environment in healthcare requires higher conditions on data security and knowledge managed in their SBP needs to be handled conscientiously to

URI: https://hdl.handle.net/10125/80093
978-0-9981331-5-7

ensure the best treatment of the patient. Based on this, our research objects address the following questions to be investigated:

RQ1: What are the drivers and barriers for the use and development of RPA solutions in sensitive areas such as the critical care process environment?

RQ2: To what extent do these drivers and barriers align with established success factors for RPA from the literature?

The remainder of this article is organized as follows. First, we present the theoretical background of RPA and the involvement of employees in the development of process automation as well as the context of SBP. Then, we explain the research methodology we used. Next, we present the results, and in the last two sections, we conclude the paper with the implications for practice and the limitations of our research, as well as an overall conclusion of our main findings.

2. Background

The background section will give an overview of the technology of RPA and its advantages. We further point out the missing research on the usability during development and execution of RPA solutions. Additionally, this Background section introduces the field of SBP's and the role of RPA in this case.

2.1 Robotic Process Automation

Robotic Process Automation (RPA) is a term used to describe software tools that fully or partially automate human activities that are manual, rule-based, and repetitive. RPA works by replicating the actions of an actual human interacting with one or more software applications. The tasks performed may consist of data entry, processing standard transactions, or responding to simple customer service requests [15].

RPA solutions can also be thought of as virtual workers that operate on the systems' user interface like human users. For example, because RPA mimics user input via an application's user interface, there is no need to program an application interface.

With RPA, an organization can automate routine tasks quickly and cost-effectively [14,16]. RPA frees people from monotonous, low-value-added tasks like data entry tasks, helps increase the quality of output, and improves speed by finding and retrieving all the necessary data in the background [16]. This makes employees available for higher-value tasks that require human ingenuity, decision-making, and trust [17]. The RPA solutions do not change the existing information systems or software infrastructure. RPA bots can easily be integrated with other broader automation initiatives - such as process and decision automation or data collection initiatives - to add value to the automation program [18–20].

Fittingly, RPA technologies are defined as technological interfaces that allow employees to create a solution on their own, without the direct involvement of service staff or IT [16,21]. To express the notion of self-service in the context of RPA, there are several terms or concepts in the literature such as "partial employee", "virtual employee integration", "co-production" and "co-creator" [14,19,22]. RPA technologies can thus be described as new operating models that imply new types of employee interactions and employee touchpoints, and they will play an even more important role in service delivery in the future [18,23].

Autonomous employee input is a key success factor in realizing the potential of RPA technologies in the future [15,24]. In response to the increasing role of RPA technologies, researchers have begun to examine the various effects of RPA technologies from either the organization's perspective or the employee's perspective [25,26]. Effects from the organization's perspective include factors such as speed of delivery, accuracy, and alignment with employee preferences, cost reduction, as well as productivity and efficiency gains, and improved competitiveness and market share [14,18,27].

From an employee perspective, RPA can provide opportunities to decrease their tedious works and realizes more time for value-added work. However, this is only possible if there is enough trust in RPA, as well as the good functionality of a RPA solution [28]. The active involvement of the employee in the development of the RPA solution as well as the understanding of quality aspects of RPA has to be promoted [20,22]. In these cases, the usability of RPA and the RPA development environment is very important to increase the trust of employees and engage them with this technology.

This paper takes the perspective of an organization that offers RPA technologies and self-service development to its employees. In the organizational context, the authors point to the role of RPA usability. Usability can be defined as the extent to which a system, product, or service can be used by specific users in a specific context of use to achieve specific goals effectively, efficiently, and satisfactorily [29]. It includes several dimensions such as functionality, ease of use, predictability, accessibility, or intuition [30,31]. Research has shown that by using the competencies of the involved

employees in the process, usability is rising in each dimension.

Although issues related to the quality of RPA-solutions, in general, have been discussed in several conceptual and empirical publications, the area of usability has not been explored in detail - especially not in the context of healthcare, hospitals, and the development environment of RPA [2,32,33].

The literature of RPA further points out that the evaluation of critical success (or failure) factors and their different impacts have been insufficiently researched so far [14]. A deeper understanding of the critical success factors of RPA can help organizations identify and better manage various elements to achieve the best results from using RPA. Further, these factors should be considered in the different organizational or process contexts in which RPA is used, e.g., as we study in sensitive business processes.

Apart from these initial statements confirming the research relevance of the topic, there are research gaps around usability during development and usability during the execution of end-user-based RPA applications. As RPA technologies become more widespread, usability becomes increasingly important. Previous research emphasizes that inadequate usability can lead to less trust of employees to RPA and decreasing value in case of RPA use.

The following work, therefore, attempts to fill this research gap by analyzing the independent development of RPA by employees and the usability of RPA, and the development environments that can be improved in existing RPA software solutions.

2.2 Sensitive business processes

An SBP is essentially defined by the fact that it contributes significantly to the achievement of the organization's objectives and always includes several critical and sensitive activities. Thus, an SBP is broadly classified as one of the organization's most important core processes, which subsequently constitute the organization's core activities. In the academic literature, SBPs are also understood as processes that transport crucial and important knowledge[34]. In addition, SBP involves activities that require the achievement, storage, sharing, and (re)use of individual and organizational knowledge, that contains a large amount of very important heterogeneous and sensitive knowledge. The execution of sensitive processes involves a large number of business units that have different experiences and levels of competence [7]. Therefore, a SBP possesses a high degree of dynamism in the realization of its objectives, and high complexity [34].

Hassan et al. (2016) define SBPs as activities that produce different types of knowledge: First, SBP produces "imperfect individual and collective knowledge (tacit and/or explicit) (i.e., missing, poorly mastered, incomplete, uncertain, etc.) necessary for solving critical, crucial problems" [7]. Further, "a large amount of heterogeneous knowledge stored in various knowledge sources (scattered and sometimes inaccessible)" [7], "expertise and/or rare knowledge held by a very small number of experts; flexible knowledge held by experts" [7], and "very important tacit organizational knowledge (such as competencies, skills, and practical experience)" [7] are produced by SBP.

Against this background, SBPs are inextricably linked to critical, because sensitive, knowledge flows, such as documentation processes and the transfer of data, information, and knowledge objects between communicating and interacting process participants. This is, of course, of particular importance in sensitive process handling areas - such as critical care areas.

However, the adoption, use, and development of RPA and the impact of this SBP classification on RPA usability have not been sufficiently studied. Furthermore, there is a lack of research on possible drivers and barriers as success factors for the use and development of RPA in SBP's of a critical care area.

3. Methodology

Since the above-mentioned marginal and general conditions of SBP have not been addressed in existing scientific research and the existing literature differs too clearly from the subject area, it seemed appropriate to us to develop a new theory by collecting and analyzing qualitative data. This theory-building had to be done inductively from the data. In line with the literature, we have chosen grounded theory with an interpretive approach as our research method to develop a theoretical understanding of the drivers and barriers of process automation of particularly sensitive processes in a critical care area according to our research question [35,36].

We conducted a preliminary literature review to align our research with the literature. This review revealed that these phenomena of barriers and drivers for the use and development of RPA technology in sensitive processes have not yet been sufficiently theorized. In this situation, the use of grounded theory approaches is particularly well suited to gain new theoretical insights [37]. Grounded theory for gaining theoretical insights is widely used in IS research and is obtained through an intensive, data-driven analysis process [36]. The nature of grounded theory requires iterative data collection and analysis.

In doing so, we divided our research design according to Chun Tie et al. (2019) as follows - data collection, initial coding, and intermediate coding, as shown in Figure 1 [38].

Data collection includes interviews, the RPA-development documents, and RPA-test protocols. The documents (RPA-development documents and RPA-test protocols) were concurrently collected and analyzed during the coding procedure of the interviews. The part of data analysis and coding is further explained in section 3.2.

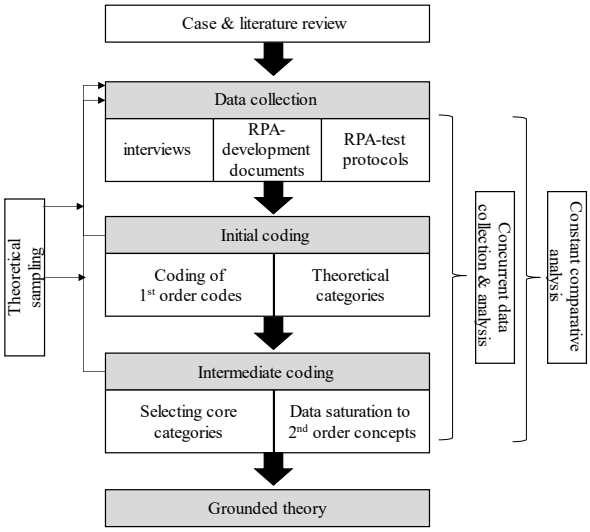

Figure 1. Research design

3.1 Case Setting

We conducted this study in collaboration with one of the largest German training centers for neonatology and intensive care medicine. Through the training center, we were able to recruit 5 nurses as participants. Each of the intensive care nurses worked in a different hospital, so we ended up studying 5 different ICUs in Germany. The nurses and their role in the ICUs are presented in Table 1 below.

Table 1. Overview participants roles

Participant	ICU	Expert's Role
Nurse 1	1	Pediatric nurse practitioner; pediatric intensive care unit; immunodeficiency outpatient clinic.
Nurse 2	2	Pediatric nurse practitioner; pediatric intensive care unit; special trauma surgery.
Nurse 3	3	Pediatric nurse practitioner; pediatric intensive care unit; child and an adolescent psychiatric hospital.
Nurse 4	4	Pediatric nurse practitioner; pediatric intensive care unit; surgical clinic.
Nurse 5	5	Pediatric nurse practitioner; pediatric intensive care unit; neurology clinic.

In addition to basic patient care, the tasks of intensive care nurses include monitoring vital functions as well as performing treatment care, administering medication, assisting with various minor procedures such as inserting a central venous catheter. The work tasks of intensive care nurses also include sensitive documentation tasks, such as the documentation of patient data. These processes represent the central information-based activity of nurses. Consequently, an ICU and the associated administrative activities can be regarded as an organization with SBP through an inherently particularly critical work area. Inevitably, intensive care also includes IT-supported nursing documentation. The nursing documentation examined is the sum of all nursing-relevant data recorded for a patient, consisting of the nursing process, nursing planning, and service recording. It is regulated in Germany and serves as a memory aid, for communication, and as evidence of nursing interventions performed or not performed. All nursing and therapeutic measures and their effects on the patient are recorded and written down. This process can therefore be defined as an SBP.

The specialized training in anesthesia and intensive care, which is conducted by the training center, includes theoretical instruction and nursing internships in various ICUs as well as the preparation of a technical paper and allows to take a closer look at a special, nursing-relevant topic. In the context of this training, part of the author team conducted a data collection with 5 participating nurses to record and investigate the usability of the development and use of RPA solutions for nursing documentation processes in different ICUs in Germany. The nursing documentation we studied, especially the IT-based part which had to be automated by RPA, is composed of different building blocks and is presented in Figure 2 below. The nursing staff enters the personal data of the person in need of care into a documentation system. In addition to name, address, and health insurance affiliation, the contact data of relatives is also recorded or taken from other software solutions, such as information on the patient's medical history. Based on the documentation of the family doctor or therapist on previous illnesses, the current diagnosis and the intake of medication are transferred from other electronic documents into the nursing documentation system. Besides detailed nursing reports as an

electronic document that must be transferred, the known risk factors or isolated information on planned nursing activities, a detailed daily and weekly structure, and any rehabilitation measures that necessarily must be noted. At regular intervals, the data are transferred to the nursing report systems by the responsible nursing staff and compiled. These were structured differently in our data collection, either in the form of a nursing diary system or only as a continuous text or *Excel* document.

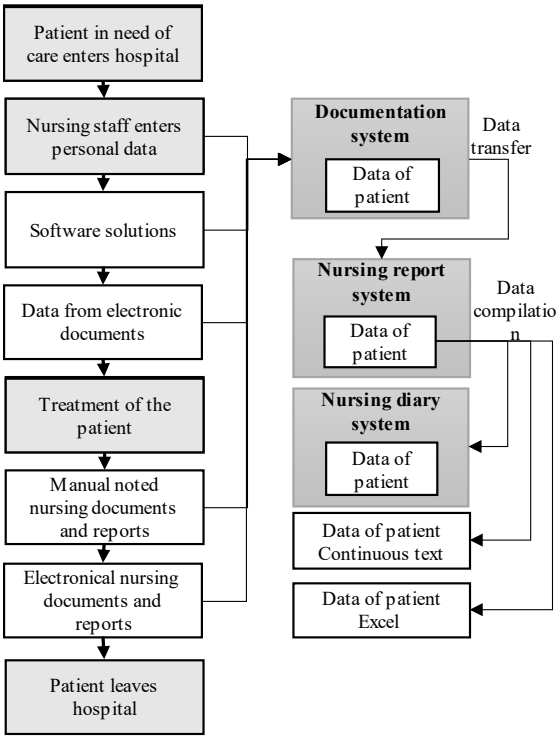

Figure 2. Nursing documentation process

Accordingly, these documentation processes were selected as the focus for our research on independent development and usage of RPA-solutions to gain further insights into critical success factors of RPA in the case of SBP. To ensure valid results and to create the organizational conditions for our theory building, 17 processes were implemented by RPA as an executable automation solution in five different hospitals to create a basis for comparison.

3.2 Data Collection and Analysis

To obtain a more comprehensive picture of the phenomenon of interest, the relevant literature recommends the use of multiple sources to study the unit of analysis [39,40].

From August 2020 to May 2021, we collected data on processes that were highly sensitive and thus showed particular effects in the use of IT technology (in this case, RPA). We used a collection of different documents (RPA-development documents and RPA-test protocols), as shown in Figure 1, which we evaluated using qualitative content analysis according to Mayring et al. (2004) in an inductive process [41]. From these, we extracted initial rudimentary conceptual constructs that we used as a guide in the employee interviews.

The RPA test protocols, which are generated by default by the development platform when RPA is executed, were analyzed, and evaluated concerning the extension implementations used, runtimes and error types, exception handling, jumps, or other execution stops. In this way, technical barriers become clearer and provide initial insights into the respective emergence of RPA solutions.

The development documents consist of the status reports and the development histories. The status reports provide insight at the recurring development cycle level to provide more context about the content and potential usage barriers of each RPA solution.

Complementarily, the RPA solution development histories serve to better understand the changes to the RPA solutions and provide a slightly more detailed overview of revisions, additions, and restructurings. The history thus created also serves to better understand initial impacts and the effect of certain measures on user intent.

Table 2. Overview data collection

Designation	Data Sources
Nurse 1 – ICU 1	Interviews (3 x 25 min); Development documents (n = 3); Test Protocol (n = 6)
Nurse 2 – ICU 2	Interviews (1 x 65 min); Development documents (n = 10); Test Protocol (n = 22)
Nurse 3 – ICU 3	Interviews (2 x 60 min); Development documents (n = 1)
Nurse 4 – ICU 4	Interviews (5 x 30 min); Development documents (n = 12); Test Protocol (n = 25)
Nurse 5 – ICU 5	Interviews (3 x 65 min); Development documents (n = 1)

We conducted 14 unstructured, in-depth interviews with the participating intensive care nurses (n = 5), as mentioned above. The interviews were conducted with a total length of 10.1 hours.

Further, we analyzed the RPA-development documents, in total 27, as well as test protocols, in total 53, of the developed RPA-solutions. The numbers of the analyzed documents, as well as the detailed breakdown of interview times, are summarized by

nurses and ICU in the overview of data collection in Table 2.

The goal of the interviews was to gain insights into the nurses' view of the usability and ease of use of the development and the developed RPA-solution for the different sensitive documentation processes. Since the nurses must work with the data entered by the RPA-solution and are responsible for the correct determination of the nursing data, it seemed crucial to let them assess the usability of the different RPA-solutions and thus the RPA-generated data sets.

The interviews were transcribed verbatim. The transcripts were then analyzed using grounded theory coding techniques. Two of the authors as part of the team of authors first coded the transcripts. During initial coding, each line of the transcribed interviews was coded with the openness to aggregate theoretical categories. Throughout the whole coding procedure, the codes were systematically compared within and between the interviews and sorted into categories. They then compared and discussed their coding and developed a set of theoretical categories to group and conceptualize the codes (cf. Figure 1).

Intermediate coding was done more focused and applied to saturate the categories and led to core second-order concepts. To ensure methodological rigor, the two of the authors adopted a reflective and comparative view during analysis; additionally, discussions about category development evolution were done [42]. Figure 3 shows the result of the codes, the associated concepts, and the supported categories.

4. Results

The following section represents our data analysis and the identified results. Furthermore, we represent a comparison of our findings with the existing literature.

4.1. Data Analysis and Results

During the study period, 17 RPA solutions were used independently by the nurses surveyed. During the project, it was found that the RPA application performed the IT-based nursing documentation process in a more time-efficient manner: Time savings (measured as effort per nurse) compared to the traditional process of data entry by a nurse was up to 40%.

Concerning our RQ1, we can show that nurses who successfully used stand-alone RPA solutions for nursing documentation always did so with elicitable constraints and barriers in their intention to use.

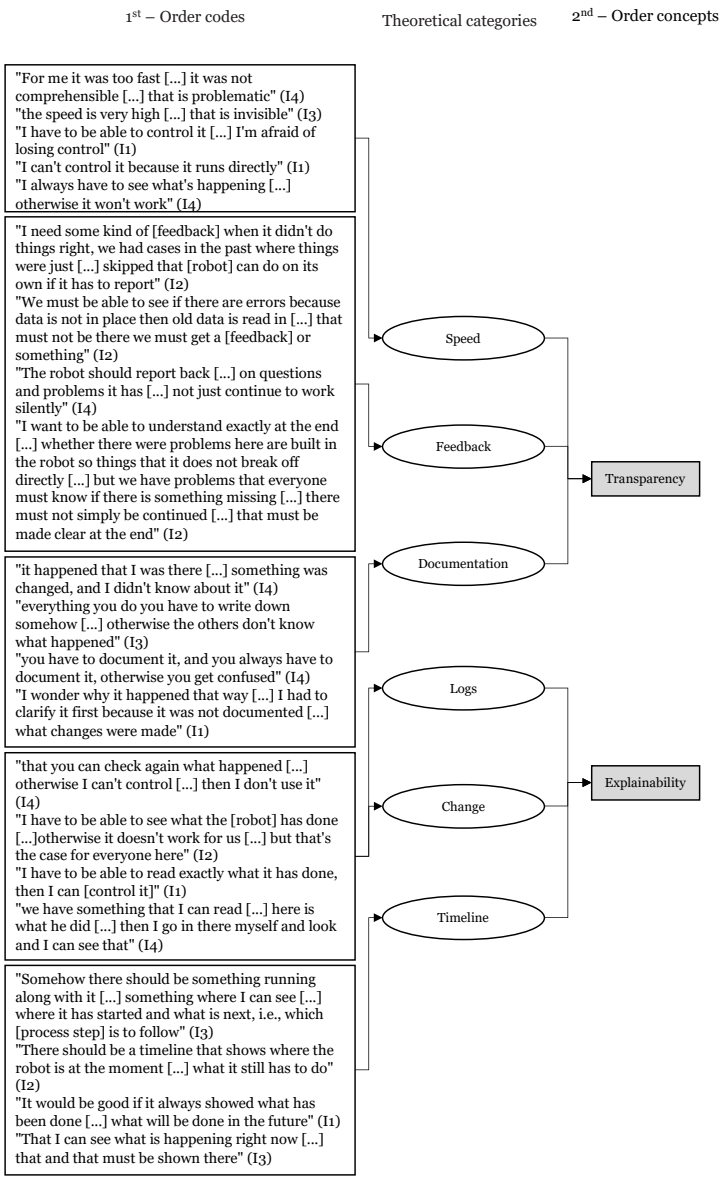

Figure 3. Data structure and coding results of grounded theory

Our results first show that the participating nurses consistently selected the same process types for automation. The selected processes do differ between the intensive care units studied in terms of systemic implementation, such as the order in which data is input or output. However, the general nursing documentation process itself as well as the inputs and outputs required for it do not differ or hardly differ between the intensive care units studied. These were the processes of extracting and compiling raw data, possible textual data transformations such as the exchange of patient data, and the transfer to a target system such as another documentation (diary) system.

Archiving processes such as document creation and storage were also selected by all nurses.

As shown in Figure 3, our data analysis revealed that the derived theoretical concepts could be formed and aggregated into the six categories of *speed*, *feedback*, *documentation*, *logs*, *change*, and *timeline*. The superordinate constructs of "*transparency*" and "*explainability*" were then formed as second-order concepts (cf. Figure 3). These were increasingly addressed when using the RPA solution, such as "the robot is going too fast, but I always have to look at what it is doing [...] it is going too fast for me, it should slow it down" (nurse 2). It became clear that they "don't want to use it if [they] don't understand it" (nurse 1) and "you don't understand it because it goes so fast" (nurse 4).

Therefore, the RPA solution was artificially slowed down by the RPA specialist, which then resulted in the RPA solution "running more understandable for all of us" (nurse 1). It was also mentioned that collaborative RPA solutions often had the problem that they "were not properly documented during a project" (nurse 2) and that this often led to "confusion and uncertainty about further use when this (next RPA solution) suddenly looks different again" (nurse 3). As shown accurately in Figure 3, the use of RPA solutions was characterized by the observing nurses wanting to "track exactly" (nurse 2) how the RPA solution "works, what [the bot] does next and what it has done so far" (nurse 3) or that "it becomes transparent and it goes so slowly" (nurse 5) that "the [user] can track that [process execution]" (nurse 3).

None of the participants associated the scripting language provided by the RPA development environment with sufficient transparency, which was described as "too complicated" (nurse 1) and "rather confusing" (nurse 2). Here, it was observed that a sufficiently "comprehensible documentation of the [mode of operation] of the bot is necessary" (nurse 3).

On the other hand, the permanent feedback of the RPA environment was also noted, which should not only abort in case of possible errors but also inform the user about missing values or incorrect entries "in an urban way" and "without gaps" (nurse 1). According to the participants' observations, the traceability factor should be represented by logging the activities of the RPA solution, e.g., like log files, "parallel to the process execution" (nurse 1) in a "comprehensible and understandable form" (nurse 2), e.g., as a "timeline" (nurse 3).

4.2. Comparisons of the factors with those from the literature

Although the research field on RPA is still in its infancy, there are, by nature, some real-world studies on success factors or barriers that observe, analyze, and assess the implementation, deployment, and operation of RPA in different application contexts.

While a variety of industries have been studied here, SBPs such as the documentation processes in the ICU studied here, have not yet been considered as a unit of inquiry in this regard. The relevant literature consistently identifies the following factors as the most essential and prioritize the following drivers for the implementation of RPA: Top management support [13,14,14,43,44], adequate involvement of all stakeholders [14,22,23,43], especially IT, and the establishment of a proof-of-concept [14,22,23,43,45].

As so, e.g., the factor of "top management support" is often mentioned as the cooperation and continuously guaranteed support of the management which enables the implementation of RPA [13,14,14,43,44]. But this is not specific to RPA projects and applies in various consensus and projects [46,47]. Whereby the use of "proof-of-concepts" [14,22,23,43,45] includes the use of RPA before implementing RPA to assess insights about the values RPA could gain in the organization [43] and create learning experiences on the users' site [48].

Our results, presented here, show that we can assume with the existing literature of success factors for the implementation of RPA into business processes. These aforementioned success factors of RPA, in the form of "management support" (nurse 4), the use of proofs-of-concept and "pilots" (nurse 4), and the "use of [vendor] support" (nurse 1), are also found in our study but play a very minor role. The nurses did not mention these factors as inevitable.

However, it is noteworthy, that in contrast, the concepts we identified in this study of "transparency" and "explainability" have not yet been sufficiently mentioned or addressed in the literature as an important success factor at all. Previous factors also tend to focus on generalizable factors without a focus on the usability of the RPA-solution itself as well as the particular involvement of employees.

In the absence of comparative case study research in a similar scenario, this suggests that the "transparency", as well as the "explainability", are concepts and drivers in the case of SBP context. Especially the high amount of needed control in SBP explains these concepts as success factors for RPA in a critical care environment. As the main purpose of critical care areas is the saving and support of human life ensuring good documentation as well as data

accuracy and data care is one of the most important parts of the treatment process of a patient. Therefore, every participant who is involved in this process wants to control this work, if it gets done by RPA, to guarantee trustful work.

5. Discussion

The focus of this work was on employee centric development of RPA solutions. From a practical perspective, our presented results offer implications for providers of RPA development environments. Regarding target group suitability, our work provides valuable insights that can be summarized under the term "Explainable RPA". Here, not only is the self-explanatory visual development of RPA solutions important, i.e., that users do not write program code but use standardized visual modules, but also that the execution of these solutions is even more explainable and comprehensible to provide employees with complete transparency about the process they are responsible for, especially in sensitive processes.

The results of this study show that, in contrast to the hindering factors previously identified in the literature, the queried categories are primarily rooted in the designated "transparency" and "explainability" in the use of RPA technologies. We were able to show that it is possible to technically counteract the perception of loss of control by the employee when using RPA technologies. Our results contribute to the critical factors of RPA development and use in sensitive processes and environments where high requirements are given.

In the RPA projects examined, problems frequently arose due to the lack of transparency of changes to the RPA solution, which is of enormous importance, especially in sensitive processes. RPA solutions invite users to quickly make changes to the respective RPA solution themselves. However, when end users make changes themselves, they often do not know how these changes affect other users of the solution and in the process. Especially in sensitive processes, compliance and standardization are extremely important, as even small changes can have a major impact. The involvement of human lives in this context also increases sensitivity and criticality. Changes must be precisely planned, communicated, or transparently visible to all those involved in the process. For this very reason, standard processes must be created for the implementation of changes to RPA solutions to document them in detail and create transparency between the various users of the RPA solution.

Among the limitations of this study, of course, is that the results may not be generalizable because only a small number of participants (n = 5) were studied for each of the five organizations. Also, we used only a single representative RPA development environment to derive our criteria; further pluralistic research will be conducted here in the future to obtain more valid conclusions. The use of perceptions through participant interviews always carries with it the limitation of strong subjectivity by them.

6. Conclusion

Following our aforementioned research questions, we were interested in understanding where the drivers and barriers to the development and deployment of the RPA solution in the SBP environment lie.

To this end, we conducted the grounded theory presented in this article to develop a theory based on empirical data. To collect this empirical data, we examined development documents and interviewed nurses who handle particularly sensitive business processes by independently developing and deploying the RPA solution. To do this, we conducted several interviews in addition to document analysis to determine what criteria influence nurses' intentions for using an RPA solution.

In doing so, we derived theoretical concepts that we summarized into six categories: speed, feedback, documentation, protocols, change, and timeline. We found that the aggregation of these six categories of RPA usage intent under study is related in two distinct, overarching ways. First, usage intent is strongly influenced by the "explainability" of the RPA solutions used. One possible explanation is that nurses change from a passive role to an active role in the processes through RPA use. As part of the RPA development and use for their work, they are directly responsible for how, and thus how correctly, data is transferred and entered by the RPA solutions. As caregivers now develop and implement RPA solutions themselves to improve their system environment, they demand full traceability and controllability of RPA solutions to increase usage intent. This, especially in SBPs, is of great importance.

The second overarching aggregate factor was that all participants indicated that the barriers they encountered were related to the opaque program flow of the RPA solution, here the usage barrier could be summarized as a lack of "transparency". This can also be explained, as the particular automated steps by RPA need to be transparent to the nurses in case of controlling the processes.

7. References

[1] Burton-Jones A, Akhlaghpour S, Ayre S, Barde P, Staib A, Sullivan C. Changing the conversation on evaluating digital transformation in healthcare: Insights from an institutional analysis. Information and Organization 2020;30(1):100255.

[2] Hege I, Tolks D, Kuhn S, Shiozawa T. Digital skills in healthcare. GMS journal for medical education 2020;37(6).

[3] Konttila J, Siira H, Kyngäs H, Lahtinen M, Elo S, Kääriäinen M et al. Healthcare professionals' competence in digitalisation: A systematic review. Journal of clinical nursing 2019;28(5-6):745–61.

[4] Klinker K, Wiesche M, Krcmar H. Digital transformation in health care: Augmented reality for hands-free service innovation. Information Systems Frontiers 2020;22(6):1419–31.

[5] Cajander Å, Larusdottir M, Hedström G. The effects of automation of a patient-centric service in primary care on the work engagement and exhaustion of nurses. Quality and User Experience 2020;5(1):1–13.

[6] Baumann LA, Baker J, Elshaug AG. The impact of electronic health record systems on clinical documentation times: A systematic review. Health policy (Amsterdam, Netherlands) 2018;122(8):827–36.

[7] Hassen MB, Turki M, Faïez G. Choosing a Sensitive Business Process Modeling Formalism for Knowledge Identification. Procedia Computer Science 2016;100:1002–15.

[8] Blum K, Müller U. Dokumentationsaufwand im Ärztlichen Dienst der Krankenhäuser: Bestandsaufnahme und Verbesserungsvorschläge ; Untersuchung im Auftrag der Deutschen Krankenhausgesellschaft. Düssldorf: DKI; 2003.

[9] Levinson W, Roter DL, Mullooly JP, Dull VT, Frankel RM. Physician-patient communication. The relationship with malpractice claims among primary care physicians and surgeons. JAMA 1997;277(7):553–9.

[10] Ong L, Haes J de, Hoos AM, Lammes FB. Doctor-patient communication: A review of the literature. Social Science & Medicine 1995;40(7):903–18.

[11] Deutscher Ärzteverlag GmbH. Klinikärzte verbringen 44 Prozent ihrer Zeit mit Dokumentation. [April 06, 2021]; Available from: https://www.aerzteblatt.de/nachrichten/62266/Klinikaerzte-verbringen-44-Prozent-ihrer-Zeit-mit-Dokumentation.

[12] Becker G, Kempf DE, Xander CJ, Momm F, Olschewski M, Blum HE. Four minutes for a patient, twenty seconds for a relative - an observational study at a university hospital. BMC Health Serv Res 2010;10(1):94.

[13] Cooper LA, Holderness DK, Sorensen TL, Wood DA. Robotic Process Automation in Public Accounting. Accounting Horizons 2019;33(4):15–35.

[14] Syed R, Suriadi S, Adams M, Bandara W, Leemans SJJ, Ouyang C et al. Robotic Process Automation: Contemporary themes and challenges. Computers in Industry 2020;115:103162.

[15] van der Aalst WMP, Bichler M, Heinzl A. Robotic Process Automation. Bus Inf Syst Eng 2018;60(4):269–72.

[16] Plattfaut R. Robotic Process Automation - Process Optimization on Steroids? ICIS 2019 Proceedings 2019.

[17] Boulton C. What is RPA? A revolution in business process automation. [April 06, 2021]; Available from: https://www.cio.com/article/3236451/what-is-rpa-robotic-process-automation-explained.html.

[18] Ivančić L, Vugec DS, Vukšić VB. Robotic Process Automation: Systematic Literature Review. Business Process Management: Blockchain and Central and Eastern Europe Forum 2019.

[19] Hofmann P, Samp C, Urbach N. Robotic process automation. Electronic Markets 2020;30(1):99–106.

[20] Madakam S, Holmukhe RM, Kumar Jaiswal D. The Future Digital Work Force: Robotic Process Automation (RPA). JISTEM 2019;16:1–17.

[21] D'Onofrio S, Meinhardt S. Robotik in der Wirtschaftsinformatik. HMD 2020;57(6):1088–96.

[22] Aguirre S, Rodriguez A. Automation of a Business Process Using Robotic Process Automation (RPA): A Case Study. In: Springer, Cham; 2017, p. 65–71.

[23] Asatiani A, Penttinen E. Turning robotic process automation into commercial success – Case OpusCapita. Journal of Information Technology Teaching Cases 2016;6(2):67–74.

[24] Junxiong Gao, Sebastiaan J. van Zelst, Xixi Lu, Wil M. P. van der Aalst. Automated Robotic Process Automation: A Self-Learning

Approach. In: Springer, Cham; 2019, p. 95–112.
[25] Kregel I, Koch J, Plattfaut R. Beyond the Hype: Robotic Process Automation's Public Perception Over Time. Journal of Organizational Computing and Electronic Commerce 2021:1–21.
[26] Plattfaut R, Koch J. Preserving the legacy–Why do professional soccer clubs (not) adopt innovative process technologies? A grounded theory study. Journal of Business Research 2021;136:237–50.
[27] Cohen M, Rozario A. Exploring the Use of Robotic Process Automation (RPA) in Substantive Audit Procedures. The CPA Journal 2019;89(7):49–53.
[28] Koch C, Fedtke S. Robotic Process Automation: Ein Leitfaden für Führungskräfte zur erfolgreichen Einführung und Betrieb von Software-Robots im Unternehmen. Berlin, Heidelberg: Springer Berlin Heidelberg; 2020.
[29] Juristo N, Moreno A, Sanchez-Segura M-I. Guidelines for eliciting usability functionalities. IEEE transactions on software engineering 2007;33(11):744–58.
[30] Caniato F, Des Doran, Sousa R, Boer H. Designing and developing OM research–from concept to publication. International Journal of Operations & Production Management 2018;38(9):1836–56.
[31] Plattfaut R, Koch JF, Trampler M, Coners A. PEPA: Entwicklung eines Scoring-Modells zur Priorisierung von Prozessen für eine Automatisierung. HMD 2020;57(6):1111–29.
[32] Garmann-Johnsen NF, Helmersen M, Eikebrokk TR. Employee-driven digitalization in healthcare: codesigning services that deliver. Health Policy and Technology 2020.
[33] Vollenberg C, Koch J, Trampler M, Bade F-M, Coners A, Plattfaut R. Die Entwicklungsbeschleunigung von Robotic Process Automation Lösungen–Fallstudie einer deutschen Gesundheitsbehörde. HMD 2021:1–20.
[34] Hassen MB, Turki M, Gargouri F. Sensitive Business Processes: Characteristics, Representation, and Evaluation of Modeling Approaches. International Journal of Strategic Information Technology and Applications 2018;9(1):41–77.
[35] Glaser BG, Strauss AL. Discovery of grounded theory: Strategies for qualitative research: Routledge; 2017.
[36] Wiesche M, Jurisch MC, Yetton PW, Krcmar H. Grounded theory methodology in information systems research. MIS quarterly 2017;41(3):685–701.
[37] Conlon C, Timonen V, Elliott-O'Dare C, O'Keeffe S, Foley G. Confused about theoretical sampling? Engaging theoretical sampling in diverse grounded theory studies. Qualitative Health Research 2020;30(6):947–59.
[38] Chun Tie Y, Birks M, Francis K. Grounded theory research: A design framework for novice researchers. SAGE open medicine 2019;7:2050312118822927.
[39] Buse RPL, Sadowski C, Weimer W. Benefits and barriers of user evaluation in software engineering research. ACM SIGPLAN Notices 2011;46(10):643–56.
[40] Kitchenham BA, Pfleeger SL, Pickard LM, Jones PW, Hoaglin DC, El Emam K et al. Preliminary guidelines for empirical research in software engineering. IEEE transactions on software engineering 2002;28(8):721–34.
[41] Mayring P. Qualitative content analysis. In: Flick U, Kardorff E von, Steinke I, editors. A companion to qualitative research. London: Sage publications Ltd; 2004.
[42] Charmaz K. Grounded Theory in Global Perspective. Qualitative Inquiry 2014;20(9):1074–84.
[43] Lacity M, Willcocks L, Craig A. Robotic Process Automation at Telefónica O2. The Outsourcing Unit Working Research Paper Series 2015;15(02).
[44] Lacity MC, Willcocks LP. A new approach to automating services. MIT Sloan Management Review 2017;Fall.
[45] Ratia M, Myllärniemi J, Helander N. Robotic Process Automation - Creating Value by Digitalizing Work in the Private Healthcare? In: Proceedings of the 22nd International Academic Mindtrek Conference: ACM; 2018, p. 222–227.
[46] Khan AA, Keung J. Systematic review of success factors and barriers for software process improvement in global software development. IET softw. 2016;10(5):125–35.
[47] Müller R, Jugdev K. Critical success factors in projects. Int J Managing Projects in Bus 2012;5(4):757–75.
[48] Hallikainen P, Bekkhus R, Pan SL. How OpusCapita Used Internal RPA Capabilities to Offer Services to Clients. MIS quarterly executive 2018;17:41–52.