UHASSELT

KNOWLEDGE IN ACTION

Faculty of Business Economics

Master of Management

Master's thesis

The business value of Robotic Process Automation: a structured literature review

Clement Kennedy Kapulukira

Thesis presented in fulfillment of the requirements for the degree of Master of Management, specialization Business Process Management

SUPERVISOR :

Prof. dr. Benoit DEPAIRE

UHASSELT

KNOWLEDGE IN ACTION

www.uhasselt.be
Universiteit Hasselt
Campus Hasselt:
Martelarenlaan 42 | 3500 Hasselt
Campus Diepenbeek:
Agoralaan Gebouw D | 3590 Diepenbeek

2018

2019

UHASSELT

KNOWLEDGE IN ACTION

Faculty of Business Economics

Master of Management

Master's thesis

The business value of Robotic Process Automation: a structured literature review

Clement Kennedy Kapulukira

Thesis presented in fulfillment of the requirements for the degree of Master of Management, specialization Business Process Management

SUPERVISOR :

Prof. dr. Benoit DEPAIRE

ABSTRACT

Coupled with increasing competition and technological advancement, organizations are exploiting robotic process automation (RPA) to reduce costs, improve performance and services. This research aims to investigate RPA business value outcomes and establish elements that ensures delivery of benefits. The study employs a qualitative research method and an interpretative review analysis approach to explore, interpret and synthesize RPA theories and concepts distilled from 85 scientific literature. The research identifies four categories of RPA outcomes including: improved productivity and efficiency; cost reduction and increased profitability; enhanced performance and scalability; and improved quality and customer satisfaction. For RPA to succeed, the study suggests eight factors to be considered: strategic alignment; IT capabilities and resources; suitable business processes; IT and employee involvement; business case, stable environment; training, skills and expertise; and testing and maintenance**.** Also proposed are eight practical tips for successful reaping RPA benefits. The findings represents theoretical views deduced from the analysis of scientific literature. As not all factors might have been reviewed and established, future research may be needed to test theoretical frameworks.

KEYWORDS: business value, robotic process automation, RPA, information technology, IT

1. INTRODUCTION

Robotic process automation (RPA) is fast becoming one of the key technologies to present organizations with new business solutions aimed at reducing expenses, improving performance, and customer satisfaction (Aguirre & Rodriguez, 2017; Fung, 2014; Rawal, 2013; Slaby, 2012; Willcocks, Lacity, & Craig, 2015). Several researchers have referred to RPA as a method, system and tool (Fernandez & Aman, 2018); a software 'robot', which include data science, artificial intelligence (AI) and machine learning (ML) technologies (Madakam, M. Holmukhe, & Kumar Jaiswal, 2019; van der Aalst, Bichler, & Heinzl, 2018), and uses codes and algorithms to imitate the way humans perform tasks and interact with systems (Gejke, 2018; Marciniak, 2017; Schmitz, Dietze, & Czarnecki, 2019). AI allows RPA to use intelligence when making decisions (vom Brocke et al., 2018), while ML uses data to 'learn from past events and make predictions' (Gejke, 2018, pp. 150-151). By imitating humans, RPA performs manual tasks faster and accurately, and simultaneously check and "flag" errors, hence enhancing efficiency, productivity and quality (Altinkemer, Ozcelik, & Ozdemir, 2011; Asatiani & Penttinen, 2016).

Continued stiff competition and imitation of organizations' products by some competitors (Jurison, 1996), compels firms to opt for remedial lowering of prices hence reducing revenue and profit (Zhu, Kraemer, Xu, & Dedrick, 2004). Thus, firms are turning to RPA to reduce operational cost, enhance efficiency, improve performance and productivity (Aguirre & Rodriguez, 2017; Stople, Steinsund, Iden, & Bygstad, 2017). However, RPA's ubiquitous nature makes it a prevalent cognitive information technology (IT), with no exclusive owner (Thomas H. Davenport & Julia Kirby, 2016; Schatsky, Muraskin, & Iyengar, 2016). Notwithstanding software's prevalence, RPA can still be strategically deployed to competitively differentiate organization's products and services from competitors by leveraging internal resources and capabilities to innovate new or improved business solutions (Fung, 2014). Yet, there has been inadequate theoretical models for conceptualizing IT values (Devece, Palacios, & Martinez-Simarro, 2017), as current research mostly focus on RPA's practical aspects (Kedziora & Kiviranta, 2018), hence creating a gap for more studies.

Firms can leverage RPA solutions that are easy to install (Asatiani & Penttinen, 2016), and requires no modifications to existing information system (IS), since the software is non-invasive (Osmundsen, Iden, & Bygstad, 2019; Stople et al., 2017). Accordingly, RPA can be deployed quickly thereby minimizing cost and disruptions of operations (Kaushik, 2018). Moreover, RPA can be used by employees with business process acumen, who can be trained to implement automation within weeks (Willcocks et al., 2015). To this end, an understanding of RPA value outcomes and its delivery process can help managers when determining whether to adopt RPA. In order to gain better insights on RPA value outcomes, this study seeks to address two research questions:

1. What kind of business value can be created with RPA systems in an organization?
2. What factors can ensure that RPA projects succeed and deliver the promised value?

By employing a qualitative research design, this investigation contributes to the growing research area of RPA through exploration and interpretation of value outcomes and elements needed to deliver RPA benefits. To examine RPA values, a complementary approach has been adopted because RPA can improve processes and return on investment (ROI) when combined with other resources unlike when used individually (Altinkemer et al., 2011; Lee, 2001; Marciniak, 2017; Zhu, 2004). Moreover, integrating RPA with other systems and resources increases tool's capabilities in the value delivery process (Devece et al., 2017; Luo, Fan, & Zhang, 2012; Osmundsen et al., 2019; van der Aalst et al., 2018; Wang, Liang, Zhong, Xue, & Xiao, 2012).

This article is structured as follows. Next section describes RPA theoretical background. Third section reviews literature. Fourth section discusses RPA value outcomes. Fifth section examines elements for successful delivery of RPA outcomes. Sixth section dissects RPA delivery process. Last section sums up main theories, concepts and contributions of the study.

2. THEORETICAL BACKGROUND

For over 30 years researchers have studied business values of IT (Mikalef & Pateli, 2016). Research shows that firms are adopting RPA to digitalize and transform processes (Schmitz et al., 2019), by automating structured and complex tasks (Frey & Osborne, 2017; vom Brocke et al., 2018). This entails automating routine, mundane, rule-based manual tasks by integrating RPA software into the company's IS to imitate human way of performing work and interacting with systems (Aguirre & Rodriguez, 2017; Gejke, 2018; Lacity & Willcocks, 2016b). Essentially, RPA uses the same approach as people do when accessing systems, that is, the software enters logging credentials to access computer systems (Osmundsen et al., 2019; Steinhoff, Lewis, & Everson, 2018; Willcocks et al., 2015); thus mimicking human behaviours when processing transactions, analyzing data and communicating with systems (Hallikainen, Bekkhus, & Pan, 2018; Kedziora & Kiviranta, 2018; Kirchmer, 2017).

Technological advancements and improvements in processes and sensors allows RPA to process huge amount of complex, unstructured, and non-routine tasks that were difficult to automate (Davern & Kauffman, 2000; Frey & Osborne, 2017; Vedder & Guynes, 2016). This provides RPA with extra processing power and enhanced sensors (Vedder & Guynes, 2016), hence evolving the software to transform complex digital processes. As an IT 'enabler' for process automation, RPA can induce digital and business transformation (Schmitz et al., 2019), and can be configured to augment other systems such as business process management (BPM), customer relationship management and business intelligence (van der Aalst et al., 2018).

Furthermore, RPA can be linked to process mining technique to analyze data extracted from actual business process transaction log, and to identify activities for automation (Geyer-Klingeberg, Nakladal, Baldauf, & Veit, 2018). One example is the joint development and deployment of an RPA-process mining integrated software by UiPath, an RPA vendor and Celonis, a process mining vendor (van der Aalst et al., 2018). However, successful RPA deployment depends on quality of data and information that supports the software (Devece et al., 2017). For example, the functionality of business rules set on RPA may be influenced by accuracy and reliability of data used (Grung-Olsen, 2017). Accurate rules enables RPA to follow correct instructions that increases efficiency, data processing speed and shorten process cycle times (Luo et al., 2012; Marciniak, 2017).

RPA is different from BPM tools in several ways. First, RPA software does not require coding expertise as the codes are generated and stored in the computer when icons are being dragged and dropped during tool development (Fernandez & Aman, 2018). In contrast, coding expertise is needed in BPM tools (Willcocks et al., 2015). Second, as a "light weight, non-invasive" technology, RPA software does not interfere with programing logic data since the software sits on top of existing IS and uses the presentation layer to access other systems (Moffitt, Rozario, & Vasarhelyi, 2018; Osmundsen et al., 2019; Stople et al., 2017), hence requiring no deep knowledge of programming (Rutschi & Dibbern, 2019). Conversely, BPM tools interact with 'business logic and data access layers' (Willcocks et al., 2015). A summary, adapted from Slaby (2012), delineating the distinctions between RPA and other BPM traditional approaches has been provided in Appendix A.

3. LITARATURE REVIEW METHODOLOGY

3.1. Review approach

To investigate RPA business values and factors that ensure delivery of outcomes, this qualitative research applies a structured literature review (SLR) methodology and an interpretative analysis approach that follows the process developed by Xiao, Califf, Sarker, and Sarker (2013) in Table 2. This allows performance of an inductive process when interpreting and developing theoretical concepts, and in constructing abstractions (Bryman & Bell (2011) cited in Graue (2015)); and formation of theory grounded in research (Dixon-Woods et al., 2006). The SLR has been used, firstly, to identify and analyze articles that help to answer research questions by allowing findings from data analysis to be applied in supporting findings (Glass, Vessey, & Ramesh, 2002; Zakaria, Atan, Ghani, & Sani, 2009). Secondly, to carry out the 'within-study literature analysis' of components of specific and relevant articles, and the 'between-study literature analysis' of comparing and contrasting information extracted from several literature (Luo et al., 2012; Onwuegbuzie, Leech, & Collins, 2012). Lastly, to extract information and factors from literature for developing theoretical frameworks (Sekaran & Bougie, 2014, p. 96).

TABLE 1 Literature review process adapted from Xiao et al. (2013)

	Step	Description
1	Selection of journals	It was not possible to select specific journals from which articles were to be searched because of the interdisciplinary nature of RPA and IT disciplines. Thus, a Google Scholar internet search engine was chosen as it provided a wide platform for searching articles on a broad range of electronic databases (Meidan, García-García, Escalona, & Ramos, 2017).
2	Identification of journal articles	An iterative online search of articles using keywords of "business value of Robotic Process Automation," "Robotic Process Automation," and "business value of information technology," generated 5658 articles. Thereafter, the articles were screened, yielding a shortlist of 210 articles. After manually reviewing the shortlist, 85 published literature focusing on RPA and IT value were selected as candidates in the final sample of the bibliography.
3	Review and categorization of journal articles	The articles review and categorization were conducted based on the structure by Ridley (2012, pp. 100-106). This involved performing cautious categorizations of articles based on relevance, similarities, citations and linkage.
4	Analysing review results	An interpretive review analysis technique was used to identify, examine, synthesize and categorize RPA outcomes. Unit of analysis were single articles.
5	Presentation of results and findings	The RPA value outcomes have been presented categorically based on their relevance, relationships and similarities to firms' strategic goals.

After completing the above SLR process, several theoretical concepts emerged. These are discussed in the next sections. First, RPA value outcomes, then elements that ensures delivery of the RPA benefits.

3.2. Conceptual framework

Despite the literature review yielding several theoretical models, no suitable conceptual framework for this study was found. Thus, the author developed a conceptual framework, Figure 1, based on the structure proposed by Sekaran and Bougie (2014, pp. 77-82), to enhance understanding of RPA value outcomes and to analyze eight elements that can be pertinent in RPA delivery process.

Of the eight factors, strategic alignment mediates the other seven variables by integrating them with RPA system (Grung-Olsen, 2017; Horlach, Drews, & Schirmer, 2016). The next six elements: IT capabilities and resources; suitable business processes; IT and employee involvement; business case; stable environment; and testing and maintenance, influence the process, hence removing them can cause RPA failure. Training, skills and expertise factors moderates RPA, hence modifying these variables can alter value outcomes. For instance, increasing users capabilities through training can increase workers experience and minimize 'cognitive limitations' (Davern & Kauffman, 2000; Kaushik, 2018).

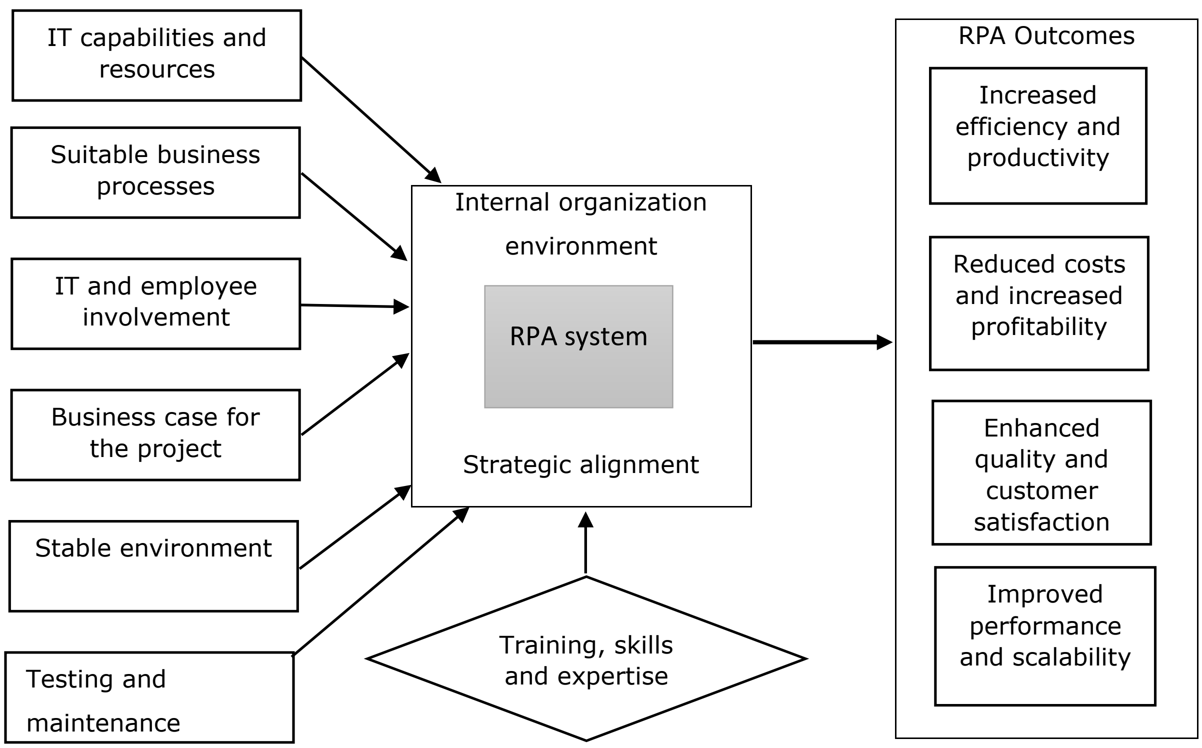

FIGURE 1 Conceptual framework of the RPA value outcomes and factors that influence value delivery. (Source: Author's adaptation from SLR).

4. RPA VALUE OUTCOMES

From the SLR, eight RPA value outcomes emerged: increased productivity; improved efficiency; cost reduction; increased profitability; enhanced quality; increased customer satisfaction; improved performance; and scalability. These outcomes have been categorized into four pairs based on their strategic goal focus (see Table 2), and are dissected in the following sections.

TABLE 2 Categorization of RPA value outcomes

Category	Basis for pairing
1. Increased productivity and improved efficiency	Resource optimization
2. Cost reduction and increased profitability	Increase of ROI
3. Enhanced quality and increased customer satisfaction	Product improvement
4. Improved performance and scalability	Growth and expansion

4.1. Increased productivity and improved efficiency

The first category increases productivity and enhances efficiency by leveraging and optimizing existing resources at three levels of analysis: process, employee, and firm (Davern & Kauffman, 2000). On process, the use of IT in business process reengineering (BPR) and redesigning has been found to improve process performances by increasing service, quality, speed and reducing cost (Altinkemer et al., 2011; Devarajan, 2018). Aptly, process mining can be used to analyze and identify process bottlenecks and in devising resolutions (Geyer-Klingeberg et al., 2018).

For employees, RPA-enhanced work processes reduces workloads and burdens of performing routine tasks, hence saving time (Aguirre & Rodriguez, 2017; Jurison, 1996; Wang et al., 2012). Moreover, RPA provides humans with flexibility to easily respond to exceptional events and learn from solving problems collaboratively (Horlach et al., 2016; Richter, Heinrich, Stocker, & Schwabe, 2018; Varghese, 2017). Thus, firms attain synergy from the combination of RPA-synchronized workflow processes, digital work force and humans (Asatiani & Penttinen, 2016; Britton & Atkinson, 2017; Hirsch, 2017). This enables RPA and people to complement each other's strength and weaknesses (Davenport & Kirby, 2015; Stople et al., 2017). By using AI and ML, RPA performs, at high speed, tasks that are less defining but more complex, leading to firm's increased productivity using same input (Hallikainen et al., 2018; Kukreja & singh Nervaiya, 2016; van der Aalst et al., 2018).

For improved efficiency, the investigation reveals that RPA leads to efficient use of resources stemming from minimized errors; reduced costs of defects; and increased productivity and ROI (Aguirre & Rodriguez, 2017; Fung, 2014; Osmundsen et al., 2019). Ultimately, processes optimization minimizes deviations, irregularities and wastage (Kaushik, 2018; Kukreja & singh Nervaiya, 2016), through RPA's quick and accurate processing of huge volumes of data and tasks (Fernandez & Aman, 2018).

However, RPA reduces the number of full-time employees or full-time equivalents (FTEs) by replacing "4.5 people with 1 digital workforce," hence saving money (Dunlap & Lacity, 2017; Kirchmer, 2017; Lacity & Willcocks, 2016b; Slaby, 2012). Furthermore, RPA's flexibility suggests that the software can be easily modified to respond to changing 'idiosyncratic' business situations that are susceptible to constant technological changes, hence helping firms to avoid losing projects, contracts and contacts. (Anandhi S. Bharadwaj, Bharadwaj, & Konsynski, 1999; Wang et al., 2012). Generally, efficiency is deemed as an anecdote of profitability (Bughin, 2018), scalability and RPA reusability (Y. A. Kumar & Raghavendra, 2018), since attaining higher efficiency levels occurs in tandem with leveraging resources.

TABLE 3 Summary of RPA value outcomes of increased productivity and efficiency

RPA value outcomes
RPA improves processes and execution of tasks and data, thus leading to high efficiency and output. RPA agility allows easy response to peculiar and changing business situations based on demand.
By reducing workloads, RPA enhances human productivity and focus on cognitive demanding tasks.
RPA replaces employees with digital workforce, thus reducing FTEs while increasing efficiency levels.

4.2. Cost reduction and increased profitability

The next set of RPA value outcomes lowers expenses and increases ROI. Firstly, by quick implementation of RPA at lower cost relative to BPM methods (Hallikainen et al., 2018; Kedziora & Kiviranta, 2018). Secondly, through easy integration of RPA which reduces implementation timeframe and simplifies identification of bottlenecks (Gupta, Fernandes, & Jain, 2018; Slaby, 2012). Thirdly, by automating outsourced tasks, hence reducing FTEs cost (Aguirre & Rodriguez, 2017; Asatiani & Penttinen, 2016; Kaushik, 2018; van der Aalst et al., 2018). Moreover, cost can be minimized through process optimization and continuous working of "robots" that performs without breaks hence increasing profit (Asatiani & Penttinen, 2016; Jurison, 1996; Ravichandran, 2018; Slaby, 2012). Notwithstanding software continuous functioning, RPA should often be maintained to be fully operational and reliable.

Regarding profitability, the results shows that additional revenue can be generated from new and improved products and services produced by RPA and shortened process cycles (Anagnoste, 2018; Jurison, 1996; Kedziora & Kiviranta, 2018). For example, RPA's high speed capabilities allowed Telefonica O2, a United Kingdom mobile telephone company, to execute services quickly thereby increasing the amount of service transactions and delivery without additional human workers, thus leading to an "ROI of 650% and 800%" (Lacity & Willcocks, 2016b).

However, since RPA is an ubiquitous technology (Thomas H. Davenport & Julia Kirby, 2016), it follows that, it is not unique, rare, and can be imitated and substituted (Anderson, Banker, & Ravindran, 2006; Hitt & Brynjolfsson, 1996; Nevo & Wade, 2010). Thus, adopting RPA alone is not enough to propel higher profitability. Therefore, firms should exploit their internal IT capabilities like unique business process designs, models expertise, and culture to augment RPA. This is important because the value of RPA lies in the product and service that it produces and on how competitively and uniquely the technology is used (Devece et al., 2017).

TABLE 4 Summary of RPA value outcomes of cost reduction and increased profitability

RPA value outcomes
The continuous working of RPA allows processing of huge amount of tasks, transactions and data at no additional FTE cost, hence reducing operational costs while increasing ROI.
RPA's high speed capability enables companies to execute services quickly thereby leading to optimization of inputs, high output and increased profitability.

4.3. Enhanced quality and increased customer satisfaction

The third category improves company's value propositions and customer satisfaction. Firstly, RPA execute transactions and data with minimum or no errors (Fernandez & Aman, 2018), leading to consistence in quality of products, services, and information (Baranauskas, 2018; Steinhoff et al., 2018). This enhances quality of value proposition and increases customer satisfaction and can trigger strategic scale ups (Anandhi S. Bharadwaj et al., 1999; Kedziora & Kiviranta, 2018). However, accuracy of process output can be contingent on the validity of data and business rules inputs. For instance, 'poor data quality or insufficient definition of business rules can result in ordering wrong items [albeit] fast and in big quantities' (Kirchmer, 2017).

Secondly, humans can enhance quality of output and RPA by exercising cognitive judgement, being creative and exploring more than exploiting (vom Brocke et al., 2018). Thus, people augment and compliment RPA by physically analyzing hardware and software resources that support "robots" in enhancing quality of output (Davenport & Kirby, 2015; Rutschi & Dibbern, 2019; Stople et al., 2017).

For increased customer satisfaction, the findings purports that employees who get replaced by RPA can be relocated to other tasks that require cognitive abilities (Asatiani & Penttinen, 2016), albeit some workers lose their jobs (Anagnoste, 2018; Hirsch, 2017; Vedder & Guynes, 2016). The relocated workers can increase customer satisfaction by focusing on cognitive demanding tasks thereby delivering improved services and support (Anandhi S. Bharadwaj et al., 1999; Jurison, 1996; Tallon, Kraemer, & Gurbaxani, 2000). One example is when IT integrates fulfilment processes for speedy delivery of goods and services to increase customer experiences and retention, by introducing online marketing, sales and ordering facilities thus increasing operational efficiency in retail industry (Kedziora & Kiviranta, 2018; Luo et al., 2012; Schmitz et al., 2019). Another is to automate activities that process transactions and respond to customer queries 24 hours a day and 365 days per year (Slaby, 2012).

TABLE 5 Summary of RPA value outcomes of enhanced quality and increased customer satisfaction

RPA value outcomes
RPA enables processing of tasks, data and services accurately and consistently, hence leading to enhanced quality of products, services, and information.
By replacing employees with digital workforce, RPA facilitates better use of human cognitive skills in more challenging and creative demanding tasks that ultimately increases customer satisfaction.

4.4. Improved performance and scalability

In the last category, improved firm's performance is viewed as an antecedent of scalability, although project expansion can also depend on strategic objectives, business processes and scale of operations. At the firm's level of analysis, RPA improves company's overall performance (Schuler & Gehring, 2018), by enhancing process performances and resource utilization through reductions in deviations, irregularities and wastage (Kaushik, 2018; Willcocks et al., 2015). Furthermore, performance has improved following recent technological advancements that have evolved RPA to perform complex tasks in 'food preparation, health care, commercial cleaning, and elderly care' (Frey & Osborne, 2017).

However, this study found limited research on the measures of performance, although having business cases as benchmarks for comparing RPA impacts is essential. Nevertheless, performance can be assessed against specific objectives such as transactional, strategic and informational goals (Lee, 2001), and based on ROI, return on assets, revenue growth rate and savings made (Dunlap & Lacity, 2017; Jurison, 1996).

Regarding scalability, the findings shows that RPA can be scaled, extended and reused within organizations; whereof, task automation can start with one business unit and extend to other processes (Hallikainen et al., 2018; Slaby, 2012). Additionally, RPA scales up data handling capacities by allowing processing and transferring of data produced by one application to other systems at no additional costs and without modifying existing software (Kirchmer, 2017; Osmundsen et al., 2019).

Aptly, RPA agility enables exploitation of existing IS and expansion of automation. This include increasing number of "robots" during peak demand periods to boost productivity, and scaling back when demand falls (Lacity & Willcocks, 2016b), thus allowing effective management of operations, economies of scale and stakeholder relationships (Ravichandran, 2018). Arguably, scaling up or down of RPA can take months to implement since the activities may include BPR and formulation of business cases to justify changes. As such, a period of 12 to 18 months of no changes in IT and business processes can be realistic if interruptions on operations are to be avoided (Fung, 2014; Slaby, 2012).

TABLE 6 Summary of RPA value outcomes of improved performance and scalability

RPA value outcomes
RPA reduces deviations, irregularities and errors leading to high performances of the firm, processes and employees in terms of resource optimization and reduction of wastage.
RPA can be gradually expanded to single processes or business units thus allowing post-assessment of benefits on a small scale and avoidance of unprofitable enterprise-wide scale up and investments.
RPA allows scaling up and down of operations based on variations of market demand, leading to increased economies of scale, and effective management of stakeholders.

5. ELEMENTS THAT CAN INFLUENCE RPA DELIVERY PROCESS

Factors thought to influence RPA delivery process have been studied in several research (Asatiani & Penttinen, 2016; Fung, 2014; Hallikainen et al., 2018; Slaby, 2012). Arising out of the review analysis are eight elements that can ensure delivery of RPA outcomes. These are examined next.

5.1. Strategic alignment

It can be said that misalignment of strategy and IT may signal poor IT resources and ineffective implementation of systems (Tallon, Queiroz, Coltman, & Sharma, 2016). Therefore, strategic alignment should be used to facilitate a nexus of IT resources with strategic intent and RPA in order to allow smooth interactions of systems (Devece et al., 2017; Kohli & Grover, 2008; Rutschi & Dibbern, 2019; Tallon et al., 2000). Accordingly, RPA can be aligned as an enabling technology to facilitate strategy development, implementation and realization (Schmitz et al., 2019), hence supporting planning on how future work would be performed following process transformations (vom Brocke et al., 2018).

5.2. IT capabilities and resources

The way IT resources and capabilities are aligned can influence organization's operations, innovation, RPA and service delivery (Luo et al., 2012). As such, innovative use of IT resources and capabilities can deliver greater business values and performance that can culminate into competitive advantages (Anandhi S Bharadwaj, 2000; Ravichandran, 2018). Similarly, effective structuring of RPA capabilities, compared with competitors, can enhance processing of huge volumes of data and tasks, reduce turnaround times of customer orders, and create competitive advantages (Kopeć et al., 2018). For RPA to succeed, a nexus of IT infrastructure e.g. 'hardware, software, network and data,' and technical IT resources, expertise and abilities (Wang et al., 2012), should be performed. This involves integrating RPA software into mainstream IS and configuring algorithms (Baranauskas, 2018; Gejke, 2018; Madakam et al., 2019; Marciniak, 2017; van der Aalst et al., 2018).

Although resources can be used as individual units, greater capabilities and improved firm performance can be achieved when resources are combined and used with other complimentary assets (Anandhi S Bharadwaj, 2000; Lee, 2001). Likewise, RPA can be aligned with humans to enhance productivity gains (Miller, 2018), and with AI to process complex tasks quickly (Grung-Olsen, 2017). However, lack of technical knowledge, understanding and experience about RPA, coupled with lack of plans for managing change can cause RPA failure (Kaushik, 2018; Willcocks et al., 2015).

5.3. Suitable business processes

Delivery of greater RPA values is contingent on IT capabilities to improve business processes (Tallon et al., 2000). Essentially, successful RPA deployment hinges on having structured and improved processes in place prior to automation (Kaushik, 2018). Structured processes define sequences and logic of activities and workflows from which RPA derive instructions and rules to perform tasks (Bataller, Jacquot, & Torres, 2017). However, inappropriate designs and poor BPR lead to creation of unsuitable processes and RPA failures, hence reducing value of outcomes (Thomas H. Davenport & Julia Kirby, 2016).

Aptly, firms should redesign processes that enhances performance and efficiency, and allows smooth integration and interaction of RPA with complimentary assets (Altinkemer et al., 2011; Shukla, Wilson, Alter, & Lavieri, 2017). Thus, BPR should align RPA with strategy and processes to create a "fit" and a synergy with complementary resources (Lee, 2001). Notwithstanding BPR, automating wrong processes can cause RPA failure and financial loss (Kaushik, 2018; Osmundsen et al., 2019).

5.4. IT and Employees involvement

As organizations conduct BPR, they should also present RPA's costs and benefits to employees, IT teams and managers earlier to gain support and avoid resistance to changes. One RPA benefit could be the introduction of virtual assistants (Herbert, Dhayalan, & Scott, 2016; Vedder, Guynes, & Parrish, 2019), that frees people from mundane and repetitive workloads, thus allowing them to focus on complex and cognitive demanding tasks (Aguirre & Rodriguez, 2017; Asatiani & Penttinen, 2016; Slaby, 2012).

Yet, RPA tends to usurp and replace certain manual jobs with "digital workforce" (Chelliah, 2017; Dunlap & Lacity, 2017; Vedder & Guynes, 2016). Notwithstanding emergence of digital workforce, humans still monitor RPA systems and interpret algorithms (Thomas H. Davenport & Julia Kirby, 2016). Therefore, users should understand RPA benefits for the company and themselves (Fernandez & Aman, 2018; Jurison, 1996; Willcocks et al., 2015). Moreover, managers' knowledge, support and perception towards RPA projects, and willingness to invest in complimentary assets is crucial for RPA's success (Davern & Kauffman, 2000; Schuler & Gehring, 2018; Tallon et al., 2000).

5.5. Business case for the project

Having business cases can help in presenting RPA's benefits and costs to employees and managers, and in justifying RPA values (Schuler & Gehring, 2018). Essentially, business cases enhance RPA understanding and clears people's fears and cautions (Asatiani & Penttinen, 2016; Willcocks et al., 2015). Moreover, it can be difficult to estimate and evaluate degrees of RPA risks without business cases and operating models (Kaushik, 2018). Thus, business cases helps to gain managers support for RPA projects and strengthen confidence of employees and potential investors. Most importantly, business cases provide costs, quantifies resources for deploying RPA and estimate benefits of process automation (Dunlap & Lacity, 2017).

5.6. Stable environment

A stable environment for business processes that is free from disruptions and frequent changes can effectively support RPA deployment and functioning (Fung, 2014; Slaby, 2012), by creating suitable platforms for monitoring and analyzing RPA performances using data generated from process mining and extracted after running processes (Geyer-Klingeberg et al., 2018). However, RPA's flexibility can be counterintuitive to the stable environment argument since the software's agility allows firms to make changes according to changing idiosyncratic business situations (Wang et al., 2012). Notwithstanding RPA's agility, the stability of the environment is key because it sets up a system environment that supports RPA integration and interactions with other systems (Rutschi & Dibbern, 2019).

5.7. Training, skills and expertise

The stability of the environment can be affected by lack of adequate RPA training for users. Employees' inexperience, incompetence and cognitive limitations can inhibit reaping of RPA's benefits (Davern & Kauffman, 2000). Moreover, high RPA adoption and support depends on managers' knowledge of the software's values, reliability, and on how it fits with organizational structure (Willcocks et al., 2015). Therefore, involving BPM, RPA experts and IT specialists earlier ensures availability of technical support throughout the RPA value delivery process. Also, employing technical experts at the outset of RPA project can smoothen implementation (Thomas H. Davenport & Julia Kirby, 2016). Ultimately, the synergy and collaboration of the experts [and all concerned stakeholders] can result in successful delivery of RPA value outcomes (Hallikainen et al., 2018).

5.8. Testing and maintenance

Technical expertise, skills and competencies are invaluable when testing RPA functionality. Testing reveals exceptional events arising during RPA delivery process, thereof, allowing automation of resolutions of the recurring problems (Dunlap & Lacity, 2017). By capturing exceptional cases, errors and incompatibilities and pinpointing RPA risks (Kaushik, 2018), testing helps to detect and resolve operational bottlenecks before scaling up. Additionally, testing establishes requirements for RPA maintenance when system changes and updates (Stople et al., 2017). Thus, maintenance ensures continuous checking of conformance to detect, prevent and correct RPA irregularities occurring after system alterations (van der Aalst et al., 2018). Most significantly, RPA testing enables 'robots' to detect errors, learn from the mistakes, and improve accuracy of output (Rutschi & Dibbern, 2019).

TABLE 7 Summary of factors that can ensure delivery of RPA value outcomes

Element	Purpose	Expected benefits
1. Strategic alignment	Facilitate pre-automation assessment and planning. Links RPA to firm's goals.	Risk and resource gap identification. Set strategic intent. Aligns tactical objectives to long-term goals.
2. IT capabilities and resources	Moderate the effective and innovative ways of utilizing IT resources to attain competitive advantages.	Enhanced functionality competencies. Speed of completing business process cycles. Agility to idiosyncratic business situations.
3. Business processes	Redesign and reengineer suitable and structured business processes.	Enforces compatibility with RPA systems. Supports integration of RPA with other systems.
4. IT and Employee involvement	Clear up uncertainties and misunderstandings on RPA roles. Gain support from top management and IT team.	Reduced resistance to RPA adoption. Gain full managerial, employee and IT department support. Facilitates effective change management
5. Business case	Provide justifications for adopting RPA. Present "as-is" and "to-be" scenarios of the proposed RPA project business values.	Basis for analysing projected RPA cost and benefits. Enhances understandings by employees, investors and other stakeholders on the nature and values of RPA projects.
6. Stable environment	Ensure consistency and conformance of RPA functionality.	Facilitates smooth integration and interaction of RPA with other systems. Minimize disruptions and downtimes. Controls unnecessary and untimely changes.
7. Training, skills and expertise	Establish competencies and enhance user experiences and productivity.	Synergy and collaboration. Reduced RPA errors due to increased employee efficiencies. Increases efficiency and quality.
8. Testing and maintenance	Establish and validate RPA reliability, performance, and conformity.	Detect errors, mistakes and exceptional cases. Help to save resources before expansion in case of RPA incompatibilities or failures. Increases efficiency and productivity.

6. RPA DELIVERY PROCESS

6.1. RPA delivery process elements

Having analysed factors that can ensure that RPA delivers the intended outcomes, this section dissects the RPA delivery process. To provide a better understanding on this process, the author developed a theoretical framework, Figure 2, based on factors inferred from literature. The framework visualizes the representation of the constructs (Sekaran & Bougie, 2014, p. 78), and enhances insights of RPA delivery process (Castellan, 2010), by analyzing seven elements that depicts its logical process flow.

The first component, "planning," refers to the activities undertaken by the firm to prepare and evaluate RPA implementation challenges prior to deployment (Kaushik, 2018). This stage involves preparation and analysis of RPA project business cases to ascertain potential risks. Moreover, the pre-automation assessment phase evaluates the organization's internal readiness to adopt RPA. In line with business strategies, firms should use planning to define how to align strategic intent with IT resources, capabilities, systems, processes and employees (Devece et al., 2017; Kohli & Grover, 2008; Rutschi & Dibbern, 2019). This can help in setting stable environments for smooth integration and interaction of RPA with other systems (Fung, 2014; Slaby, 2012), and ensures that the software operates reliably to deliver intended outcomes (R. L. Kumar, 2004).

Next element, "development," portrays RPA tools' designing phase and BPR, which can be performed using process mining techniques to analyze data extracted from actual business process transaction logs, and then use the deduced information to establish process flow patterns (Geyer-Klingeberg et al., 2018). Nevertheless, the design of IT software solutions should be done in line with typical user work structure (Richter et al., 2018), to streamline BPR activities and simplify automation (Rutschi & Dibbern, 2019). This means involving IT teams, managers and employees (Davern & Kauffman, 2000), who can provide insights on the functional aspects of manual processes that can subsequently be redesigned and improved to be suitable for RPA integration (Tallon et al., 2000).

However, RPA's flexibility suggests that the software can be modified and adapted to changing work processes (Asatiani & Penttinen, 2016). Hence, evaluation of RPA capabilities can reveal the software's reliability, that is, its ability to operate with low failures; and its agility to adapt to changing internal and external environments; and its 'upgradability,' when technology evolves (R. L. Kumar, 2004). This can assist in designing RPA tools that fit and integrate well and facilitate delivery of values.

Third element, "implementation," refers to the integration of RPA software into the company's IS and transformation of manual processes and tasks to automation (Asatiani & Penttinen, 2016; vom Brocke et al., 2018). This phase entails continuous use of RPA technical experts (Thomas H Davenport & Julia Kirby, 2016), in training users to build skills, knowledge and competences that can prevent failures to leverage RPA's value creation and delivery (Davern & Kauffman, 2000).

One view to successful RPA deployment posits that organizations should start by implementing simple and routine tasks, and then move on to complex processes (Hallikainen et al., 2018). Viewed this way, firms can test RPA's functionality, reliability, flexibility, adaptability, and scalability on pilot projects, with end users, to ascertain errors, bottlenecks and maintainability issues before expansion. RPA maintenance needs can be established after testing and addressed accordingly (Stople et al., 2017).

Fourth concept, "exploitation," optimizes usage of existing internal IT capabilities and resources to attain enhanced performances. As a complementary resource to humans (Schuler & Gehring, 2018; Tallon et al., 2000), RPA can augment existing IS to support and improve work processes (Bygstad, 2017). In particular, the firm's ability to use RPA can lead to delivery of business values of high performance, lower cost and economies of scale thereby allowing efficient and effective use of resources (Anandhi S Bharadwaj, 2000; Ravichandran, 2018). Consequently, the improvements in performance, efficiency and productivity can merit scaling up of operations to leverage RPA benefits across business units (Anandhi S. Bharadwaj et al., 1999; Slaby, 2012).

The fifth variable, organization environment, refers to factors surrounding the company that can affect RPA, operations, resources and systems. These include structures, capabilities, culture, employees and IT infrastructure used in operations (Anandhi S Bharadwaj, 2000; Devece et al., 2017; Popa, Soto-Acosta, & Loukis, 2016). For instance, RPA's user interface access to applications can be impacted by systems and humans (Hallikainen et al., 2018; Y. A. Kumar & Raghavendra, 2018). Most importantly, organization's readiness to adopt RPA can be compounded by engaging employees including gaining IT specialists' and managers' support for the project (Willcocks et al., 2015), and training RPA users to develop skills (Kaushik, 2018). Aptly, humans can integrate, combine and configure RPA with mainstream IS (Bygstad, 2017), but also handle software failure issues stemming from system and transactional changes (Poosapati, Katneni, & Manda, 2018; Stople et al., 2017). The sixth element, competitive environment, depicts external forces that can affect the organizations profitability and competitive position in the market. Specifically, it refers to the intensity of competition from local, national or global rival firms, which can affect organization's operations and performance (Zhu et al., 2004). Accordingly, RPA benefits can be impacted by levels of competition in the market, especially when rival companies imitate firm's products or services, causing some customers to switch brands, hence reducing its market share (Jurison, 1996). Consequently, companies can opt to reduce prices of products or services, thus lowering revenue and profit. However, organizations can differentiate themselves from rival firms by leveraging internal resources and capabilities to innovate new, unique or improved business solutions (Fung, 2014). The last factor, outcomes, represents theoretical business values delivered by RPA. These include: increased productivity; improved efficiency; cost reduction; increased profitability; enhanced quality; increased customer satisfaction; improved performance; and scalability. These outcomes can lower operational cost (Aguirre & Rodriguez, 2017; Kaushik, 2018), through reduction of FTEs (Kirchmer, 2017; Slaby, 2012), and increase ROI (Jurison, 1996; Lacity & Willcocks, 2016b), hence leading to the attainment of competitive advantages (Ravichandran, 2018).

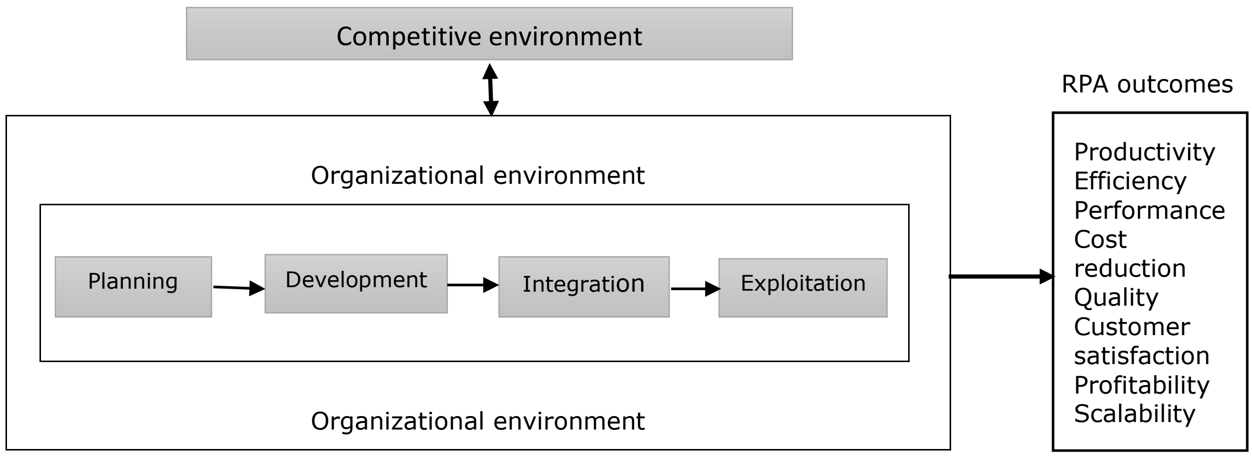

FIGURE 2 Theoretical framework of RPA delivery process (Source: Author's adaptation from SLR).

TABLE 8 Constructs for the RPA delivery process

Construct	Description
Planning	Assess organization's processes, existing IS, strategic capabilities and skills to determine resources and expertise needed for RPA projects.
Development	Design and reengineer processes based on existing IS and business cases in collaboration with IT specialists. Develop RPA pilot projects.
Integration	Configure RPA software to existing IS, implement, test and maintain RPA systems on pilot projects.
Exploitation	Optimize RPA success by scaling up to other suitable business units. Expand RPA integration to new processes.
Organizational environment	Internal forces that can impact organization's use of resources and realization of RPA benefits.
Competitive environment	The external forces that influence the market position of the organization. Influence firm's market share, customer base and profits.
Outcomes	The resultant output delivered by RPA process that can be measured by the value of software's impact.

6.2. Practical method (tips) for successful reaping of benefits from RPA

From the RPA delivery process theoretical framework, eight non-exhaustive ways for successful obtaining benefits from value outcomes have been deduced. These practical methods or tips postulate that managers and business leaders should: (1) pre-evaluate RPA suitability and compatibility to the firm; (2) attain a state of preparedness of the firm and internal readiness; (3) design RPA tools in line with process and work flow patterns; (4) implement initial RPA on pilot projects before scaling up; (5) control organizational internal environment; (6) differentiate RPA deployment from competitors; (7)

utilize RPA agility to scale operations up or down; and (8) pre-define KPIs for RPA value outcomes for measuring benefits of automation. A discourse of the eight practical methods follows.

6.2.1. Pre-evaluate RPA suitability and compatibility to the firm

When planning RPA, first pre-assess business processes to identify suitable processes that have high automation probabilities and BPR needs. However, choosing wrong processes lead to RPA failure (Osmundsen et al., 2019). Next, match firm's business strategy, IT resources, capabilities and infrastructure with RPA outcomes. For example, a business can relate continuous process improvement goals of efficiency and performance to the objectives of cost reduction and profitability (Kaushik, 2018).

Afterwards, ascertain potential risks associated with adopting RPA and develop solutions for eradicating the risks. This include conducting a cost-benefit-analysis to deduce RPA cost and benefits information to be used in developing two business cases, one for "as-is" manual processes and another for RPA "to-be" scenario. Business cases translates RPA project activities into financial terms and provide input information for data-based decision making (Willcocks et al., 2015).

Moreover, business cases can be used in post-automation evaluation to compare RPA outcomes with actual impacts. Thus, firms should use business cases to increase insights about RPA benefits and justify its usefulness to managers, IT teams, employees and investors (Asatiani & Penttinen, 2016; Schuler & Gehring, 2018). Securing RPA project support earlier from all concerned stakeholders prevents resistance, ensures cooperation and enterprise-wide adoption.

6.2.2. Preparedness of the firm and internal readiness

Following pre-evaluation of RPA projects, the organization need to prepare and be ready for process automation. This entails engaging employees and training users prior to RPA deployment to develop skills, build capacity and competences needed for efficient and effective implementation of RPA (Davern & Kauffman, 2000; Lacity & Willcocks, 2016a).

Furthermore, firms should employ RPA experts earlier and foster cooperation with IT teams and BPM experts in training users and resolving exceptional events (Thomas H Davenport & Julia Kirby, 2016). Additionally, companies should have adequate and reliable IT infrastructure: hardware, software, networks, data and systems, in order to create suitable system environments for smooth integration and interplay of RPA. This include conducting adequate feasibility study to ascertain RPA compatibility with existing IT infrastructure (Kaushik, 2018).

6.2.3. Design RPA tools in line with process and work flow patterns

After attaining a preparedness state, RPA tools' development can commence. Aptly, BPR can be conducted to re-design and reengineer business processes in line with defined work flow structures and to make process flow logical and compatible with RPA (Altinkemer et al., 2011). Business process reengineering aligns RPA with strategy, IT resources, capabilities, infrastructure and processes, hence creating a nexus and a synergy of resources that allows smooth configuration and interaction of systems (Lee, 2001; Rutschi & Dibbern, 2019).

Firms should therefore use BPM and RPA experts to redesign, reengineer processes and develop RPA codes that are feasible, logical and compatible with mainstream systems and applications (Bataller et al., 2017). Most significantly, designing of RPA tools should be done in accordance with employee work structure (Richter et al., 2018), and should involve IT specialists and managers (Davern & Kauffman, 2000), who can provide insights on manual process functionality, hence streamlining BPR and RPA development.

6.2.4. Implement initial RPA on pilot projects

The implementation of RPA should primarily be performed on pilot projects, whereof, deployment should start with simple and routine tasks and gradually progress to more complex processes (Hallikainen et al., 2018). This helps to establish RPA's compatibility, suitability, functionality, and scalability on small projects before expansion. RPA pilot project should include adequate testing of the software to monitor performance, evaluate, identify and rectify exceptional events, errors, bottlenecks and downtimes. Eventually, resolutions can be automated to resolve recurring exceptional events (Dunlap & Lacity, 2017). Testing reveals RPA reliability and agility in value delivery process success (R. L. Kumar, 2004).

Moreover, RPA technical experts should carry out ad hoc and routine software maintenances in coordination with IT teams especially when existing systems update or change. Consistent RPA maintenances can reduce disruptions of operations and prevent frequent downtimes thereby increasing value delivery (Stople et al., 2017). Furthermore, organizations should operationalize RPA outcomes in order to determine the effects and value added by process automation in terms of changes in cost structure, economies of scale, FTE numbers, processing times, quantity and quality of output (Asatiani & Penttinen, 2016; Dunlap & Lacity, 2017; Ravichandran, 2018).

6.2.5. Control organizational internal environment

Controlling internal organizational structures, resources, capabilities, processes, culture and employees is paramount because these factors support and facilitate RPA integration and interaction with IT infrastructure: hardware, software, network and data, and IT and technical expertise (Rutschi & Dibbern, 2019; Wang et al., 2012). By controlling internal environment, firms ensure that structures that support RPA are in place and functional, hence optimizing IT infrastructure and minimizing deviations, irregularities and wastage while enhancing efficiency (Kaushik, 2018). Consequently, process accuracy can be increased and errors minimized, leading to reduced costs and defects of output while improving productivity and profitability (Aguirre & Rodriguez, 2017; Fung, 2014; Osmundsen et al., 2019).
Aptly, companies can change some structures since adopting RPA could also require transforming certain business aspects like processes, using BPR, to enhance performance, service delivery, quality, speed,

and efficiency (Altinkemer et al., 2011). Business transformation should involve employees in RPA transformational processes and trainings (Davern & Kauffman, 2000). This assist managers to collaboratively handle change and create organizational cultures that are prepared to support RPA.

6.2.6. Differentiate RPA deployment from competitors

Having controlled the internal environment, firms should leverage IT resources, capabilities and infrastructure by innovatively, creatively and uniquely deploying RPA to deliver business solutions that differs from competitors (Fung, 2014). With unique RPA designs and complementary assets, companies can deliver peculiar business values that can lower cost, increase firms' performance and economies of scale and strengthen stakeholders relationships, hence culminating into competitive advantages (Kukreja & singh Nervaiya, 2016; Ravichandran, 2018). Most significantly, this leads to development of new, unique or improved, efficient and cost-effective business solutions (Devarajan, 2018; Fung, 2014).

Despite RPA being ubiquitous (Thomas H. Davenport & Julia Kirby, 2016), since it is not unique, it is prevalent, and can be imitated and substituted (Anderson et al., 2006; Hitt & Brynjolfsson, 1996; Nevo & Wade, 2010), companies should exploit the software together with IT resources, capabilities and technical expertise to create unique business process designs, business models and organization cultures that differ from and hard to copy by competitors. Managers should, therefore, explore more innovative, competitive and unique ways of deploying RPA to maximize benefits (Devece et al., 2017).

6.2.7. Utilize RPA agility to scale operations up or down

Coupled with competitive advantages and unique structures, organizations can optimize RPA's flexibility to scale operations up or down based on levels of market demand. This can help to control production and resource use hence improving firm's performances, lowering cost and enhancing efficiency, quality and customer satisfaction (Anandhi S Bharadwaj, 2000; Ravichandran, 2018). In practice, this entails changing the number of "robots" based on fluctuations of seasonal market demand to either increasing productivity, efficiency or scaling back operations to reduce cost (Lacity & Willcocks, 2016b).

6.2.8. Pre-define key performance indicators (KPIs) for RPA value outcomes

To determine the business values delivered by RPA, companies should ascertain monetary values of the outcomes. By setting explicitly defined KPIs for operationalizing RPA values outcomes, managers can measure and quantify monetary benefits of the software. One KPI example could be based on the number of FTEs reduced or replaced by "digital workforce" as a result of RPA (Dunlap & Lacity, 2017; Kirchmer, 2017), which can be translated into financial terms by monetizing the time saved in respect of employees' wages. Another instance could be set as percentage changes in productivity and accuracy of RPA-synchronized output (Kaushik, 2018). Practically, KPIs for RPA value outcomes should be explicitly defined in the business cases for each project and aligned with firm's strategic goals.

7. CONCLUSION AND CONTRIBUTIONS

In conclusion, this article has presented insights on RPA value outcomes and its delivery process that can help managers and business leaders to determine whether to adopt RPA. The research makes contributions to theory and knowledge as follows. Firstly, the study proposes a conceptual framework that can be used to examine RPA value outcomes. This framework found eight non-exhaustive RPA outcomes that suggest that organizations are adopting RPA to achieve: increased productivity; improved efficiency; cost reduction; increased profitability; enhanced quality; increased customer satisfaction; improved performance; and scalability. Most RPA value outcomes demonstrates 'multiple benefit effects,' that is, a single outcome, for example enhanced efficiency, offers several benefits to employees, the firm and customers (Davern & Kauffman, 2000). Easiness to use the software increases employees' working efficiency; reduces costs and errors; increases accuracy, compliance and reliability for the company; and increases service satisfaction for customers (Willcocks et al., 2015).

Secondly, the study offers eight non-exhaustive factors that can ensure success in RPA delivery process. These include: strategic alignment; IT capabilities and resources; suitable business processes; IT and employee involvement; business case, stable environment; training, skills and expertise; and testing and maintenance**.** Combined use of these elements enhances value of IT unlike when employed individually (Altinkemer et al., 2011; Lee, 2001; Zhu, 2004), thus confirming that an integrative approach for deploying RPA can be effective (Asatiani & Penttinen, 2016; Devece et al., 2017; Kaushik, 2018; Luo et al., 2012; van der Aalst et al., 2018; Wang et al., 2012). Overall, the relationships of RPA outcomes posits that firms adopt RPA to improve operations, optimize resource use, attain competitive advantages and serve customers better (Kedziora & Kiviranta, 2018).

Thirdly, the study proposes a theoretical framework which provide insights when analysing RPA delivery process functions of planning, development, integration, exploitation, internal, and external environments. In the framework, AI moderates RPA by enabling flexibility and adaptability and use of intelligence to make decisions (vom Brocke et al., 2018), while ML mediates the relationship of AI and RPA using data to learn from past transactions and propose future actions (Gejke, 2018, pp. 150-151).

Fourthly, the research offers eight non-exhaustive practical methods or tips for successful reaping RPA benefits. The tips postulate that managers should: (1) pre-evaluate RPA suitability and compatibility to the firm; (2) attain a state of firm's preparedness and internal readiness; (3) design RPA tools in line with process and work flow patterns; (4) implement initial RPA on pilot projects before scaling up; (5) control internal environment; (6) differentiate RPA deployment from competitors; (7) utilize RPA agility to scale operations up or down; and (8) pre-define KPIs for measuring RPA values.

The use of a SLR analysis methodology means that the findings of this study represents theoretical views deduced from secondary sources of literature. Moreover, due to time constraints, this approach is limited to an interpretive review analysis and hence the research might have not reported on all literature, applications and testing of theoretical frameworks. As the results of this study and the proposed tips are theoretical, future research should focus on testing RPA frameworks and investigating practical applicability of methods needed to succeed in obtaining maximum RPA benefits.

ACKNOWLEDGEMENTS

The author would like to acknowledge the contributions of Prof. dr. Benoit Depaire for the inspiring supervision and motivating mentorship and for the timely and constructive feedback and input, Prof. dr. Koen Vanhoof, Dr. Linde Colen and Prof. dr. Allard van Riel for the for the sessions and guidance.

REFERENCES

Aguirre, S., & Rodriguez, A. (2017). *Automation of a business process using robotic process automation (rpa): A case study.* Paper presented at the Workshop on Engineering Applications.

Altinkemer, K., Ozcelik, Y., & Ozdemir, Z. D. (2011). Productivity and Performance Effects of Business Process Reengineering: A Firm-Level Analysis. *Journal of Management Information Systems, 27*(4), 129-162. doi:10.2753/MIS0742-1222270405

Anagnoste, S. (2018). The Road to Intelligent Automation in the Energy Sector. *Management Dynamics in the Knowledge Economy, 6*(3), 489-502. doi:10.25019/MDKE/6.3.08

Anderson, M. C., Banker, R. D., & Ravindran, S. (2006). Value implications of investments in information technology. *Management science, 52*(9), 1359-1376.

Asatiani, A., & Penttinen, E. (2016). Turning robotic process automation into commercial success – Case OpusCapita. *Journal of Information Technology Teaching Cases, 6*(2), 67-74. doi:10.1057/jittc.2016.5

Baranauskas, G. (2018). Changing Patterns in Process Management and Improvement: Using RPA and RDA in Non-Manufacturing Organizations. *European Scientific Journal, ESJ, 14*(26), 251.

Bataller, C., Jacquot, A., & Torres, S. R. (2017). Robotic process automation. In: Google Patents. Retrieved from https://patents.google.com/patent/US9555544B2/en.

Bharadwaj, A. S. (2000). A resource-based perspective on information technology capability and firm performance: an empirical investigation. *MIS quarterly*, 169-196.

Bharadwaj, A. S., Bharadwaj, S. G., & Konsynski, B. R. (1999). Information Technology Effects on Firm Performance as Measured by Tobin's q. *Management science, 45*(7), 1008-1024. doi:10.1287/mnsc.45.7.1008

Britton, B. L., & Atkinson, D. G. (2017). An Investigation Into the Significant Impacts of Automation in Asset Management. *Economics World, 5*(5), 418-428.

Bughin, J. (2018). Why AI Isn't the Death of Jobs. *MIT Sloan Management Review, 59*(4), 42-46.

Bygstad, B. (2017). Generative innovation: a comparison of lightweight and heavyweight IT. *Journal of Information Technology, 32*(2), 180-193.

Castellan, C. M. (2010). Quantitative and qualitative research: A view for clarity. *International journal of education, 2*(2), 1.

Chelliah, J. (2017). Will artificial intelligence usurp white collar jobs? *Human Resource Management International Digest, 25*(3), 1-3. doi:10.1108/HRMID-11-2016-0152

Davenport, T. H., & Kirby, J. (2015). Beyond automation. *Harvard Business Review, 93*(6), 58-65.

Davenport, T. H., & Kirby, J. (2016). Just how smart are smart machines? *MIT Sloan Management Review, 57*(3), 21.

Davenport, T. H., & Kirby, J. (2016). *Only humans need apply: Winners and losers in the age of smart machines*: Harper Business New York, NY.

Davern, M. J., & Kauffman, R. J. (2000). Discovering potential and realizing value from information technology investments. *Journal of Management Information Systems, 16*(4), 121-143.

Devarajan, Y. (2018). A Study of Robotic Process Automation Use Cases Today for Tomorrow's Business. *International Journal of Computer Techniques, 5*(6), 12-18.

Devece, C., Palacios, D., & Martinez-Simarro, D. (2017). Effect of information management capability on organizational performance. *Service Business, 11*(3), 563-580.

Dixon-Woods, M., Cavers, D., Agarwal, S., Annandale, E., Arthur, A., Harvey, J., . . . Smith, L. (2006). Conducting a critical interpretive synthesis of the literature on access to healthcare by vulnerable groups. *BMC medical research methodology, 6*(1), 35.

Dunlap, R., & Lacity, M. (2017). Resolving Tussles in Service Automation Deployments: Service Automation at Blue Cross Blue Shield North Carolina (BCBSNC). *Journal of Information Technology Teaching Cases, 7*(1), 29-34. doi:10.1057/s41266-016-0008-9

Fernandez, D., & Aman, A. (2018). Impacts of Robotic Process Automation on Global Accounting Services. *Asian Journal of Accounting and Governance, 9*, 123-132.

Frey, C. B., & Osborne, M. A. (2017). The future of employment: how susceptible are jobs to computerisation? *Technological forecasting and social change, 114*, 254-280.

Fung, H. P. (2014). Criteria, use cases and effects of information technology process automation (ITPA). *Adv Robot Autom, 3: 124. doi: 10.4172/21689695.1000124*

Gejke, C. (2018). A new season in the risk landscape: Connecting the advancement in technology with changes in customer behaviour to enhance the way risk is measured and managed. *Journal of Risk Management in Financial Institutions, 11*(2), 148-155.

Geyer-Klingeberg, J., Nakladal, J., Baldauf, F., & Veit, F. (2018). Process Mining and Robotic Process Automation: A Perfect Match. *Proceedings of the Dissertation Award, Demonstration, and Industrial Track at BPM*, 9-14.

Glass, R. L., Vessey, I., & Ramesh, V. (2002). Research in software engineering: an analysis of the literature. *Information and Software technology, 44*(8), 491-506.

Graue, C. (2015). Qualitative data analysis. *International Journal Of Sales, Retailing & Marketing, 4*(9), 5-14.

Grung-Olsen, H.-C. (2017). A Strategic Look at Robotic Process Automation.

Gupta, P., Fernandes, S. F., & Jain, M. (2018). Automation in recruitment: a new frontier. *Journal of Information Technology Teaching Cases, 8*(2), 118-125.

Hallikainen, P., Bekkhus, R., & Pan, S. (2018). How OpusCapita Used Internal RPA Capabilities to Offer Services to Clients. *MIS QUARTERLY EXECUTIVE, 17*(1), 41-52.

Herbert, I., Dhayalan, A., & Scott, A. (2016). The future of professional work: Will you be replaced or will you be sitting next to a robot? *Management Services, 60*(2), 22.

Hirsch, P. B. (2017). The robot in the window seat. *Journal of Business Strategy, 38*(4), 47-51. doi:10.1108/JBS-04-2017-0050

Hitt, L. M., & Brynjolfsson, E. (1996). Productivity, Business Profitability, and Consumer Surplus: Three Different Measures of Information Technology Value. *MIS quarterly, 20*(2), 121-142. doi:10.2307/249475

Horlach, B., Drews, P., & Schirmer, I. (2016). Bimodal IT: Business-IT alignment in the age of digital transformation. *Multikonferenz Wirtschaftsinformatik (MKWI)*, 1417-1428.

Jurison, J. (1996). Toward more effective management of information technology benefits. *Journal of Strategic Information Systems, 5*(4), 263-274. doi:10.1016/S0963-8687(96)80029-1

Kaushik, S. (2018). Critical Parameters for Successful Process Automation. *Software Quality Professional, 20*(4), 22-32.

Kedziora, D., & Kiviranta, H.-M. (2018). Digital Business Value Creation with Robotic Process Automation (RPA) in Northern and Central Europe. *Management, 13*(2), 161-174. doi:10.26493/1854-4231.13.161-174

Kirchmer, M. (2017). Robotic process automation-pragmatic solution or dangerous illusion. *BTOES Insights, June*.

Kohli, R., & Grover, V. (2008). Business value of IT: An essay on expanding research directions to keep up with the times. *Journal of the association for information systems, 9*(1), 1.

Kopeć, W., Skibiński, M., Biele, C., Skorupska, K., Tkaczyk, D., Jaskulska, A., . . . Marasek, K. (2018). Hybrid Approach to Automation, RPA and Machine Learning: a Method for the Human-centered Design of Software Robots.

Kukreja, M., & singh Nervaiya, A. (2016). Study of robotic process automation (rpa). *International Journal on Recent and innovation trends in computing and communication, 4*(6), 434-437.

Kumar, R. L. (2004). A Framework for Assessing the Business Value of Information Technology Infrastructures. *Journal of Management Information Systems, 21*(2), 11-32. doi:10.1080/07421222.2004.11045801

Kumar, Y. A., & Raghavendra, G. (2018). The Pioneers of Robotic Process Automation (RPA) Software and Blue Prism. *International Journal of Scientific Research in Computer Science, Engineering and Information Technology, 3*(4).

Lacity, M. C., & Willcocks, L. P. (2016a). A new approach to automating services. *MIT Sloan Management Review, 58*(1), 41-49.

Lacity, M. C., & Willcocks, L. P. (2016b). Robotic process automation at telefónica O2. *MIS QUARTERLY EXECUTIVE, 15*(1), 21-35.

Lee, C. S. (2001). Modeling the business value of information technology. *Information & Management, 39*(3), 191-210. doi:10.1016/S0378-7206(01)00090-8

Luo, J., Fan, M., & Zhang, H. (2012). Information technology and organizational capabilities: A longitudinal study of the apparel industry. *Decision Support Systems, 53*(1), 186-194. doi:10.1016/j.dss.2012.01.003

Madakam, S., M. Holmukhe, R., & Kumar Jaiswal, D. (2019). The Future Digital Work Force: Robotic Process Automation (RPA). *Journal of Information Systems and Technology Management, 16*. doi:10.4301/S1807-1775201916001

Marciniak, R. (2017). Automation Revolutionize the Business Service Industry.

Meidan, A., García-García, J. A., Escalona, M., & Ramos, I. (2017). A survey on business processes management suites. *Computer Standards & Interfaces, 51*, 71-86.

Mikalef, P., & Pateli, A. G. (2016). *Developing and Validating a Measurement Instrument of IT-Enabled Dynamic Capabilities.* Paper presented at the ECIS.

Miller, S. (2018). AI: Augmentation, more so than automation. *Asian Management Insights, 5*(1), 1-20.

Moffitt, K. C., Rozario, A. M., & Vasarhelyi, M. A. (2018). Robotic Process Automation for Auditing. *Journal of Emerging Technologies in Accounting, 15*(1), 1-10.

Nevo, S., & Wade, M. R. (2010). The Formation and Value of IT-Enabled Resources: Antecedents and Consequences of Synergistic Relationships. *MIS quarterly, 34*(1), 163-183. doi:10.2307/20721419

Onwuegbuzie, A. J., Leech, N. L., & Collins, K. M. (2012). Qualitative analysis techniques for the review of the literature. *The qualitative report, 17*(28), 1-28.

Osmundsen, K., Iden, J., & Bygstad, B. (2019). *Organizing Robotic Process Automation: Balancing Loose and Tight Coupling.* Paper presented at the Proceedings of the 52nd Hawaii International Conference on System Sciences.

Poosapati, V. R., Katneni, V., & Manda, V. K. (2018). Cognitive Automation in Industry–Design Principles and Case Study. *International Journal of Applied Engineering Research, 13*(20), 14827-14831.

Popa, S., Soto-Acosta, P., & Loukis, E. (2016). Analyzing the complementarity of web infrastructure and eInnovation for business value generation. *Program, 50*(1), 118-134.

Ravichandran, T. (2018). Exploring the relationships between IT competence, innovation capacity and organizational agility. *The Journal of Strategic Information Systems, 27*(1), 22-42.

Rawal, P. (2013). AIDA Marketing Communication Model: Stimulating a purchase decision in the minds of the consumers through a linear progression of steps. *International Journal of Multidisciplinary research in social & management sciences, 1*(1), 37-44.

Richter, A., Heinrich, P., Stocker, A., & Schwabe, G. (2018). Digital Work Design. *Business & Information Systems Engineering, 60*(3), 259-264. doi:10.1007/s12599-018-0534-4

Ridley, D. (2012). *The literature review: a step-by-step guide for students* (2 ed.). Los Angeles, Calif: Sage.

Rutschi, C., & Dibbern, J. (2019). *Mastering Software Robot Development Projects: Understanding the Association between System Attributes & Design Practices.* Paper presented at the Proceedings of the 52nd Hawaii International Conference on System Sciences.

Schatsky, D., Muraskin, C., & Iyengar, K. (2016). Robotic process automation A path to the cognitive enterprise. In: Deloitte University Press.

Schmitz, M., Dietze, C., & Czarnecki, C. (2019). Enabling digital transformation through robotic process automation at Deutsche Telekom. In *Digitalization Cases* (pp. 15-33): Springer.

Schuler, J., & Gehring, F. (2018). Implementing Robust and Low-Maintenance Robotic Process Automation (RPA) Solutions in Large Organisations. *Available at SSRN 3298036*.

Sekaran, U., & Bougie, R. (2014). *Research methods for business: a skill-building approach* (6 ed.). Chichester: Wiley.

Shukla, P., Wilson, H. J., Alter, A., & Lavieri, D. (2017). Machine reengineering: robots and people working smarter together. *Strategy & Leadership, 45*(6), 50-54. doi:10.1108/SL-09-2017-0089

Slaby, J. R. (2012). Robotic Automation Emerges as a Threat to Traditional Low-Cost Outsourcing. *HfS Research Ltd*.

Steinhoff, J. C., Lewis, A. C., & Everson, K. E. (2018). The March of the Robots. *The Journal of Government Financial Management, 67*(1), 26-33.

Stople, A., Steinsund, H., Iden, J., & Bygstad, B. (2017). Lightweight IT and the IT function: experiences from robotic process automation in a Norwegian bank *Bibsys Open Journal Systems, 25*(1), 27-29.

Tallon, P. P., Kraemer, K. L., & Gurbaxani, V. (2000). Executives' perceptions of the business value of information technology: a process-oriented approach. *Journal of Management Information Systems, 16*(4), 145-173.

Tallon, P. P., Queiroz, M., Coltman, T. R., & Sharma, R. (2016). Business process and information technology alignment: construct conceptualization, empirical illustration, and directions for future research. *Journal of the association for information systems, 17*(9), 563.

van der Aalst, W. M. P., Bichler, M., & Heinzl, A. (2018). Robotic Process Automation. *Business & Information Systems Engineering, 60*(4), 269-272. doi:10.1007/s12599-018-0542-4

Varghese, F. C. (2017). The Impact of Automation in IT Industry: Evidences from India. *International Journal of Engineering Science, 5000*.

Vedder, R., & Guynes, C. S. (2016). The Challenge Of Botsourcing. *The Review of Business Information Systems (Online), 20*(1), 1. doi:10.19030/rbis.v20i1.9677

Vedder, R., Guynes, S., & Parrish, J. (2019). Botsourcing's impact on society. *ACM SIGCAS Computers and Society, 48*(2), 10-13. doi:10.1145/3307622.3307623

vom Brocke, J., Maaß, W., Buxmann, P., Maedche, A., Leimeister, J. M., & Pecht, G. (2018). Future Work and Enterprise Systems. *Business & Information Systems Engineering, 60*(4), 357-366. doi:10.1007/s12599-018-0544-2

Wang, N., Liang, H., Zhong, W., Xue, Y., & Xiao, J. (2012). Resource Structuring or Capability Building? An Empirical Study of the Business Value of Information Technology. *Journal of Management Information Systems, 29*(2), 325-367. doi:10.2753/MIS0742-1222290211

Willcocks, L. P., Lacity, M., & Craig, A. (2015). The IT function and robotic process automation.

Xiao, X., Califf, C. B., Sarker, S., & Sarker, S. (2013). ICT innovation in emerging economies: a review of the existing literature and a framework for future research. *Journal of Information Technology, 28*(4), 264-278.

Zakaria, Z., Atan, R., Ghani, A. A. A., & Sani, N. F. M. (2009). *Unit testing approaches for BPEL: a systematic review.* Paper presented at the 2009 16th Asia-Pacific Software Engineering Conference.

Zhu, K. (2004). The complementarity of information technology infrastructure and e-commerce capability: A resource-based assessment of their business value. *Journal of Management Information Systems, 21*(1), 167-202.

Zhu, K., Kraemer, K. L., Xu, S., & Dedrick, J. (2004). Information Technology Payoff in E-Business Environments: An International Perspective on Value Creation of E-Business in the Financial Services Industry. *Journal of Management Information Systems, 21*(1), 17-54. doi:10.1080/07421222.2004.11045797

APPENDIX A.

DISTINCTION FEATURES BETWEEN RPA AND TRADITIONAL BPM AUTOMATION

Issue	RPA	Traditional IT developed from BPM
Development skills required to address new business unit requirements	Modest; can be done by process modelers and analysts with a few months of training with RPA tools.	Extensive; requires software architects and engineers with years of experience with relevant programming languages, BPM tools, and enterprise application suites.
Development methodology	Lightweight; takes advantage of the presentation layer of existing applications and their underlying logic and security.	Heavy weight requires complex application layer integration or potentially brittle data layer integration.
Component re-use	High; functions can be reused to develop new robot.	High, though comparatively expensive to develop.

Source: Slaby (2012, p. 5)