



MANAGEMENT CONSIDERATIONS FOR ROBOTIC PROCESS AUTOMATION IMPLEMENTATIONS IN DIGITAL INDUSTRIES

Dimitrios S. Stamoulis^{1*}

¹ Department of Informatics, National and Kapodistrian University of Athens, Greece

Email: dstamoulis@di.uoa.gr

* Corresponding Author

Article Info:

Article history:

Received date: 13.12.2021

Revised date: 27.12.2021

Accepted date: 02.02.2022

Published date: 07.03.2022

To cite this document:

Stamoulis, D. (2022). Management Considerations for Robotic Process Automation Implementations in Digital Industries. *Journal of Information System and Technology Management*, 7 (25), 35-53.

DOI: 10.35631/JISTM.725003

This work is licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/)



Abstract:

Robotic Process Automation (RPA) is gaining popularity among digital industries as a means of light interconnection among information systems as well as an efficient and effective way of business processes execution when explicit knowledge is modelled into the tasks of a business process and humans offer little value in performing manual work for them. Apart from the obvious technological issues, management considerations are equally important for RPA implementation. This research aims at revealing best practices and recommendations for management considerations in RPA implementations by performing an industry experts' survey with questionnaires covering six main areas of management concern: (a) strategy, (b) staffing, (c) financial issues, (d) organization of work and tools, (e) design and (f) production. The answers of the respondents are grouped in terms of mean values and deviation to demonstrate congruence of perceptions and some of them are commented against existing research literature findings.

Keywords:

RPA, RPA Implementation Barriers, RPA Management Considerations

Introduction

Much like robots in the traditional industries, software robots are conquering gradually the digital industries nowadays. Their purpose is the same as their electromechanical predecessors: undertake the execution of manual, repetitive, time consuming work that is performed according to specific patterns, e.g. the business processes in an organizational context instead of an assembly line. The logic is the identical, which is to gain operational efficiency and

effectiveness in terms of no faults, therefore free human capital to supervise and monitor the work rather than execute it themselves.

Business processes represent the assembly lines in the contemporary digital industries; they represent how the work is organized along the organizational units, roles, information systems and information resources. Embedded into the business processes, all the business logic of an organization can be found, especially when drilling down into the tasks that comprise a business process. Robots, similar to humans, need to get trained to the job, to be taught what to do in an explicit, or more fuzzy (when AI is used) way.

Software robots, or bots, provide integration capabilities across information resources and applications without (or with little when Application Programming Interfaces are used) interoperability among the rest of the information systems in an organization, thus the terms non-invasive and presentation layer integrations are used to denote that bots are doing the work exactly as a human would do, rather than interoperating computer applications. Bots belong to a new category of software tools called low-code / no-code tools, which are aiming at subject matter experts as their developers, i.e. people that do not belong to the IT division but to the business areas of an organization.

It seems that contemporary organizations that turn into digital industries through digital transformation projects include robotic process automation quite highly in their agenda, targeting the replacement of humans in back office, mainly but not exclusively, operations with bots in various organizational units such as accounting (for invoicing and reconciliations), initial credit screening (in banking and insurance companies), human resources operations (e.g. payroll, recruitment, etc.), record keeping, customer data cleansing etc. Industry sectors where RPA has been adopted include telecommunications¹, banking [Stople et. al, 2017], universities [Denagama Vitharanage et. al., 2020], health², public administration [Houy et. al., 2019], as well as business functions such as accounting [Fernandez & Amman, 2018], human resources [Jones, 2017] etc.

Being a new breed of software tools with profound impact on the transformation of work, management considerations and challenges are obviously present. Technological problems are constantly being solved and the gradual enrichment of these tools with allows for cognitive types of decisions to be addressed within tasks of business processes. On the contrary, managerial issues need to be further investigated as little research has focused on them. This is exactly what this research paper is about. Asking RPA experts who have been involved in RPA projects to complete a questionnaire, this paper attempts to identify management considerations that decision makers have to take into account when designing the organizational transition from manual to bot work.

RPA Implementation Projects

Digital transformation of organizations in the 21st century has led to an increased need for horizontal business processes being revisited with a view to simplify, reengineer and digitize them. Obstacles to this end, are mainly the islands of non-interoperable information systems applications dispersed all over the organization and the manual work in tasks across the business process. The need for easy, fast and effective systems integration and interoperability

¹ RPA (Robotic Process Automation) in Telecom Industry (xenonstack.com)

² RPA in Healthcare: Benefits, Use Cases & Case Studies [2021] (aimultiple.com)

as well as the quest of operational efficiencies, both in terms of productivity, error reduction and costs lowering has led organizations to think about Robotic Process Automation (RPA) as the solution to their problems, since “RPA is about using software to automate business processes.” [Lacity & Willcocks, 2015] A definition for RPA is the following: “When virtual robots perform a task previously performed by humans, through software that mimics the steps in a structured process, it is called robotic process automation (RPA) (Robotic Industries Association, 2017).” [Stople, et. al., 2017]

RPA implementations with low code / no code software tools are appealing to business users for many reasons: circumvention of IT backlogs, operational simplicity and efficiency, less operational staffing requirements regardless of the volume of work, business users’ capability to operate them without continuous IT staff assistance etc. However, “the evidence from the literature explains the need to identify and justify how RPA can contribute towards achieving diverse corporate strategies (such as cost reductions, efficiency, higher service quality, better compliance).” [Syed et. al., 2020]

Although RPA implementations improve operational efficiencies at an unprecedented scale, scoring very low error rates as compared to humans [Tronstad et. al., 2016], RPA projects do fail [Kulisiewicz & Sobczak, 2018] at high rates. “RPA implementations carry intrinsic risks. “In 2017, Ernst and Young, found 30-50% of RPA projects stalling, not scaling, being abandoned or moved to other solutions. “ [Willcocks et al., 2018] Eight areas of manageable risk have been identified, related to “strategy, sourcing, tool selection, project time estimates, operations and execution, change management, maturity, and stakeholder buy in.” [Kevin et. al., 2018]. “Various reasons exist why RPA projects fail and one of them is when businesses try to solve everything with RPA.” [Noppen, 2019]. “The estimated RPA project failure rates are relatively high, and transforming the wrong business processes is attributed as one of the critical reasons for this.” [Padmini et. al., 2021] This is obviously true, since not all processes are suitable for automation. The most appropriate processes are those having rule-based tasks and do not require human judgment, since the cognitive aspect of work can only be partially handled by AI capabilities, which is not the case for most of the RPA implementations.

Recent research has revealed some reasons that describe failure causes, such as Money [2021] who has proposed the following reasons:

- “Not considering RPA as business led, as opposed to IT led.
- Not having an RPA business case and postponing planning until after proof-of concepts (POCs) or pilots
- Underestimating what happens after processes have been automated
- Treating robotics as a series of automations vs. an end to end change program.
- Targeting RPA at the wrong processes.
- Applying traditional delivery methodologies Automating too much of a process or not optimizing for RPA
- Forgetting about IT infrastructure”

Rutaganda et. al. [2017] have identified the following five issues as the most common in failed RPA projects:

- Incorrect RPA leadership at the top-level
- No long-term RPA vision or roadmap
- Selecting incorrect RPA use case and lack of clear KPIs
- Trying to deliver RPA benefits on shifting sands

- Dated project delivery approach for RPA

These findings demonstrate that technology is not an issue; managerial problems need to be tackled for RPA implementations to be successful and achieve their business objectives. As technologies are getting more mature and experience in using RPA rises, attention is turned on “how to organize and govern RPA initiatives. The recommendations from prior research are unclear, and there is a call for more research on this area” [Osmundsen, et. al., 2019] and still remains so. “Building on problematizations of RPA implementation failures and scholarly urges for further research within the field” [Camo, et. al., 2021], this study aims at shedding some more light on elements of best practices in managing RPA implementations, by means of an opinion survey that tries elicit best practice knowledge from field experts to provide recommendations for successful RPA implementations.

Design Of The Experts’ Survey

Surveys are appropriate for identifying explicit or tacit knowledge that cannot be directly elicited from subject matter experts; since learning is doing, those who have participated in RPA implementations hold the knowledge that pertain to the management considerations that need to be taken into account when organizations decide to start the RPA journey.

The survey does not focus on those few management issues that have already been resolved such as the identification of the tasks that are pertinent to RPA; nine criteria have been developed to this end [Fung, 2014]. The management issues around RPA that this research would like to reveal, have to do with operational, financial, technological adoption and human aspects of RPA implementations. A Likert scale is used to collect the respondent’s opinion / experience on these topics, with twenty-five (25) questions in part I and sixteen (16) questions in part II, most of them being reverse questions to the first part ones in order to check the internal consistency of the answers for each respondent. Finally, the third part is a small one with three open-ended questions and a ranking one. Answers that are not consistent between part I and part II are both cancelled and are not taken into account. In the appendix, the reader may find the complete set of the questionnaire questions and the questions of part II which are denoted as reverse to specific questions of part I.

The survey has been conducted among professionals with experience in RPA implementations in Greece coming from three industry sectors: banking/ finance, consulting and telecommunications. Six professionals have been selected from each sector, therefore the results are not biased towards RPA implementations in specific industry sectors, but can be considered as quite representative of the digital industry.

The questions whether robots had better be attended or unattended during their execution and the degree to which should be programmable and connected through APIs with other applications are out of scope of the survey as not really management issues. The answer to the former question has to do with how much straightforward the tasks of the business processes are and the latter is a rather technological issues that related to the nature and the information richness of the user interfaces of the applications participating into the business processes that run by bots.

Thus, the design of the survey has focused on managerial issues, such as organizational, staffing, finance and strategic aspects that are discussed at higher management levels in

organizations that decide to use RPA as a digital transformation tool. The questions of the survey have been produced during observations of RPA implementations in the banking sector in Greece, following some discussions with consultants as well as from a literature review on RPA.

Questions cover six main areas of management concern: (a) strategy, (b) staffing, (c) financial issues, (d) organization of work and tools, (e) design and (f) production. In the following, questions of both part I and part II of the questionnaire have been grouped according to their affinity to the aforementioned six areas. Questions are not put into a particular order to avoid bias in answers. Questions denoted with their number only belong to part I, whereas those denoted such as PII-Qx, PI-QyR mean that they belong to Part II and can be considered as conceptually reverse to question no y of Part I.

(a) Strategic issues

1. RPA is a joint IT-business initiative (Q3)
2. RPA projects aim mainly at complex business processes with many different information systems involved in the process (Q7)
3. RPA is preferable over IT implementations for interoperability because it offers very fast implementation (Q11)
4. Time-to-market is a main advantage of RPA implementations (PII-Q10, PI-Q11R)
5. IT has to implement new applications only, whereas RPA is the only choice for fast applications coordination for business processes (PII-Q14, PI-Q16R).
6. Human knowledge cannot be embedded into an RPA implementation (PII-Q6, PI-Q8R)
7. Ownership of the RPA applications is clearly given to business owners of the relevant business processes, rather than to RPA experts or IT.

(b) Staffing

1. RPA implementation does not require IT resources (Q9)
2. RPA is driven by business users only. (PII-Q1, PI-Q3R)
3. RPA tools are easy to use and do not require developer skills (Q10)
4. To train a robot, only business users are needed. (Q17)
5. RPA tools are indeed no code – low code software applications. (Q22)
6. Only 10% of the people previously needed to execute manually a business process are needed to supervise robots after a successful RPA implementation project. (Q25)
7. IT is not involved at all in an RPA implementation (PII-Q7, PI-Q9R)
8. An business user may implement a project using RPA tools without any other assistance (PII-Q8, PI-Q10R)
9. RPA is not error-prone and thus it is a quality management tool mainly (PII-Q11, PI-Q13R)
10. RPA experts as well as business subject matter people cooperate to train a robot (PII-Q15, PI-Q17R)
11. Humans cannot supervise more than 20 robots per day (PII-Q3, PI-Q5R)

(c) Financial issues

1. The cost-benefit equation for RPA projects can be easily justified. (Q23)
2. From a financial point of view, RPA vs IT-built interoperability is a question of operational vs. capital expenditure. (Q12)

3. RPA is mainly a cost-cutting tool (in terms of human FTEs) rather than anything else. (Q13)
 4. RPA requires gradual investments (“pay-as-you-go”) as opposed to IT projects which are mainly incurring costs up-front. (PII-Q9, PI-Q12R)
- (d) Tools and organization of work
1. Business process management (BPM) tools offer more or less the same functionality with RPA tools (Q14)
 2. New RPA implementations need to be organized as project teams and agile methodologies from IT apply. (Q15)
 3. Effort estimations for RPA implementation projects are based on business processes’ number of tasks and complexity. (Q18)
 4. A Center of Excellence with RPA technology experts is a prerequisite for success for RPA adoption. (Q24)
- (e) Design of RPA implementations
1. Before you start RPA projects, it is necessary to agree on the process maps (Q2)
 2. It is difficult to identify business processes for RPA (Q6)
 3. For each repetitive, bureaucratic work, a decision must be taken, whether to implement a robot or opt for an applications interoperability project. (Q16)
 4. Automatic discovery of business process tasks is a prerequisite for high levels of RPA success. (Q21)
 5. There is no prerequisite for starting an RPA project. (PII-Q2, PI-Q2R)
 6. RPA teams prefer to implement projects for business processes with a few steps (PII-Q5, PI-Q7R)
 7. When using RPA tools, there is no need to invest in tools for business process management as well (PII-Q12, PI-Q14R)
- (f) Robots in production
1. RPA execution needs human supervision on a daily basis as a full time job (Q4)
 2. A RPA expert may supervise up to 20 robots on daily (Q5)
 3. When cognitive tasks performed by humans participate in the work, RPA cannot be applied (Q8)
 4. Unattended execution is reliable and humans are involved only to check results (Q20)
 5. RPA implementations are scalable solutions that can easily upscale to magnitudes of hundred / thousand robots working on the same business process at the same time. (Q19)
 6. Implementation of new RPA is a business as usual situation for business users (PII-Q13, PI-Q15R)
 7. Business users may easily find where to apply RPA (PII-Q4, PI-Q6R)
 8. RPA is not error-prone and thus it is a quality management tool mainly (PII-Q11, PI-Q13R)
 9. RPA is not error-prone and thus it is a quality management tool mainly (PII-Q11, PI-Q13R)
 10. When using RPA tools, there is no need to invest in tools for business process management as well (PII-Q12, PI-Q14R)
 11. RPA experts as well as business subject matter people cooperate to train a robot (PII-Q15, PI-Q17R)

12. Attended robots perform better results since humans may decide upon specific tasks to be executed according to their cognitive judgement. (PII-Q16, PI-Q16R).
13. RPA experts as well as business subject matter people cooperate to train a robot (PII-Q15, PI-Q17R)
14. Attended robots perform better results since humans may decide upon specific tasks to be executed according to their cognitive judgement. (PII-Q16, PI-Q16R).
15. Attended robots perform better results since humans may decide upon specific tasks to be executed according to their cognitive judgement. (PII-Q16, PI-Q16R).

The pre-testing of the questionnaire with two respondents checked the comprehensives and the validity of the questions. Respondents are asked to answer by ticking: (strongly agree/2, agree/1, neutral/0, disagree/ -1, strongly disagree/-2) in the 1st and 2nd questionnaires.

The data collected by opinion is shown in the following figure.

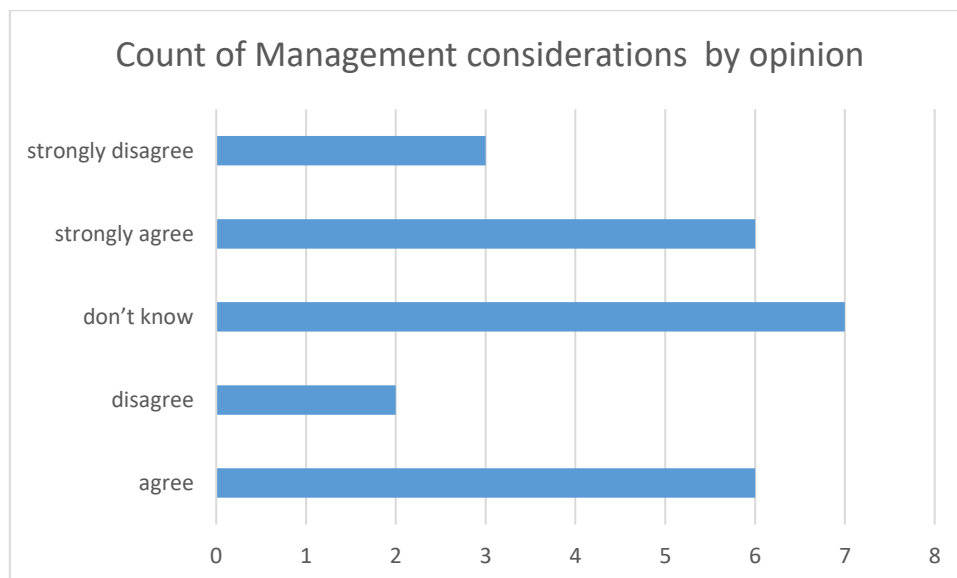


Figure-1 : Count of Management Considerations by Opinion

Results Of The Survey

Question no 1 aims at attesting the level of knowledge and experience of the survey respondents. All of them have scored 4s or 5s (agree, strongly agree), confirming that they are truly subject matter experts. Only minor inconsistencies appeared when checking the answers of the reverse questions with those of the first questionnaire.

Analysis Of The Data Collected

Questionnaire 1

Collected data from Questionnaire 1 have been processed to calculate the mean value and the deviation. The mean value demonstrates the opinion of most of the respondents, while deviation reveals whether opinions differ a lot or not. Zero deviation corresponds to unanimity, up to 0.5 shows strong congruence, between 0.5 and 1 is congruence, more than 1 is incongruence and more than 1.5 strong incongruence. The following table shows the results sorted by degree of congruence among the respondents.

Deviation	Mean value	Main opinion based on mean value	Management considerations
<i>Unanimity</i>			
0	1	Agree	5. A RPA expert may supervise up to 20 robots on daily basis
<i>Strong congruence / agreement</i>			
0.375	2	Strongly agree	2. Before you start RPA projects, it is necessary to agree on the process maps
0.375	2	Strongly agree	3. RPA is a joint IT-business initiative
0.375	1	Agree	8. When cognitive tasks performed by humans participate in the work, RPA cannot be applied
0.5	-1.5	Strongly disagree	6. It is difficult to identify business processes for RPA
0.5	1.5	Strongly agree	18. Effort estimations for RPA implementation projects are based on business processes' number of tasks and complexity.
0.5	1.5	Strongly agree	22. RPA tools are indeed no code – low code software applications.
<i>Congruence / agreement</i>			
0.75	1	Agree	11. RPA is preferable over IT implementations for interoperability because it offers very fast implementation
0.75	-1.5	Strongly disagree	17. To train a robot, only business users are needed.
0.75	-0.5	Disagree	21. Automatic discovery of business process tasks is a prerequisite for high levels of RPA success.
0.875	-1	Disagree	14. Business process management (BPM) tools offer more or less the same functionality with RPA tools
0.875	1	Agree	23. The cost-benefit equation for RPA projects can be easily justified.
0.875	1	Agree	25. Only 10% of the people previously needed to execute manually a business process are needed to supervise robots after a successful RPA implementation project.
1	-1.5	Strongly disagree	9. RPA implementation does not require IT resources
1	0	Don't know	12. From a financial point of view, RPA vs IT-built interoperability is a question of opex vs. capex.
<i>Incongruence / disagreement</i>			
1.125	2	Strongly agree	24. A Center of Excellence with RPA technology experts is a prerequisite for success for RPA adoption.

1.25	-1	Disagree	7. RPA projects aim mainly at complex business processes with many different information systems involved in the process
1.25	0	Don't know	15. New RPA implements need to be organized as project teams and agile methodologies from IT apply.
1.25	1	Agree	19. RPA implementations are scalable solutions that can easily upscale to magnitudes of hundred / thousand robots working on the same business process at the same time.
1.25	0	Don't know	20. Unattended execution is reliable and humans are involved only to check results
1.5	0	Don't know	10. RPA tools are easy to use and do not require developer skills
1.5	2	Strongly agree	16. For each repetitive, bureaucratic work, a decision must be taken, whether to implement a robot or opt for an applications interoperability project.
<i>Strong incongruence / disagreement</i>			
1.75	0.5	Agree	4. RPA execution needs human supervision on a daily basis as a full-time job
1.75	0.5	Agree	13. RPA is mainly a cost-cutting tool (in terms of human FTEs) rather than anything else.

Sorting the table of results on the mean value, the following results are shaped:

mean value	opinion	Management considerations
2	strongly agree	1. Before you start RPA projects, it is necessary to agree on the process maps
2	strongly agree	2. RPA is a joint IT-business initiative
2	strongly agree	3. A Center of Excellence with RPA technology experts is a prerequisite for success for RPA adoption.
2	strongly agree	4. For each repetitive, bureaucratic work, a decision must be taken, whether to implement a robot or opt for an applications interoperability project.
1.5	strongly agree	5. Effort estimations for RPA implementation projects are based on business processes' number of tasks and complexity.
1.5	strongly agree	6. RPA tools are indeed no code – low code software applications.
1	agree	7. A RPA expert may supervise up to 20 robots on daily basis
1	agree	8. When cognitive tasks performed by humans participate in the work, RPA cannot be applied
1	agree	9. RPA is preferable over IT implementations for interoperability because it offers very fast implementation
1	agree	23. The cost-benefit equation for RPA projects can be easily justified.
1	agree	25. Only 10% of the people previously needed to execute manually a business process are needed to supervise robots after a successful RPA implementation project.

1	agree	19. RPA implementations are scalable solutions that can easily upscale to magnitudes of hundred / thousand robots working on the same business process at the same time.
0.5	don't know	4. RPA execution needs human supervision on a daily basis as a full-time job
0.5	don't know	13. RPA is mainly a cost-cutting tool (in terms of human FTEs) rather than anything else.
0	don't know	12. From a financial point of view, RPA vs IT-built interoperability is a question of opex vs. capex.
0	don't know	15. New RPA implements need to be organized as project teams and agile methodologies from IT apply.
0	don't know	20. Unattended execution is reliable and humans are involved only to check results
0	don't know	10. RPA tools are easy to use and do not require developer skills
-0.5	don't know	21. Automatic discovery of business process tasks is a prerequisite for high levels of RPA success.
-1	disagree	14. Business process management (BPM) tools offer more or less the same functionality with RPA tools
-1	disagree	7. RPA projects aim mainly at complex business processes with many different information systems involved in the process
-1.5	strongly disagree	6. It is difficult to identify business processes for RPA
-1.5	strongly disagree	17. To train a robot, only business users are needed.
-1.5	strongly disagree	9. RPA implementation does not require IT resources

Combining the opinions those opinions that range from unanimity up to congruence with those that range from mean value 2 (strongly agree) to 1 (agree), the following list of opinion statements represent the common subset that can be considered as elements of best practices and/or common understanding points in RPA implementations:

- I. RPA is a joint IT-business initiative
- II. When cognitive tasks performed by humans participate in the work, RPA cannot be applied
- III. RPA tools are indeed no code – low code software applications.
- IV. The cost-benefit equation for RPA projects can be easily justified.
- V. RPA is preferable over IT implementations for interoperability because it offers very fast implementation
- VI. An RPA expert may supervise up to 20 robots on daily basis
- VII. Before you start RPA projects, it is necessary to agree on the process maps
- VIII. Effort estimations for RPA implementation projects are based on business processes' number of tasks and complexity.
- IX. Only 10% of the people previously needed to execute manually a business process are needed to supervise robots after a successful RPA implementation project.

The next subset of issues that belong either to low deviation or to high mean value score, represent valid points that most of the respondent experts mainly agree upon, but all of the experts share the same experience from their projects:

- X. A Center of Excellence with RPA technology experts is a prerequisite for success for RPA adoption.
- XI. Automatic discovery of business process tasks is a prerequisite for high levels of RPA success.
- XII. Business process management (BPM) tools offer more or less the same functionality with RPA tools
- XIII. For each repetitive, bureaucratic work, a decision must be taken, whether to implement a robot or opt for an applications interoperability project.
- XIV. From a financial point of view, RPA vs IT-built interoperability is a question of operational vs. capital expenditures.
- XV. It is difficult to identify business processes for RPA
- XVI. RPA implementation requires IT resources (most people strongly disagree with Q9, RPA not do require IT)
- XVII. RPA implementations are scalable solutions that can easily upscale to magnitudes of hundred / thousand robots working on the same business process at the same time.
- XVIII. To train a robot, only business users are needed.

Implementers of RPA projects must carefully consider these two lists in order to contextualize appropriately their managerial and organizational decisions.

The rest of the elements questionnaire that didn't scope high in the opinion survey are also important issues to consider, because opinions may be biased towards the specific organizational contexts in which the respondents have run the projects in which they were involved. According to Syed et. al. [2020] support factors for benefits realization, "vary from organization to organization and differ from each other given various business contexts".

Questionnaire 2

Ratings provided by respondents from Questionnaire 2 have been collected and processed to arrive at the following descending order list from the most significant to the least significant barrier in RPA implementations.

	Mean rating	Barriers in RPA implementations
<i>Most significant</i>	2.5	Knowledge gap among end-users and experts
	4.5	In house resource constraints
	4.75	Lack of commitment from top leadership
	6.25	Significant resistance from functional managers
	6.75	Higher costs of implementation then expected
	6.75	Implementation team coordination
	6.75	Unavailability of skilled project people

	7.25	Strategic questions that are answered “as we go”
	7.75	Significant resistance from staff
	7.75	Technical difficulties in set-up and training
	8.5	Turnover of key project persons
	9.5	Difficulties in estimating project time
<i>Least significant</i>	12	Bugs in the software tools for RPA

It is very obvious the IT is not an issue; human, organizational and managerial issues as shown above represent the most significant barriers that need to be removed for RPA projects to be proven successful.

Regarding the importance of objectives for RPA projects that resulted from the processing of the results from the last part of the questionnaire showed the following:

- | | | | |
|--------------------------|-----------------------------------------|------|----------------------------|
| <input type="checkbox"/> | operational efficiency | 1.0 | most significant objective |
| <input type="checkbox"/> | quality of service | 1.50 | |
| <input type="checkbox"/> | easy and fast implementation | 2.50 | |
| <input type="checkbox"/> | improved risk management and compliance | 2.75 | |
| <input type="checkbox"/> | integration with other systems | 3.75 | less significant objective |

Finally, some important aspects for successful RPA implementations have been revealed by the answers of the respondents in the open-ended questions part of the survey.

The number of robots that a person may supervise per day is a key organizational question if RPA implementations are to be deployed at scale. Opinions differ but it seems that around 20 is the most common answer. However, this answer is highly dependent on the operating mode and the correct set-up of the bots. If everything is well defined (not so common as a prerequisite), then from the operations perspective (for example, monitoring the basic ops KPIs (volumes, exceptions, peaks, licenses needs, execution time plan etc.) it is argued that one person can monitor even 50 bots. From a business perspective, the capability of robots for sending a detailed report of how much success or failure cases after finalizing the daily work, is considered a best practice.

A follow-up issue has to do with a common question that arises during the cost-benefit analysis of such projects: what percentage of the people previously needed to execute manually a business process are needed to supervise robots after a successful RPA implementation project? The initial assumption of around 10% seems to be an agreement point for the respondents. One of them said: “Usually, based on my experience, the % of successful management from RPA the processes is between 80%-95%. This means that if you send to RPA 100 cases, then 5-20 cases will not be managed by the bots and a human will have to continue working on them. Of course, you need to add the person(s) who will to supervise the bots as previously explained. So, the assumption of 10% on average is correct. Based on my experience again, we have implemented processes with 99% of exceptions and I have also seen others that started with 80% of success due to systems unavailability and tech limitations but these have progressively

moved to higher success rates. So, a continuous improvement process is necessary to keep on monitoring the bot's performance in almost real-time for corrective actions.”

Regarding whether it is an organizational objective to move all tasks possible to robots or not, the answer has to do with top management decisions. If the organization has chosen to lead by operational efficiency (denoted above as most significant objective for RPA projects), then rapid deployment of RPA implementations is expected with a gradual approach for scaling them up. If there is no such an organizational objective, the move to RPA will be slow and can take 3-4 years to automate business processes, estimating 80-100 medium complex business processes

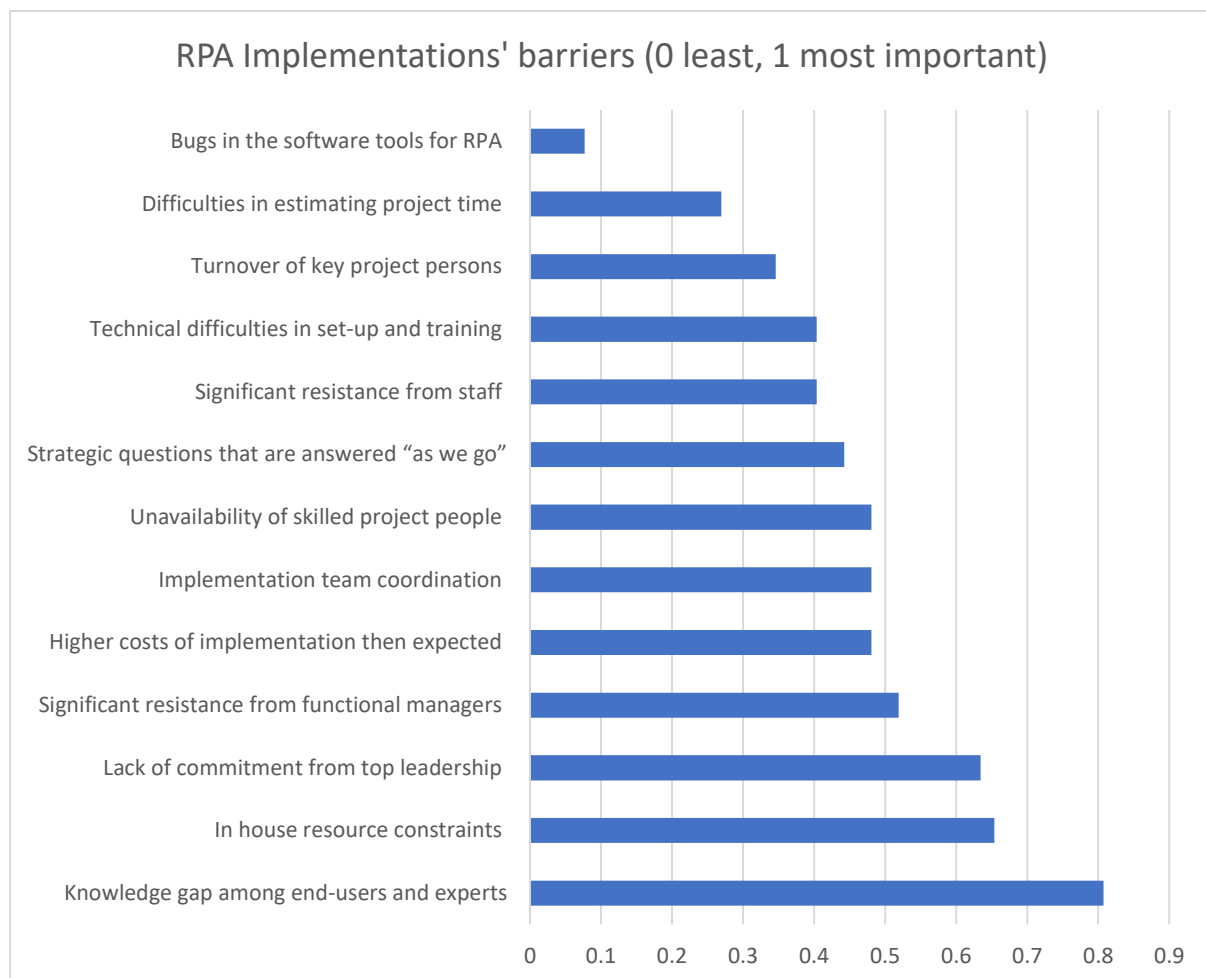


Figure-2 : Barriers in RPA implementations (from least to most significant)

Following the structure of the survey, some more comments are provided on them, using the data collected.

Comments-recommendations

Strategy:

Regarding the strategic issues, answers have shown that an RPA projects is clearly a joint initiative between business and IT. The initiation is sometimes IT driven, in the sense that IT presents such solutions to their business counterparts in order to provide them with solutions

that need not wait the IT backlog of projects; while sometimes it is the business people that have come to know about these solutions and ask for such implementations. Ownership issues do not seem to arise, as IT prefers to restrain itself to the administration of the tools and business users accept the responsibility of maintaining the application according to the changes happening to their business processes. C-level decisions are taken with time-to-market, operational efficiency and effectiveness in mind; RPA projects' decisions seem to be no exception to these.

Staffing & Organizational Aspects:

Process owners may become the initiators of innovation in a company [Bygstad and Iden 2017] and lead RPA projects by involving relevant stakeholder groups to develop software robots according to specific process steps and business requirements [Lacity et al. 2015]. Stakeholder involvement decisions must be based on the specific RPA project goals and must include representatives of all affected functional business areas (e.g. IT, controlling, and human resources). Particularly, cooperation between business and IT functions in developing and deploying software robots is beneficial. XVI finding of our study shows that IT staff is necessary in RPA projects, but if there is lack of such skills in IT, different sourcing alternatives are sought by organizations [Lacity and Willcocks 2016].

According to Hofmann et. al. [2020]: "Since RPA is still a form of IT, it cannot be regarded solely from a business operation perspective; IT personnel (i.e. IT executives, developers, and operators) must be included in the decision process regarding for instance the deployment of and security surveillance over software robots. However, the cooperation between business and IT personnel regarding RPA management will be different compared to conventional IT projects [Fersht and Slaby 2012]. Thus, IT personnel could consider agile methods in their cooperation with process owners. Using agile methods allows one to address business demands compliantly and rapidly. Thus, introducing RPA into a company may lead to the necessity to redesign the (IT) organization regarding agility (Jöhnk et al. 2017)". Strangely enough, the answers for Q15 vary a lot (mean value zero and deviation 1.25) and do not confirm the aforementioned rationale. Trying to identify the reason for this discrepancy, it was made obvious that organizations don't usually start agile with RPA projects, but as they become more mature in these, they tend to follow agile methodologies. So, respondents with experience in more mature organizations replied strongly positive, as opposed to others who disagreed or remained neutral; thus, the deviation in opinions.

Finding X of the study, the need for setting up a Centre of Excellence (CoE), scores quite high in the preferences of the respondents. Few respondents disagree, but as it is found out, the basis of their disagreement was that, according to their experience, IT department was skilled enough, both technically and project management wise, to sustain the continuation and improvement of RPA practice; hence, the need for a CoE was not strong enough for them. CoE is mainly envisaged for maintaining post-implementation activities [Camo et. al, 2021].

Financial Issues

Finding IV of the study "The cost-benefit equation for RPA projects can be easily justified" is aligned with the fact that RPA implementations are less expensive than traditional process automation [Vom Brocke et. al., 2018]; however, question 12 "From a financial point of view, RPA vs IT-built interoperability is a question of operational vs. capital expenditures" did not receive much attention on average (mean value zero, deviation 1). The statistical result didn't

really reflect the underlying consent of many of the respondents on this statement, mainly because some of the respondents had experiences with high software licensing and staffing costs upfront in the project. Nonetheless, most mainly agree that RPA investments tend to be more operational expenses oriented, even more so when organizations continue using it widely rather than for specific, limited implementation.

Conclusions

“So far, guidelines or best practices for benefit realization of RPA deployment (from adoption to delivery) rarely exist. Hence, development of a systematic approach supporting benefit realization of an RPA solution becomes an open issue to address.” [Syed, et. al, 2020] To this end, this study contributes by offering elements of best practices from practitioners in the field with significant experience in RPA implementations, taking into consideration the congruence of their views and the mean value of the respondents’ replies. Data have been collected by means of a Likert scale rating survey organized in a structure of six main themes.

RPA implementations are first and foremost joint business and IT initiatives, with both areas sharing almost equally the burden of success or failure. Organizational, methodological, strategic objectives, knowledge gaps and other managerial issues have to be tackled if the RPA implementations are to achieve their operational excellence and other strategic and tactical goals. Although there are many prerequisites for preparing correctly and setting them up appropriately, the organizational context for such projects as shown by the research results, is of key importance. Continuous monitoring and improvement must be an endless activity, if higher levels of operational excellence are to be achieved. It is expected that the results of this study can help organizations to raise awareness from a managerial perspective on key decisions for arriving at successful RPA implementations.

References

- Anagnoste, S. (2018) Setting Up a Robotic Process Automation Center of Excellence. *Management Dynamics in the Knowledge Economy* (6,2), 307-322.
- Bygstad, B., & Iden, J. (2017). A governance model for managing light-weight IT. In Á. Rocha, A. M. Correia, H. Adeli, L. P. Reis, & S. Costanzo (Eds.), *Recent advances in information systems and technologies*, 384–393. Springer International Publishing.
- Lamberton, C. (2016) *Get ready for robots – Why planning makes the difference between success and disappointment*, EYGM Limited, United Kingdom
- Camo, H., Harnesk, S., & Grufman, N. (2021). *Implementation of Robotic Process Automation: A case study of issues, challenges and success factors for RPA implementation in banking and financial services*. Master Thesis. Upsala University. <https://www.diva-portal.org/smash/get/diva2:1579503/FULLTEXT01.pdf>
- Denagama Vitharanage, I. M., Bandara, W., Syed, R., & Toman, D. (2020). An empirically supported conceptualisation of robotic process automation (RPA) benefits. In *Proceedings of the 28th European Conference on Information Systems (ECIS2020)*. Association for Information Systems.
- Fernandez D., Aman A. (2018) Impacts of Robotic Process Automation on Global Accounting Services. *Asian Journal of Accounting & Governance*, (1,9) 123–131.
- Fung, H.P. (2014) Criteria, use cases and effects of information technology process automation (ITPA). *Advances in Robotics and Automation* (3), 124.

- Herm, V., et al. (2020). A Consolidated Framework for Implementing Robotic Process Automation Projects. in D. Fahland et al. (Eds.): *BPM 2020*, LNCS 12168, 471–488, Springer International Publishing.
- Hofmann, P., Samp, C., & Urbach, N. (2020). Robotic process automation. *Electronic Markets*, 30(1), 99-106.
- Houy, C., Hamberg, M., & Fettke, P. (2019). Robotic process automation in public administrations. Michael Räckers [et al.] (Hrsg./editor): *Digitalisierung von Staat und Verwaltung Lecture Notes in Informatics (LNI)*, Gesellschaft für Informatik, 62-74.
- Jones, K. (2017) May the bots be with you: RPA for HR. *Workforce Solutions Review*. July-September, 39-40.
- Kevin C. Moffitt, Andrea M. Rozario, Miklos A. Vasarhelyi; Robotic Process Automation for Auditing. *Journal of Emerging Technologies in Accounting*, July 2018, 15 (1): 1–10.
- Kulisiewicz, T., & Sobczak, A. (2018). Robotic Process Automation Current State, Expectations and Challenges. In *Proceedings-11th International Conference on Management, Enterprise and Benchmarking (MEB 2018)*, 201-213. Óbuda University, Keleti Faculty of Business and Management
- Lacity, M., & Willcocks, L. P. (2015). Robotic Process Automation: The Next Transformation Lever for Shared Services. London School of Economics Outsourcing Unit Working Papers (7).
- Lacity, M., & Willcocks, L. (2016). A new approach to automating services. *MIT Sloan Management Review*, Fall.
- Lok, C. P. (2021). *Critical Success Factors for Robotic Process Automation Implementation* (Doctoral dissertation, Auckland University of Technology).
- Money, W. H. (2021). Resolving Pressure and Stress on Governance Models from Robotic Process Automation Technologies. In *Proceedings of the Conference on Information Systems Applied Research* ISSN (2167), 1508.
- Noppen, P. V. (2019). *The Qualitative Impact of Robotic Process Automation* (Master's thesis).
- Osmundsen, K., Iden, J., & Bygstad, B. (2019). Organizing robotic process automation: balancing loose and tight coupling. In *Proceedings of the 52nd Hawaii international conference on system sciences*.
- Padmini, K. J., Perera, G. I. U. S., Bandara, H. D., & Silva, R. O. H. (2021). A Decision Support Tool to Select Candidate Business Processes in Robotic Process Automation (RPA): An Empirical Study. In *Inventive Computation and Information Technologies*, 567-582. Springer, Singapore.
- Rutaganda, L., Bergstrom, R., Jayashekhar, A., Jayasinghe, D., & Ahmed, J. (2017). Avoiding pitfalls and unlocking real business value with RPA. *Journal of Financial Transformation*, (46), 104-115.
- Stople, A., Steinsund, H., Iden, J. and Bygstad, B. (2017) : Lightweight IT and the IT function: experiences from robotic process automation in a Norwegian bank. Paper presented at *NOKOBIT 2017*, Oslo, 27-29, vol. 25, no 1, Bibsys Open Journal Systems, ISSN 1894-7719
- Syed, R., Suriadi, S., Adams, M., Bandara, W., Leemans, S. J., Ouyang, C., ... & Reijers, H. A. (2020). Robotic process automation: contemporary themes and challenges. *Computers in Industry*, (115), 103162.
- Tronstad, L., Becke, R., & Aasgaard, G. (2016). Robotic Process Automation. Retrieved from <http://www.nokios.no/2016/presentasjoner/s3a-robotic-process-automation.pdf>
- Willcocks, L., Hindle, J., & Lacity, M. (2018). Keys to RPA success. Executive Res. Rep., Knowl. Capital Partners, USA, Tech. Rep. Available here:

https://www.blueprism.com/uploads/resources/white-papers/KCP_Summary-Executive_Research_Report_Final.pdf

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.

APPENDIX***SURVEY – QUESTIONNAIRE PART I (FORWARD QUESTIONS)***

1. You are familiar with RPA
2. Before you start RPA projects, it is necessary to agree on the process maps
3. RPA is a joint IT-business initiative
4. RPA execution needs human supervision on a daily basis as a full time job
5. A RPA expert may supervise up to 20 robots on daily
6. It is difficult to identify business processes for RPA
7. RPA projects aim mainly at complex business processes with many different information systems involved in the process
8. When cognitive tasks performed by humans participate in the work, RPA cannot be applied
9. RPA implementation does not require IT resources
10. RPA tools are easy to use and do not require developer skills
11. RPA is preferable over IT implementations for interoperability because it offers very fast implementation
12. From a financial point of view, RPA vs IT-built interoperability is a question of opex vs. capex.
13. RPA is mainly a cost-cutting tool (in terms of human FTEs) rather than anything else.
14. Business process management (BPM) tools offer more or less the same functionality with RPA tools
15. New RPA implements need to be organized as project teams and agile methodologies from IT apply.
16. For each repetitive, bureaucratic work, a decision must be taken, whether to implement a robot or opt for an applications interoperability project.
17. To train a robot, only business users are needed.
18. Effort estimations for RPA implementation projects are based on business processes' number of tasks and complexity.
19. RPA implementations are scalable solutions that can easily upscale to magnitudes of hundred / thousand robots working on the same business process at the same time.
20. Unattended execution is reliable and humans are involved only to check results
21. Automatic discovery of business process tasks is a prerequisite for high levels of RPA success.
22. RPA tools are indeed no code – low code software applications.
23. The cost-benefit equation for RPA projects can be easily justified.
24. A Center of Excellence with RPA technology experts is a prerequisite for success for RPA adoption.
25. Only 10% of the people previously needed to execute manually a business process are needed to supervise robots after a successful RPA implementation project.
26. Ownership of the RPA applications is clearly given to business owners of the relevant business processes, rather than to RPA experts or IT.

SURVEY – QUESTIONNAIRE PART II (REVERSE QUESTIONS)

1. RPA is driven by business users only? (PI-Q3)
2. There is no prerequisite for starting an RPA project. (PI-Q2)
3. Humans cannot supervise more than 20 robots per day (PI-Q5)
4. Business user may easily find where to apply RPA (PI-Q6)

5. RPA teams prefer to implement projects for business processes with a few steps (PI-Q7)
6. Human knowledge cannot be embedded into an RPA implementation (PI-Q8)
7. IT is not involved at all in an RPA implementation (PI-Q9)
8. An business user may implement a project using RPA tools without any other assistance (PI-Q10)
9. RPA requires gradual investments as opposed to IT projects which are mainly incurring costs up-front. (PI-Q12)
10. Time-to-market is a main advantage of RPA implementations (PI-Q11)
11. RPA is not error-prone and thus it is a quality management tool mainly (PI-Q13)
12. When using RPA tools, there is no need to invest in tools for business process management as well (PI-Q14)
13. Implementation of new RPA is a business as usual situation for business users (PI-Q15)
14. IT has to implement new applications only, whereas RPA is the only choice for fast applications coordination for business processes (PI-Q16).
15. RPA experts as well as business subject matter people cooperate to train a robot (PI-Q17)
16. Attended robots perform better results since humans may decide upon specific tasks to be executed according to their cognitive judgement.

SURVEY PART III – OPEN QUESTIONS

1. How much robots may a human supervise per day?
2. It is an organizational objective to move all tasks possible to robots or it is a gradual approach?
3. Only 10% of the people previously needed to execute manually a business process are needed to supervise robots after a successful RPA implementation project.
4. Please rate the importance of objectives for RPA projects (1 most significant, 2 less and so on)
 - operational efficiency,
 - quality of service
 - easy and fast implementation
 - integration with other systems
 - improved risk management and compliance