# Business Process Automation in SMEs

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**Abstract.** Business Process Automation has been gaining increasing importance in the management of companies and organizations since it reduces the time needed to carry out routine tasks, freeing employees for other more creative and exciting things. The use of process automation seems to be a growing trend in the business's operational restructuring, combined with digital transformation. It can be applied in the most varied business areas. Organizations from any sector of activity can also adopt it. Given these benefits, the granted success in transforming business processes would be expected. However, 30 to 50% of automation initiatives with Robotic Process Automation technology fail. In this work, a set of guidelines will be proposed that will constitute, after validation, a framework capable of guiding organizations, with a focus on SMEs, in the procedure of automating their processes, thus obtaining the maximum return of this transformation.

**Keywords:** Business Process Automation · Framework · Robotic Process Automation · Business Process Management · Digital Transformation

## 1 Introduction

The COVID-19 pandemic context accelerated Digital Transformation (DT) because companies and organizations have reinvented how they act in the market to continue providing services and products to customers and users [1]. There are about 22.6 million Small and Medium-sized Enterprises (SMEs) in European Union. Of those, 34% have already adopted digital technology, 24% recognize that they need a digital tool, 10% consider adopting advanced digital technology, and 8% have the same perception as the previous group. However, due to a lack of digital literacy or funding, they do not know which one will be the most appropriate [2].

Business process digitalization can involve automation. For Zaoui and Souissib [3], DT is a current theme with enormous importance for companies in all sectors of activity because it changes the relationship with customers, suppliers, and human resources and alters the value creation process. Gartner [4] mentioned that in 2021 (given the pandemic context), the use of process automation technologies would be an essential topic (90% of large companies worldwide would adopt this technology by 2022), with increasing importance for companies and the economy in general. These process automation technologies will automate critical business processes, freeing employees from the manual effort for other tasks [4].


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Business Process Management (BPM) becomes essential for the constant improvement of the efficiency and effectiveness of an organization [5]. Chakraborti et al. [6] define BPM as a multidisciplinary area that includes business process management, modelling, automation, execution, control, measurement, and optimization. BPM sees the company as a whole, involving activity flows (process workflow), systems and people involved, internal and external to the organization [6]. Wewerka and Reichert [7] recognize the importance of BPM in the business process digital lifecycle, involving all its participants and information systems. Due to the evolution of changing contexts, the authors point out that business processes must be adaptable, efficient, and with low costs; in short, companies increasingly need a greater degree of business process automation to remain competitive.

In the definition of the concept of BPM, suggested by Wewerka and Reichert [7], process mining appears as a sub-discipline of BPM where the discovery of business processes, compliance verification, and data analysis are carried out. This sub-discipline also helps discover processes for automation. It can contribute to BPM projects by surveying the as-is scenario, in short, the current state of the organization's business processes [7]. BPM can be adopted in numerous areas present in the organizational structure [8]. Despite its broad spectrum of use in the business area and the processes eligible for adoption, it is always essential to check its adaptability, suitability, and the return that comes from this change since this adoption can translate into a paradigm shift in the way the business works.

New technologies allied to BPM allow new ways of working, affecting humans, which can cause some fears regarding jobs and the lack of knowledge of the technology itself [5]. The technologies capable of being disruptive, changing and improving business processes, are Blockchain, Robotic Process Automation (RPA), Artificial Intelligence (AI) [5, 9], IoT, process mining, reality virtualization, and 4D printing [9].

Chakraborti et al. [6], Stravinskienė and Serafinas [5], and Wewerka and Reichert [7] mention RPA technology as being essential in BPM and Business Process Automation (BPA). They complement each other [7]. While BPM provides companies with actual knowledge about their business processes and workflows, RPA is concerned with developing bots whose function is to imitate human interaction with information systems [7]. According to Ahuja and Tailor [10], the term RPA came into force in the vocabulary of organizations in 2000, yet, its development began in 1990. Bhatnagar [11], Chakraborti et al. [6], Siderska [12], Syed et al. [13], Siderska [14], Wewerka and Reichert [7], and Puica [15] consider RPA an advanced/emerging technology that through software automates routine and rule-based tasks, previously performed by humans. Despite all the benefits and positive effects that process automation with RPA brings to organizations, applying this type of technology is not always successful. According to Stravindkiené and Serafinas [5], 30 to 50% of RPA initiatives fail.

Given the general benefits of adopting business process automation tools, there are various reasons automation can fail. Stands out in the assessment of the process of digitalization, its documentation, its maturity, in short, the assessment of digital readiness; there is also the doubt in choosing the ideal process to automate; lack of knowhow about the automation technology in the organization; and lack of knowhow about the implementation methodology. These reasons and the references are presented in Table 1.

**Table 1.** Reasons for automation to fail.

| Reason | References |
|---|---|
| The assessment of digital readiness | Romão et al. [16]; Hofmann et al. [17]; Siderska [12]; Syed et al. [13]; Siderska [14]; Yatskiv et al. [18]; Flechsing et al. [19]; Ng et al. [20]; Puica [15]; Sobczak [21] |
| Doubt in choosing the ideal process to automate | Ansari et al. [22]; Asquith and Horsman [23]; Auth et al. [24]; Mishra et al. [25]; Romão et al. [16]; Sobczak [21]; Chakraborti et al. [6]; Sobczak [26]; Hindel et al. [27]; Hofmann et al. [17]; Leite et al. [28]; Patri [29]; Rizk et al. [30]; Siderska [12]; Syed et al. [13]; Yatskiv et al. [18]; Choi et al. [31]; Flechsing et al. [19]; Sobczak [32]; Puica [15] |
| Lack of knowhow about the automation technology in the organization | Ansari et al. [22]; Dey and Das [33]; Mishra et al. [25]; Reddy et al. [34]; Sobczak [26]; Dechamma and Shobha [35]; Hindel et al. [27]; Hofmann et al. [17]; Patri [29]; Rizk et al. [30]; Sethi et al. [36]; Yatskiv et al. [18]; Choi et al. [31]; Flechsing et al. [19]; Zhang et al. [37]; Sobczak [21] |
| Lack of knowhow about the implementation methodology | Ansari et al. [22]; Sobczak [26]; Hindel et al. [27]; Hofmann et al. [17]; Sobczak [32]; Zhang et al. [37]; Sobczak [21] |

There are still gaps in the implementation of the automation process, like a lack of guidelines/roadmaps for RPA adoption; definition of formal techniques for choosing target processes for automation; definition of metrics for measuring the benefits achieved with RPA; and definition of critical factors for success in automating and their implications, among others gaps in the literature. The most cited gaps and the references are listed in Table 2.

**Table 2.** Gaps in the implementation of the automation process.

| Gap | References |
|---|---|
| Lack of guidelines/roadmaps for RPA adoption | Mishra et al. [25]; Sobczak [26]; Ahmad and Van Looy [9]; Enríquez et al. [38]; Hofmann et al. [17]; Siderska [12]; Syed et al. [13], Flechsing et al. [19]; Wewerka and Reichert [7]; Puica [15]; Sobczak [21] |
| Definition of formal techniques for choosing processes for automation | Ansari et al. [22]; Mishra et al. [25]; Ahmad and Van Looy [9]; Patri [29]; Syed et al. [13]; Choi et al. [31]; Puica [15] |
| Definition of metrics for measuring the benefits achieved with RPA | Mishra et al. [25]; Hofmann et al. [17]; Syed et al. [13]; Stravinskienė and Serafinas [5] |
| Definition of critical factors for success in automating and implications | Sobczak [26]; Ahmad and Van Looy [9]; Hofmann et al. [17]; Syed et al. [13]; Siderska [14] |

Combining the factors that contribute to the failure in the procedure of process automation and some existing weaknesses in research in this area, one can assume that, a roadmap (framework) that guides this entire process, from the as-is study, the to-be study, adoption, and follow-up (guidelines/roadmaps for process automation), is necessary.

So, this work aims to propose creating a framework (guidelines) that can answer the main research question: *what methodological support can be given to SMEs for successfully adopting process automation tools?* Based on the previous question, five research questions were formulated:

1. How to typify the processes to be automated?
2. What are business process automation's main barriers, risks, and limitations?
3. What are the leading technologies/tools to support business process automation?
4. What guidelines exist to support process automation in an organization?
5. How to evaluate the success of business process automation?

## 2 Framework/Guidelines Design

### 2.1 Design Science Research

The Design Science Research (DSR) methodology, using the model developed by Peffers et al. [39], was chosen to accomplish the goal of this work, whose main objective is creating and evaluating new technological artefacts that help organizations deal with technological problems [40]. So, Table 3 illustrates the goal of this work, using the DSR model of Peffers et al. [39]. It should be noted that the mentioned artefact will be the final product of this research, the support framework for SMEs to carry out the automation procedure of their processes minimizing the risks involved to maximize the positive effects of this change.

### 2.2 Formal Methodology for Business Process Automation (FM4BPA)

Business Process Automation (BPA) and Business Process Management (BPM) are related. At least four pillars form BPM and BPA ecosystem (Fig. 1): Human Resources, Business Process, Technology and Business Strategy. In these four sectors, there are some concerns that we must address in the FM4BPA:

1. Business Strategy – Is automation proper for the business? What does the organization have to do to apply automation? Will automation change the business model?
2. Human Resources – Human is the essential capital in the business core. Human Resources must be involved in the procedure of BPM and BPA from the beginning;
3. Business Processes – Materialization of business strategies. List of existent processes? Which one is a candidate for automation? Is there already BPM?
4. Technology – How automate? Which tool does the enterprise have to use to maximize outcomes?

**Table 3.** DSR Model of Peffers et al. [39] applied to this work.

| Activity of the DSR Model | Description |
|---|---|
| 1. Problem identification and motivation | Understand why automation fails;<br>How to help SMEs in the BPA process so they achieve success in the procedure |
| 2. Define the objectives for a solution | A framework/guidelines will be proposed and validated for automation in SMEs |
| 3. Design and development | "*Formal Methodology for Business Process Automation*" (FM4BPA) will be the artefact developed to overcome the difficulties of SMEs in their BPA procedure. FM4BPA will describe all steps and provide tools for successful automation |
| 4. Demonstration | FM4BPA will be applied in SMEs that are in automation process or intend to start one. At least five companies will be invited to use FM4BPA in their automation procedure |
| 5. Evaluation | Questionnaires (with close answer questions) and case studies will be conducted with SME employees to collect data to analyze the suitability of the developed artefact<br>Case studies will help validate if all the steps are in the FM4BPA, and questionnaires will measure the success of the artefact. The possible answers will be defined on a scale of 1 to 5. The success will be calculated with the medium of the responses. If the result is less than 2, FM4BPA is not adequate. Suppose the result is between 2,01 and 4; FM4BPA is partially adequate and helpful. If the result is more than 4 FM4BPA is adequate and helpful |
| 6. Communication | This work will be communicated in the form of papers submitted to relevant conferences in the area and scientific journals, culminating with the thesis document |

These pillars have relations and are interdependent. They must be in the same direction. BPM and BPA have cycle characteristics. The study of processes and their management are a continuous effort in the organization to optimize its resources [5]. The automation focus appears on the execution stage in the BPM cycle (see Fig. 2).

Five phases form the BPM cycle [6, 7]: Design, Modelling, Execution, Monitoring and Optimization. These phases are cycle and sequential (Fig. 2).

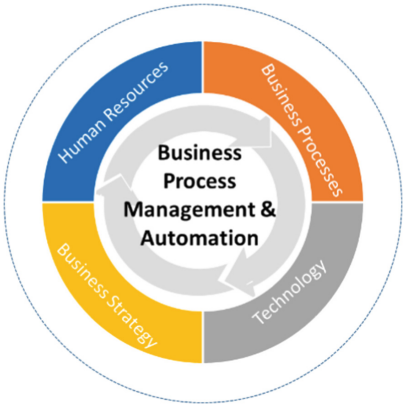


**Fig. 1.** BPM and BPA ecosystem.

1. Design – Identify the current business process and design of the proposed change and break the process down into multiple tasks;
2. Modelling – What if analysis to model change is proposed on multiple variables?; Model process using suitable BPM software?; As-is model to be in the future (to-be scenario);
3. Execution – Use of software to track and manage; Execute the process, or put a system in place; Integration and automation;
4. Monitoring – Keep track of completion level of changes and effectiveness; Monitor and analyze the system; KPIs;
5. Optimization – Identify problems and opportunities and apply changes for more significant cost savings and efficiency; Make changes to the business process to improve it.

Van der Aalst [41] proposed that BPM be implemented in three phases: design or redesign of the process, its implementation, and its execution and adjustment. Other authors follow roughly the same lifecycle, with more or less detail than others.

In the design phase, the understanding and analysis of the functioning of the process are carried out, which tasks are done, the roles of its stakeholders, that is, the process mining, and the description of the current state (as-is model) of the organization [7, 9, 42]. In the second phase of the BPM cycle, modelling is responsible for the graphic description, through BPMN (Business Process Management Notation), of the to-be scenario if improvements have been detected to be carried out in the previous phase [42]. In this description, weaknesses are analyzed, tasks are restructured, weaknesses are eliminated, and opportunities for improvement are mentioned [42].

The execution phase follows, the modelling implementation occurs, and the characterized tasks are automated [42]. The monitoring phase is responsible for verifying compliance with the established objectives. It detects errors, anomalies, or deviations from the objectives, through the verification of the Key Performance Indicators (KPI) that have been defined to quantify the impact of automation [42]. The cycle ends with

the optimization phase, where, through the analysis of KPIs, new measures are drawn up for future improvements in the process, always with the objective of optimization [42].

Wewerka and Reichert [7] indicate that, as a consequence of the constantly changing context of our world, business processes must be adaptable, efficient, and with low costs. In short, companies increasingly need a greater degree of business process automation to remain competitive.

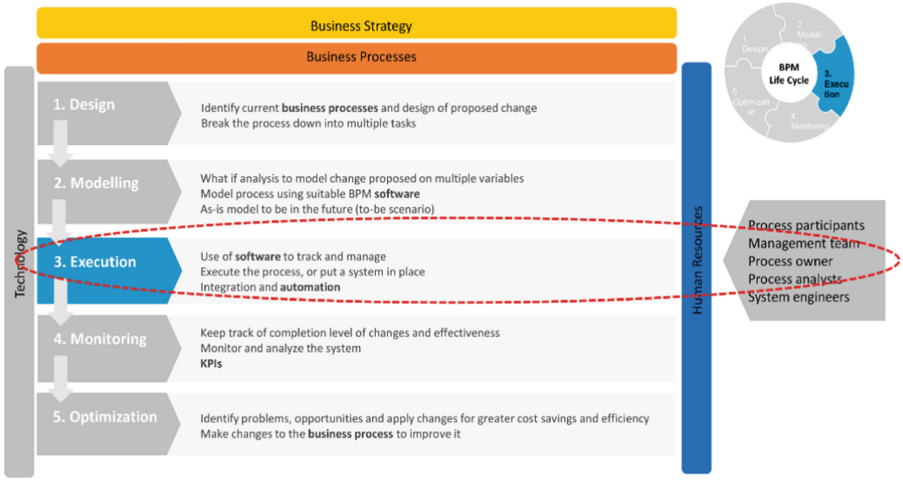


**Fig. 2.** BPM cycle with the four pillars from their ecosystem [5–7, 41]

Figure 2 complements the BPM cycle with four pillars of the ecosystems and calls our attention to the nomination of five actors (pillar of Human Resources) important to the automation procedure: process participants, management team, process owner, process analysis, and system engineers.

*Integration and automation* are mentioned in the execution (third step of the BPM cycle). This is related to integration with other systems or processes related to the study process. Automate the process with a software tool. At this point, a *Formal Methodology for Business Process Automation* (FM4BPM) appears (Fig. 3).

The automation life cycle includes six steps [43]: 1. *Identify processes for automation*; 2. *Design and optimization of the process*; 3. *Verification of the digital readiness*; 4. *Selection of the automation technology/tool*; 5. *Automation implementation*, and 6. *Solution governance.* Step 2 is a cycle task since optimization and design of process must be a concern, with the high performance of automation as a goal.

In each of the steps, some issues must be considered (Fig. 4). So, in step 1 we have to verify the scenario as-is and project a to-be, and choose processes that are more suitable for automation. In this step, we want to propose a *checklist with the characteristics of candidates for automation.* With this tool, we can help the correct identification of processes for automation. As an output of step 1, we have the delivery of the ranking list of the processes to automate. In this phase, we think it is important and necessary to include stakeholders to help the process mining in the organization.

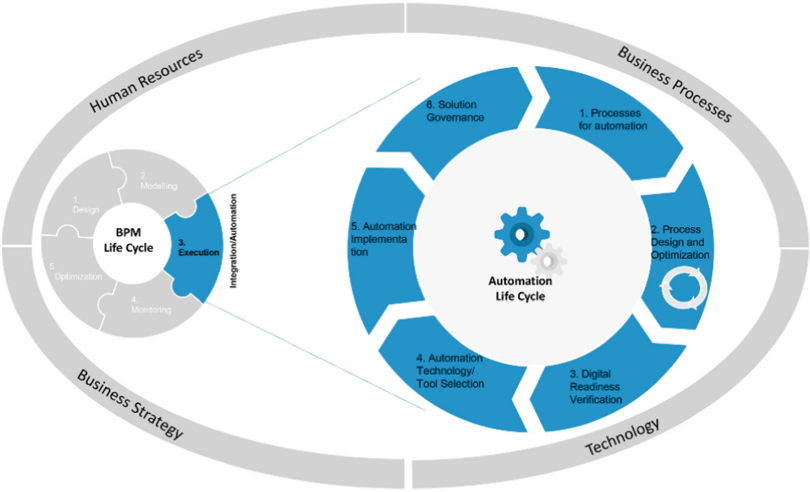


**Fig. 3.** Formal Methodology for Business Process Automation (FM4BPA)

One of the most critical and time-consuming tasks in step 2 is to analyze the process and optimize (remember the cycle characteristic and its goal). The detail of the process and its optimization can be found in the output of step 2.

It is considered essential to define also the KPIs (Key Performance Indicators) because we must know how automation affects the process (compared to as-is scenarios and KPIs before automation).

Digital readiness is the concern in step 3. We want to develop a *checklist with the digital characteristics for automation.* Is the process digitalized? If not, is it possible? What are the changes? If a process is ready for automation, the organization can choose the automation technology/tool (step 4 of FM4BPA).

FM4BPA defines a *matrix that relates processes automation requirements versus technology characteristics*. Step 4 delivers a *list of process requirements* and *the tool for the implementation of the automation.* In step 4, system engineers must be included in the IT governance and architecture-related tasks.

The focus in *automation implementation* (step 5 of FM4BPA) is the materialization of the choices made in the previous steps, the process, its design, its study, its requirements and a computer tool to support automation. At least six tasks are essential in this step: focus on the responsibilities of each human resource; installation and configuration of the technology/tool; training of the participants in processes; automation process design in the tool; implementation of solution; and test.

Lastly, step 6 *solution governance* aims to *monitor and analyze the effectiveness of the adopted solution* (with evaluation dashboards with KPIs (before and after automation) and the list of processes requirements); to concern the *security/RGPD and privacy* of the solution; *dealing with errors and exceptions*, and *scalability and balance resources.*

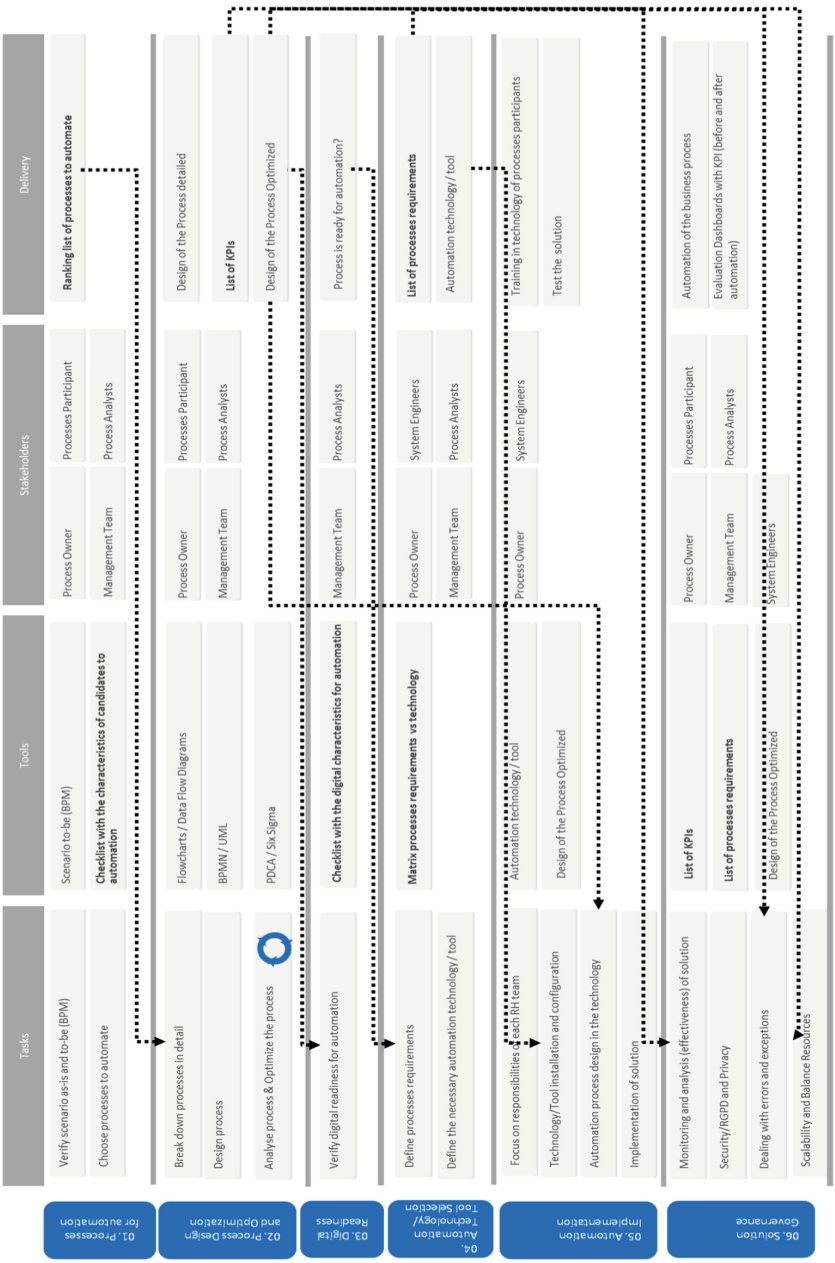


**Fig. 4.** FM4BPA detail with tasks, tools, stakeholders and deliveries

## 3 Final Considerations

Process automation using supporting technologies has been an excellent driving factor in the digital transformation of organizations [30]. It is a significant technological evolution in which emerging software platforms are already in a very acceptable state of maturation and are already scalable, reliable, and resilient [11].

The benefits and the challenges of adopting process automation technologies were well stated in this paper. We concluded that there are several theoretical benefits that automation can add to organizations. We believe that the challenges are being addressed. Namely, the question of discovering the critical processes for automation and the concern with the social and human aspects that technologies can influence becomes evident. This concern is significant because a process that transforms the paradigm of organizational functioning cannot forget its human capital. Human resources are a significant part of the core ecosystem.

This document draws attention to those challenges. With the research and investigation into the issue of guidelines/roadmap for the adoption of automation, covering the entire procedure, especially in SMEs, it is intended that part of the challenges demonstrated here will be overcome.

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