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The perception of the management and lower-level employees of the impacts of using Robotic Process Automation: the case of a shared services company

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Abstract

The increasing use of digital technologies has allowed organizations to improve their business processes, enhancing the productivity and efficiency of their operations. The implementation of Robotic Process Automation (RPA), a technology that allows replicating human actions in existing systems, given its benefits, can play an important role in achieving this goal, often referred as the digital transformation of organizations. However, the benefits of RPA implementation may not be perceived equally by managers, those responsible or that required its implementation, and lower-level employees. The work described in this paper aims not only to assess the perception that both groups have of the impacts of technology, but also to understand whether the use of robots by the employees of a shared services company positively influences their perception of the technology and whether it affects developments in additional robots in the future. A questionnaire, underpinned in a multidimensional evaluation model of the technology and given to all the company's employees, is used as the main research instrument, while results are analysed and interpreted using descriptive statistical techniques and hypothesis testing. We argue that this study may be an important contribution to the company for a better understanding of its employees' perception of RPA, allowing the tailoring of its future communication strategies to facilitate the acceptance of the technology and, thus, enhance the success and effectiveness of its implementation. Furthermore, the multidimensional evaluation model developed enhances the existing literature on the topic of RPA impacts, more specifically in terms of evaluating possible differences in perceptions between managers and other employees.

Keywords: Robotic Process Automation; Digital Transformation; RPA impact.

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1. Introduction

The increasingly widespread use of digital technologies has transformed organizational models and structures, products and business processes in organizations. These changes, that is, the process of improving an entity through changes induced by digital technologies, also called digital transformation, has revolutionized not only organizations but also entire sectors of activity [1, 2, 3]. Indeed, organizations from different sectors of economic activity have carried out several initiatives, including hiring specialists and creating digital transformation departments, with the aim of exploring and obtaining benefits from new digital technologies [4, 5, 6]. These tools have allowed organizations to improve their business processes, increasing their efficiency or reducing costs. In fact, in order to remain competitive, organizations need to constantly improve their productivity and the efficiency of their operations, namely through the adoption of new technologies, new methodologies and the reengineering of their business processes. The implementation of Robotic Process Automation (RPA), being a technology that allows replicating human actions in existing systems and defined as the use of software to automate repetitive, routine business processes, can play a key role in the digitalization of organizations [1, 2, 7].

Given its potential to boost companies' productivity, reduce operating costs, reduce errors and increase the speed and quality of work, RPA has gained a lot of popularity and corporate attention, and it is often referred as one of the most relevant concepts and of greater growth in the current business context [8, 9, 10]. Despite this, companies are still far from exploring all the opportunities that automation provides and there is a large margin for progression [11]. According to a forecast by Gartner [12], by 2022, 90% of large organizations worldwide will have adopted RPA and by 2024, large organizations will triple their RPA portfolio. Another study conducted by Fortune Business Insights [8], estimates that by 2026 the global RPA market will amount to 6,81 billion dollars.

Beyond the fact that RPA is as an area of growing business interest, it has also aroused academic interest, being an extremely trending topic. Nevertheless, due to the emergent nature of the technology, the volume of literature on the subject is not extensive, nor does it address all issues of its use [1, 13, 14]. In this regard, Nauwerck and Cajander [14] argue that research on RPA has not taken into account the perspective of company employees; Enriquez et al. [15] launch a challenge to investigate the impact of RPA, not only on companies, but also on their employees, and Hofmann et al. [9] reinforce the existing gap with the need to understand not only the impacts but also the employees' perception of RPA. While a study performed by Cooper et al. [16] in 4 large international accounting companies has compared the managers' perception of the impact of using RPA with the remaining employees, this paper intends to follow a similar line of research, going, however, further in deepening the problem and trying to assess whether the perception of the impacts of RPA influences the request for new automations.

1.1. Research objectives and main contribution

The following main research issue will be addressed, using the case of a shared services company (MESP) of a multinational group of companies based in Portugal: *What is the perception of management and other employees of the impacts of using RPA?*

Other secondary objectives are also intended to be achieved, namely to assess whether the use of robots by MESP employees positively influences their perception of the impact of RPA and whether this perception affects future developments. Hence, two hypotheses are set that will be validated:

- Hypothesis 1: the use of robots by employees in their work activities positively influences their perception of the impacts of RPA.
- Hypothesis 2: employees' intention to use more robots in the future is positively related to their perception of RPA impacts.

The work reported in this paper, in addition to contributing to the enrichment of knowledge in the emerging area of RPA, aims to address the human aspects of the impact of implementing this technology. It is envisaged that the study of this dimension can help companies to define strategies that facilitate the acceptance of the technology and that consequently lead to the success and effectiveness of its implementation [16, 17, 18].

2. The case: A shared services company

2.1. The use of RPA in MESP

MESP is the shared services company of the Mota-Engil Group, a multinational Portuguese-based group of companies in the sectors of civil construction and infrastructure management. MESP supports the services of several companies of the group in areas such as Accountability, Treasury, Accounting, Financial Services and Human Resources. The RPA technology was introduced in 2017 at MESP, and the company was highlighted by its then president as “an internal leader of the group in the adoption and development of the technology”.

UiPath was chosen as the RPA software platform and, in 2018, the initial training of the RPA team and selection of pilot processes took place. By 2019, the company had already robotized more than 30 activities in areas such as Accounting, Reporting, Treasury, Master Data, Reconciliations and Human Resources, representing a saving of working hours of 5 FTE per year [19].

2.2. Robots and dashboards

Currently, with a reference date of 31-12-2021, and according to the RPA report produced by the company [20], MESP has 7 RPA licenses (3 development, 1 unattended and 3 attended) and 53 processes performed with robots, with periodicities as diverse as daily, bi-daily, weekly, monthly, bi-monthly or on request, distributed by the areas of Accountability, Base Services, Accounting, Management Control, Treasury, Human Resources or other group companies.

MESP monitors the performance of the implemented robots since, although they do not make errors if they are well parameterized, there may be failures in their execution mainly motivated by situations related to the systems or processes. For example, as it would happen with a human, if a computer system is inaccessible, or if a process deletes a file used by the robot, it will not be able to carry out its actions, recording this fact and reporting the situation to the process manager. During the year 2021, the different robots executed 5201 times, in a total of 2247 hours of execution, having reached a performance of 90%. These KPIs are shown on the robots’ performance dashboard (Fig. 1a).

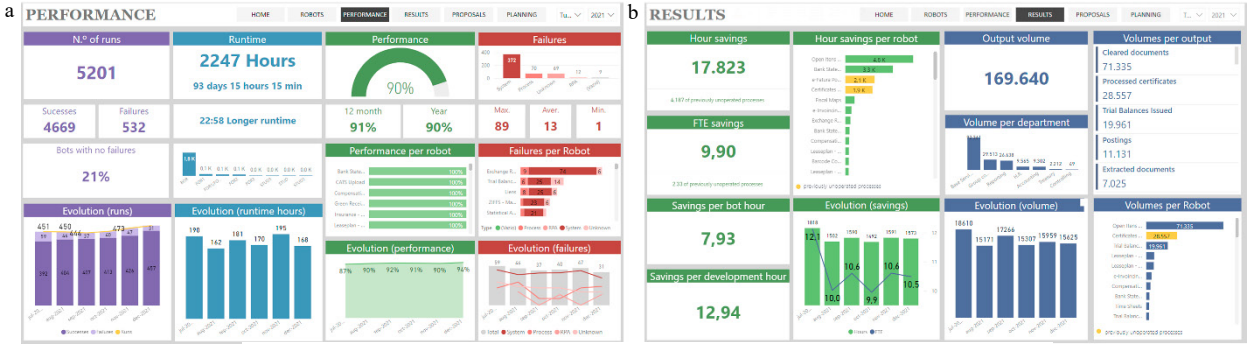

Fig. 1. (a) MESP robots’ performance dashboard; (b) MESP robots’ results dashboard.

Regarding the results obtained, the robots used allowed the company to save, in 2021, 17823 hours of work (4187 from processes previously not operationalized, that is, from tasks that only started to be done with the help of RPA), corresponding to a saving of 9,90 FTE (Fig. 1b). It is also worth noting that, in the same period, for each hour of running a robot, the company saved 7,93 hours and for each hour spent on development, 12,94 hours were saved. In terms of volumes, as a result of the robots' activity, MESP obtained a total of 169640 outputs, namely 71335 documents cleared in current accounts and 19961 balance sheets issued (Fig. 1b). The robots produced outputs as different as accounting entries, invoices issued, pawns dealt with, bank statements obtained and integrated, reconciled accounts, tax statements, data integrated into systems, various analyzes carried out, and controls and reports produced.

3. Empirical study

3.1. Questionnaire developed

In order to study the perception of management and other MESP employees of the impacts of the use of RPA, a questionnaire entitled "Perception of the impacts of the use of RPA" was developed. The questionnaire, available online in https://forms.office.com/r/igAC7r2LTE, was organized into 3 parts:

i. Questions about the general characteristics of respondents;
ii. Questions about respondents' relationship with RPA;
iii. Questions related to the perception of the impacts of using RPA.

The first part of the questionnaire (Part I – General Data) aimed at collecting sociodemographic and organizational data, which would allow characterizing the sample and which could be used to verify the respective influence on the answers given. These data include age, gender, length of service in the company, level of education, level of digital literacy, the role performed in the company and the respective area of work. The question related to the function performed was considered to allow differentiating the perceptions of management from the perceptions of the other employees.

The objective of the second part of the questionnaire (Part II – Relationship with RPA) was to assess the relationship of the respondents with the RPA technology. The question "Are you aware of what RPA is?" (Question 8) was used as a filter question, since it would not make sense to obtain the perception of the impacts of the use of RPA in the company by respondents who did not know the technology. The questions "Indicate the sentence that best suits your position regarding RPA" (question 9) and "Indicate how many robots are used in your work" (question 10), the latter only for those who effectively use RPA in their work, were used to validate the hypothesis raised (Hypothesis 1, cf. Section 1.1) that the use of robots in the activities of respondents positively influences their perception of RPA.

Furthermore, a question was introduced (question 11) to assess the involvement of respondents in the process of implementing robots in their area, allowing those who answered affirmatively to specify the corresponding stages of involvement (question 12), namely "request for robotization", "analysis of the process to be robotized" and "robot development". A question was also added (question 13) that allowed the assessment of whether respondents were able to identify the necessary requirements for a task or process to be eligible for RPA. The last question of this part of the questionnaire (question 14) consisted of the classification of 4 statements, using a 5-point Likert scale, in which 1 represented "strongly disagree" and 5 "strongly agree". The first 3 statements, "Company management is transparent about RPA plans", "Communication about the existing robot portfolio is adequate" and "I know what I should do if I want to request the creation of a robot for my area or my job", aimed to obtain important data for the company's management to assess the effectiveness of its communication strategies in relation to RPA. Regarding the last statement, "I would like to use more robots in my area or in my work", it served to validate the hypothesis raised (Hypothesis 2, cf. Section 1.1) that the perception of the impact of RPA is positively related to the intention to use more robots in the future.

The third part of the questionnaire (Part III – Perception about the impact of RPA) targeted the collection of data through a multidimensional model considering along 5 dimensions the benefits and disadvantages of the use of the technology; an additional 6th dimension was considered to gather a global perception of the technology from the respondents. For each dimension, statements were developed, which respondents would have to classify according to a 5-point Likert scale. Since MESP has a Digital Transformation area, which seeks to promote innovation in the company and in which the RPA department is included, a first group of statements related to the impact of RPA on the digitalization policy and external image of the company was created (question 15). The remaining statements were prepared based on the various dimensions previously analyzed and depicted from the literature review, namely cost reduction, operational efficiency, quality improvement, job satisfaction and robotization disadvantages (cf. Table 2).

In addition to the questions associated with the several dimensions of RPA impacts, 3 statements were also introduced to assess the respondents' knowledge of the technical aspects involved (question 22): "RPA is faster and less expensive to implement compared to a typical project of systems integration, as it does not require the change of existing applications"; "The RPA software solution used in the company is adequate in terms of usability" and "The

support documentation of each robot is adequate". In these statements, the possibility of answering "N/A" (not applicable) was added to the 5-point scale, as it was assumed that not all respondents had knowledge that would allow them to form an opinion about the technical aspects associated with RPA. Finally, in order to complement and enrich the analysis, an optional question was presented (question 23), with an open answer: "Please indicate optionally and briefly, what are, in your opinion, the main impacts of the use of RPA on MESP".

The questionnaire was built using the Microsoft Forms online platform, which allowed the results to be obtained in real time. In order to ensure that all the questions were clear and that the structure of the questionnaire appeared coherent, a pre-test was carried out by 2 people. These indicated that the questionnaire was not only clear and easy to answer, but also that the response time indicated on the questionnaire was adequate.

3.2. Data collection

The target population of this study consisted of MESP employees (management and other employees) as of 12-31-2021, in a total of 175 people. A URL for the developed questionnaire was sent by email to the entire universe in question. The questionnaire was available for response between February 23 and March 4, 2022, with a recall on March 2, 2022. After the end of the response period, the data collected in Microsoft Excel were analyzed in the IBM SPSS Statistics software.

3.3. Data analysis techniques

The techniques used to characterize the sample, analyze the respondents' relationship with RPA and their perception of the impact of the use of RPA, were mostly descriptive statistics techniques, namely frequency distributions, the average as a measure of central tendency and the standard deviation as a measure of dispersion.

The averages of all the questions, used in the different dimensions, were the instrument used to assess the perception of management and other employees about the impact of the use of RPA in MESP, which was called the ***RPA Impact Perception Score***. In order to assess the internal consistency of the constructed scale, that is, of the aforementioned score, the Cronbach's alpha coefficient was used. The result was a coefficient of 0.920; the value obtained for the constructed scale, being greater than 0.9, is associated with an excellent reliability of measurement [21, 22].

The coefficient was also applied to each of the dimensions; good consistency results were obtained, except for the "Cost reduction" dimension, which only included 2 questions and obtained a coefficient of 0.655, slightly below the acceptable value of 0.7 [23]. Given that cost reduction is naturally related to operational efficiency, the original dimension "Cost Reduction" was discarded and the 2 associated questions were included within the "Operational Efficiency" dimension, renaming the respective designation to "Cost Reduction and Operational Efficiency".

3.4. Analysis and interpretation of results

3.4.1. Sample characterization

108 company employees completed the questionnaire, corresponding to a response rate of 62%. The sample obtained consists of 67 women and 41 men aged between 22 and 59 years, with an average age of 37,5 years (standard deviation of 10,550). With regard to academic qualifications and the level of digital literacy of the respondents, respondents are mainly graduates (45.4%) and the majority with digital skills from the user's perspective (71.3%). Regarding the role of respondents in the company, framed within the different levels of management, 4.6% of the answers correspond to elements of top management (5 directors), 10.2% to elements with middle management functions (11 managers), 14.8% to employees with operational management functions (16 area coordinators) and the remaining 70.4% to employees without management functions (65 technicians or administrative and 11 interns).

As for the remaining characteristics of the sample relating to the company, the largest percentage of respondents have been in the company for more than 10 years (47.2%), although there is a relevant percentage of employees with less than 2 years of service (23.1%). Employees who responded to the questionnaire are distributed across different areas of the company, with a special emphasis on Accounting, Treasury and Accountability (42.6%). From the 108 respondents, 13 employees (12%) responded negatively to the question related to their knowledge of RPA; thus, the further analysis of the RPA impacts and perception targeted the remaining 95 respondents.

3.4.2. Differences between the perception of management and other employees

From the performed analysis, it is concluded that the respondents not only perceive RPA as a digital transformation tool, promoting a culture of innovation in the company, but also agree with the various positive impacts described in the literature in terms of cost reduction and operational efficiency increase, quality and job satisfaction increase, as well as they do not fear that robotization may have negative impacts on the company.

It is, however, important to understand whether the different hierarchical levels present the same positive perception, including those who do not have any management role. Thus, the score that includes all the questions that make up the different dimensions, referred in Section 3.4 as the RPA Impact Perception Score, was analyzed by hierarchical level of the employee. The results presented in Table 1 show that, at all levels, the average score exceeds 4 points, starting at 4.13 for the level without management functions and increasing at each level until reaching 4.60 in the top management. Thus, all hierarchical levels, including those that do not have any management function, have a positive perception of the impacts of RPA, with the highest score being achieved by top management.

Table 1. RPA Impact perception score by organizational hierarchical level

RPA impact perception score	N	Average	Standard deviation
Top management	5	4,60	0,2117
Middle management	10	4,44	0,2191
Operational management	16	4,18	0,4268
Without management functions	64	4,13	0,4639
Total	**95**	**4,19**	**0,4447**

It will then be relevant to validate whether there are statistically significant differences between the perception of top management, who made the decision to implement RPA and who have access to the robots' performance reports, and the other employees, whose areas or themselves interact with the technology. Analyzing the differences between the perception of the impacts of the implementation of the RPA by the top management of the company and the other employees, the averages of answers indicate a more positive perception by the top management in all dimensions, including in the score created from the average of all questions (cf. Table 2).

Table 2. Descriptive statistics – RPA impact perception of management and other employees by dimensions

Dimension	Organisational Role	N	Average	Standard deviation
Digitalization policy and external image of the company	Top management	5	4,60	0,5477
	Remaining employees	90	4,34	0,6022
Cost Reduction and Operational Efficiency	Top management	5	4,80	0,2173
	Remaining employees	90	4,36	0,5190
Quality improvement	Top management	5	4,65	0,5477
	Remaining employees	90	4,28	0,6428
Job satisfaction	Top management	5	4,47	0,4314
	Remaining employees	90	4,17	0,5843
Robotization disadvantages	Top management	5	1,65	0,8588
	Remaining employees	90	2,49	0,7433
Global perception	Top management	5	4,80	0,2739
	Remaining empoyees	90	4,37	0,6172
RPA impact perception score	**Top management**	**5**	**4,60**	**0,2117**
	Remaining employees	**90**	**4,17**	**0,4439**

Analyzing in more detail each of the statements that make up each dimension (cf. Table 3), it can be concluded that, with the exception of the question about RPA as a vehicle for promoting the company's culture of innovation and the question related to the reduction of out-of-hours work, the average response from top management was higher than that of the other employees (and lower in the case of the disadvantages of robotization).

Table 3. Descriptive statistics – RPA impact perception of management and other employees by dimensions' statements.

		Top management				Remaining employees			
		Min	Max	Avg	Std. deviation	Min	Max	Avg	Std. deviation
Digitalization policy and external image	RPA is associated with the company's digital transformation policy	4	5	4,80	0,447	3	5	4,59	0,559
	RPA promotes a culture of innovation in the company	3	5	4,40	0,894	3	5	4,49	0,674
	RPA improves the external image of the company	4	5	4,80	0,447	1	5	4,13	0,851
	RPA contributes to Employer branding	3	5	4,40	0,894	2	5	4,13	0,796
Cost Reduction and Operational Efficiency	RPA enables the company to reduce FTE's	3	5	4,20	0,837	2	5	4,06	0,826
	RPA enables the company to reduce the cost of transactions	5	5	5,00	0,000	3	5	4,08	0,738
	RPA enables to increase the work capacity of the areas	4	5	4,80	0,447	3	5	4,57	0,582
	RPA allows to reduce the time processing of tasks	5	5	5,00	0,000	2	5	4,57	0,601
	RPA allows to increase the productivity of the company	5	5	5,00	0,000	2	5	4,52	0,622
	RPA allows to increase employees' productivity	4	5	4,80	0,447	2	5	4,39	0,682
Quality improvement	RPA performs the work in a precise way reducing the number of errors	3	5	4,60	0,894	2	5	4,19	0,820
	RPA allows to increase work consistency and compliance with procedures	4	5	4,60	0,548	3	5	4,37	0,661
	RPA produces reliable data	4	5	4,80	0,447	2	5	4,24	0,739
	RPA increases the quality of processes	3	5	4,60	0,894	3	5	4,33	0,653
Job satisfaction	RPA allows to eliminate backlogged work	3	5	4,40	0,894	1	5	3,72	0,936
	RPA alllows to reduce the time dedicated to monotonous and routine tasks	4	5	4,80	0,447	3	5	4,57	0,601
	RPA makes work easier	4	5	4,60	0,548	3	5	4,39	0,665
	RPA allows to dedicate more time to higher value-added tasks	5	5	5,00	0,000	3	5	4,56	0,583
	RPA allows the reduction of work outside working hours	3	5	3,80	1,095	2	5	3,99	0,841
	RPA creates new job opportunities	3	5	4,20	0,837	2	5	3,80	0,962
Robotization disadvantages	RPA leads to layoffs	1	3	1,60	0,894	1	5	2,38	0,955
	RPA leads to hiring reduction	1	4	1,80	1,304	1	5	2,68	1,079
	RPA adds new unnecessary tasks	1	2	1,40	0,548	1	4	1,93	0,804
	RPA implies greater procedural rigidity	1	3	1,80	0,837	1	5	2,96	1,070
Global perception	Overall, RPA has a positive impact on the business	5	5	5,00	0,000	3	5	4,44	0,602
	Overall, RPA has a positive impact on employees	4	5	4,60	0,548	2	5	4,29	0,707

3.4.3. Analysis of the hypotheses

Hypothesis 1

In order to assess whether the perception of the impact of RPA is related to the use of robots, a first hypothesis was raised (Hypothesis 1, cf. Section 1.1) that the use of robots, in work activities, positively influences the perception of MESP employees on the technology. So as to validate this hypothesis, the score of the perception of the impact of RPA was compared with the positioning of the respondents towards the technology. Hence, it was verified if there were significant differences between those employees who work in areas that do not use RPA, as well as those employees who, although belonging to areas that already use RPA, do not work directly with the technology and the employees in which RPA is used not only in their work areas, but also in their jobs.

Applying the Kruskal-Wallis test (cf. Table 4), it can be seen that the averages of the classifications are very similar for all the groups. Furthermore, given that the p-value = 0.652, considering a significance level of 5% (0.652 > 0.05), the null hypothesis that states that the distributions are equal for all groups is not rejected. Thus, it is concluded that the use of robots in their work activities does not influence the positive perception that employees have about RPA.

Table 4. Respondents' positioning towards RPA - Kruskal-Wallis test.

	Positioning towards RPA	N	Mean Rank
RPA impact perception score	RPA is not used in my area	19	45,87
	RPA is used in my area, but not in my job	26	52,23
	RPA is used in my area and in my job	50	46,61
	Total	**95**	

	RPA impact perception score
Kruskal-Wallis H	0,854
Df	2
Asymp. Sig.	0,652

Hypothesis 2

In order to understand whether the perception of RPA affects future robots' developments, a second hypothesis was raised (Hypothesis 2, cf. Section 1.1) that the perception of the impact of RPA is positively related to the intention to use more robots in their future work. The Spearman coefficient was used, to allow the validation of this hypothesis, as presented in Table 5.

Table 5. Hypothesis 2 – Spearman coefficient.

Spearman's rho		I would like to use more robots in my area or in my job
RPA impact perception score	Correlation coefficient	,233*
	Sig. (2-tailed)	0,023
	N	95

Given that the p-value = 0.023, for a significance level of 5% (0.023 < 0.05), there is statistical evidence to state that the RPA impact perception score is related to the desire to use more robots in the future. In fact, there is a direct relationship, although weak (0.233), between the two variables; hence, there is a slight tendency that as the RPA perception increases, so does the intention to use more robots.

Influence of other variables

Although these hypotheses were not raised, the influence of variables such as academic qualifications, digital literacy or seniority in the company on the perception of the impact of RPA was also analyzed, using the Spearman coefficient. It was concluded, however, that none of these variables is related to the RPA perception of MESP employees (p-value = 0.380, 0.732 and 0.949 respectively).

4. Conclusions and Future Work

This study contributed, in the first place, to increase MESP's knowledge about the relationship of its employees with RPA, not only with regard to their knowledge of technology, but also about their positioning in relation to it and their involvement in the implementation of robots. Additionally, it enabled to verify whether the perception of the company's management regarding the impacts of the use of RPA (formulated, among other factors, through the analysis of the robots' performance indicators), is similarly registered by the other employees, with the conclusions already reported. Finally, it allowed to verify that the image that the company employees present of RPA is not influenced by the use of the technology, but has a slight influence on the intention to use more robots in the future.

The underlying argument of this work is that addressing the human aspects of RPA implementation, namely the understanding of the different perceptions of the technology by top management and other employees, is essential to

allow an organization to design better solutions and define strategies for communication that contribute to improving the acceptance and effectiveness of technology. Therefore, some suggestions of actions or initiatives in this area to be taken by MESP are listed:

(i) Better dissemination of the robotic automation of processes carried out in the company, in particular aimed at new employees, namely through newsletters or experience sharing sessions (to overcome the still existing lack of knowledge of the technology by the company's employees);

(ii) Disclosure of information regarding the performance and results obtained with the robots to all the company employees (to bridge the gap between a more positive perception of the impact of RPA by top management in all dimensions, compared to the remaining employees);

(iii) Adoption of initiatives to maintain the good image that RPA currently has among the company's employees (to continue and increase the efforts to robotize processes in the company). Such initiatives may include innovation awards that distinguish innovative ideas for process improvement and/or automation.

Regarding future work, since the company essentially measures the quantitative aspects of the performance and results obtained with the implementation of RPA in terms of hours saved and volumes, and that there are also qualitative impacts of RPA perceived by most of the employees surveyed which are not are directly measured, a model could be devised to measure all RPA impacts. This model would allow issues associated with quality gains to be considered, namely related to the satisfaction of employees who use RPA in their work and the identification of added-value tasks that can be carried out, due to the reduction of time dedicated to monotonous and routine tasks.

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