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The impact of ambidexterity on robotic process automation implementation strategy in service enterprises

Piotr Sliż[1*], Jędrzej Siciński[1] and Beata Jackowska[1]

Abstract

Robotic Process Automation (RPA) has gained increasing significance in recent years. RPA leverages software bots to automate repetitive business processes traditionally performed by humans, making it one of the easiest, least invasive, and fastest automation approaches. Publications on the topic are scarce, however, and concerns regarding job loss and employee acceptance of new operational processes and technologies remain significant challenges. The additional motivation behind this study is to address the lack of research on the implementation strategy of RPA in the context of ambidexterity, i.e., optimizing enterprise capability in balancing between exploration and exploitation. The paper adopts a managerial perspective and aims to identify the key factors supporting the implementation of RPA in the context of ambidexterity, using an empirical study of service companies as an example. The research methodology employed includes literature review, opinion surveys, and statistical analysis. The paper highlights the stimulating role of the ambidexterity concept in RPA implementation projects and strategies, with a hybrid approach to dynamic balancing of exploitation and exploration. The findings of this paper will be of use for researchers and practitioners in developing effective RPA implementation strategies that balance the needs for exploitation and exploration while factoring in the concerns raised by employees.

Keywords RPA, Service, Ambidexterity, Exploitation, Exploration, Implementation strategy

Introduction

Robotic Process Automation (RPA) is a key technology of Industry 4.0 [4, 28], involving intelligent network integration of machines and processes [1, 23]. RPA leverages software bots to automate repetitive business processes that are traditionally performed by humans [8, 32, 33]. Currently, RPA—identified as one of the easiest, least invasive, and fastest automation approaches—is gaining increasing significance [33]. Compared to previous digital transformation technologies [22], RPA can be implemented swiftly. As a result, interest in RPA is systematically increasing among the business community [36]. According to Gartner's report, the RPA software market remains one of the fastest-growing segments [27]. Examples of RPA implementations in various sectors of the global economy speak to the potential of RPA (See: [16]). Apart from practitioners, interest in RPA is also growing among researchers. It is worth noting, however, that publications addressing the topic are scarce [14, 32, 33]. This means that Robotic Process Automation requires further exploration within the intersecting disciplines of computer science and management. In the context of the research problem, RPA fits into the digital transformation initiative [21], particularly in exploitation activities. RPA implementation aims to increase efficiency, scalability, security, convenience, and compliance [14, 35]. Under the assumption of routine tasks and highly standardized process automation,

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RPA implementation should generate a new work environment that allows employees to focus on exploratory activities facilitating innovation. This aligns with effective achievement of strategic goals, especially since RPA is expected to automate more than half of existing human–system interactions [19]. Previous research results highlight limitations related to employee concerns regarding RPA implementation; however, it is worth noting that the number of publications on the topic in this context is low [9, 33]. Research results also indicate that employees' job loss concerns cannot be considered unfounded. In the literature, as Agarwal and Ojha [1] mention, researchers emphasize the lack of a culture in which employees accept new operational processes and technologies, and top management recognizes the limitations associated with the silo syndrome [1]. The solution to this problem may lie in incorporating the principles of ambidexterity (i.e., optimizing enterprise capability in balancing between exploration and exploitation activity) and a hybrid approach to RPA implementation strategy. The paper adopts a managerial perspective on the issue, while the impetus for the research stems from the call, voiced by Zhu and Kanjanamekanant [36], for the need to conduct studies within the new type of collaborative environment between computer science and management researchers. The literature overview revealed that publications considering the aspect of RPA strategy implementation with incorporation of the ambidexterity concept are limited. It turns out that many of the key RPA implementation factors relate to elements that are characteristic of ambidexterity.

The research problem has been formulated as follows: What are the potential supporting and limiting factors in the implementation of RPA? This delineates the structure of the main objective, which is to identify the key factors supporting RPA implementation in the context of ambidexterity, using an empirical study of service companies as an example. To achieve this objective, methods such as the literature review, opinion surveys, and statistical analysis were used. The focus of the paper is to draw researchers' and practitioners' attention to the advantage of the inclusion of the ambidexterity concept in RPA implementation projects and strategies, with a particular focus on a hybrid approach to dynamic balancing of exploitation and exploration.

The theoretical background section of this paper delves into the concept of ambidexterity and its relevance in service enterprise strategy, emphasizing the importance of balancing exploitation and exploration. The role of ambidexterity in RPA implementation is highlighted as a potential factor to facilitate modern technology adoption. The materials and methods section details the study design and statistical methods conducted to assess RPA implementation maturity and the role of ambidexterity. The results and discussion section presents the findings related to the association between ambidexterity and RPA implementation, considering organization size and strategy. The paper ends with the conclusion section.

Theoretical background

The concept of ambidexterity

The issue of exploration and exploitation has been raised in studies dating back to as early as the beginning of the twentieth century, by Schumpeter, e.g. [31]. The terms exploration and exploitation generally vary in their definition, depending on the adopted context. Nevertheless, it can be assumed that the former represents activities related to exploration and experimentation, i.e., acquisition of new knowledge that contributes to the identification of opportunities in the environment and satisfaction of emerging demands [6]. Such activities imply forgoing some of the present benefits, to allocate the resources to extract innovations and undertake improvements in the organization. Referring to the second term, exploitation is associated with a short-term perspective and the reaping of surpluses from existing solutions and standards that have already been implemented and operationalized [25]. The apparent opposition of these concepts, however, shows signs of complementarity, as exploration requires resources and surpluses that are customarily created through exploitation; whereas, new solutions, developed during the experimental phase, can be exploited in the future [26]. An attempt to harmonize the two seemingly antagonizing forces (e.g., exploitation and exploration) poses a significant strategy management challenge [34] and takes on the substance of the so-called strategic paradox [7]. The art of gaining and maintaining competitive advantage, as Wit and Meyer consistently emphasize, is to resolve the strategic paradoxes faced by companies in their operations [7]. One way to manage the paradoxes is to employ the ambidexterity approach. The essence of ambidexterity is to seek a certain balance, to optimally weigh the benefits of two different areas of activity, without completely extinguishing either of them. Ambidexterity can be sequential or simultaneous in nature, i.e., allow for swinging balancing (sequentiality) or be implemented continuously at a single point in time (so-called simultaneity) [5]. Ambidexterity can also be combined with a single unit (e.g., an employee), without formal separation within the organizational structure [10] or take place in a clearly delineated segment of the enterprise. Under the one time frame assumption of balancing simultaneity, the so-called contextual dimension of ambidexterity can be distinguished, which applies to the first case (lack of demarcation within the structure) and the structural dimension of ambidexterity, which covers the scope of the organization or its clearly demarcated part [13]. The aforementioned approaches to ambidexterity (structural and contextual) are not exclusionary, but can be of complementary nature. There is evidence that companies facing complex and comprehensive problems (e.g., digital transformation management) are inclined to combine the two, which allows for a hybrid ambidexterity strategy, blending the strengths and reducing the limitations inherent in each of these forms of ambidexterity [17].

Exploitation and exploration in business process management

The fundamentals of Business Process Management (BPM) initially prioritized exploitative activity [11]. In the academic discourse, however, an increasing number of threads have been raised around the exploratory and ambidextrous view of the still underutilized BPM [20]. The development of the experimental attribute of BPM does not, however, offset the need to sustain its exploitative value (innovation is fueled by the surpluses exploitation provides). The optimal solution is to pursue duality of these activities within the entity. In terms of overall technological maturity, ambidextrous BPM entails, so to speak, balancing within the realm of the technologies already implemented and those implementations and implementation strategies of which are yet to crystallize. Consequently, competitive technologies that are mature and require mainly ongoing control bear characteristics of exploitation [29]. Moreover, it is indicated to simultaneously maintain the ability to compete within the palette of new technological solutions (which generally takes place in a more flexible environment), which calls for measures of an experimental nature [29]. Ambidexterity thus shows conjuncture to the widely discussed issue of digital transformation (DT) and its inextricable vectors: information and communication technologies (ICT), including RPA. Digital transformation, and its aforementioned vehicles, can therefore serve as an answer to the need, as urgently outlined by Rosemann [20], to employ the BPM concept for exploratory tasks also, thus making it ambidextrous and less isolated from the world of business practice.

The role of ambidexterity in RPA implementation

Ambidexterity in a hybrid form represents a particularly interesting asset in terms of shaping the right implementation strategy for an enterprise's digital transformation, as the literature review carried out suggests (See: [17]). The main utility of ambidexterity is that balancing an organization's activities can make it more susceptible to more effective implementation of new technologies (due to the freed up space for exploration-type activities). This means that skillful balancing between exploitation and exploration within the sphere of ICT implementation can not only optimize the benefits and accelerate the digital transformation of the enterprise, but also offset organizational resistance and fear of modern solutions, through implementation of, e.g., RPA. The ambidexterity approach, as a harmonious balancing between exploitation and exploration, can play a supporting role in DT—in itself, it can serve as a support factor for the RPA implementation, strengthen the existing factors facilitating implementation, and facilitate emergence of new DT support factors. The existence of BPM ambidexterity in organization can be supportive to modern technology implementation strategy development. This state is consistent with the communicated needs and the gaps identified during the systematic literature review. The validity of such a formula is further confirmed by the fact that the BPM approach is likely to be capable of leveraging the benefits of an enterprise's exposure, in exploratory terms, to cutting-edge technologies, particularly in the context of RPA [24]. The key aspect in developing an effective implementation strategy entails a diagnosis of the current organizational state, including organizational culture [3], as well as assessment of the awareness and reach of current DT solutions operating in companies. The instrument suitable for detection of the current state therefore seems to entail the use of the maturity model, adapted to the needs of DT, a clear example of which are the successful applications thereof cited in the literature. A noteworthy example is the study of enterprise maturity within the sphere of Industry 4.0 by Santos and Martinho [30]. Summing up, the use of a suitably adapted maturity model, as a stage preceding the formulation of a strategy for digital IT (including RPA) solution implementation, therefore, seems not only a valuable option, but also a necessity, since knowledge of the currently functioning solutions can determine the later success of the entire DT strategy in the organization [12].

Materials and method

Survey design

The study involved the use of an opinion survey method. The empirical investigation using the computer-assisted web interview (CAWI) technique was conducted in 2022. The questionnaire was addressed to the organizations' executives, experts, and employees responsible for the implementation of ICT technology or management of business processes in the organizations in Poland. Purposive selection of enterprises was used due to the following limitations: Incomplete electronic contact details necessary for CAWI in the National Official Business Register as a sampling frame and a large number of inactive enterprises in this register, resulting from delayed synchronization of register data with the database of current social insurance payers. These constraints made randomization unfeasible. The criteria used in the selection of organizations for this study included organization size, expressed in the number of employees (medium and large organizations), as well as the declared business profile (service organizations). Out of 367 completed questionnaires received, 340 were accepted, following data quality analysis (formal and substantive control of the collected information). The survey units were divided into subgroups, based on the criterion of organization size (medium-sized organizations (50–249 employees): 53.24%, large organizations (250 or more employees): 46.76%); scope of operation (local: 22%, regional: 10%, national: 30%, international: 38%); and number of market segments, expressed as homogeneous recipients (1 segment: 35%, more than 1 segment: 65%).

RPA implementation maturity

The classification of units was carried at five levels of RPA implementation maturity, based on the Industry 4.0 maturity model developed by Santos and Martinho [30]. The quantitative approach to the study necessitated a reduction in the number of levels, from 6 to 5, by dropping the last level 6 and assigning a level 1 notation to the level previously labeled as 0. Classification details and the assumptions of the adopted model are presented in Table 1.

Subsequently, the level of RPA implementation maturity was assessed against the background of five ICT maturity dimensions. The section of the survey questionnaire devoted to this topic was divided into 5 dimensions, in accordance with the Santos and Martinho model [30] (Table 2). Due to the specifics of service organizations, some questions were tailored to the nature of these entities, unlike in the studies analyzing manufacturing companies, authored by Santos and Martinho. The respondents were asked to rate each of the statements presented on a 5-point scale (1—strongly disagree, 2—disagree, 3—hard to say, neither yes nor no, 4—agree, 5—strongly agree).

Table 3, in turn, outlines the second part of the questionnaire, aimed at identifying the focus on exploitation and exploration. On this basis, the ambidexterity strategy and the mode of its achievement (contextual, structural, and hybrid) were defined.

Statistical methods

Correlation analysis, cluster analysis and multiple correspondence analysis were employed in order to identify the relationship between the degree of RPA implementation and the concept of ambidexterity, the forms of ambidexterity, the degree of other ICT technologies implementations, the dimensions of ICT implementation maturity, including other characteristics of the organizations. Descriptive statistical techniques were used, since the sample is not random. This means that statistical inference cannot be made (i.e., inferences cannot be made about the population from which the sample was drawn), and the conclusions in this paper apply to the 340 organizations studied only. Spearman's rho rank correlation coefficient was used to measure the strength of the relation between two ordinal variables, and Cramer's V contingency coefficient was used for at least one nominal variable out of two variables [2, 18]. Additionally, the co-occurrence of the degree of RPA implementation with the degree of other ICT technologies implementations has been presented using a dendrogram with the results of the cluster analysis. For this purpose, a hierarchical clustering of the variables describing the level of implementation maturity of individual ICT technologies was carried out, using the absolute value of Spearman's rho rank correlation coefficient as a measure of similarity [15]. Multiple correspondence analysis was used to explore the relationship between the variables measured on nominal and ordinal scales. Unlike correlation analysis, this method allows for analysis of the relationships not only between variables, but also between the attributes of these categorical variables [15, 18].

Results

The clustering results for the variables describing the implementation degree of the 10 ICT technologies are shown in the dendrogram (Fig. 1). In addition to RPA, the survey included the following ICT technologies: Artificial

Table 1 RPA implementation maturity level. *Source* survey questionnaire in own study conducted in 2022

Level	Survey questions
L1	The technology is not implemented and there are no plans for implementation
L2	There are no plans to implement the technology in the organization, but there are plans to implement it in the long-term of 2–5 years
L3	The technology is not implemented, but steps have been taken to implement it within 2 years
L4	The technology is being implemented in the organization
L5	The technology has been implemented in the organization

Table 2 Evaluation of ICT implementation maturity dimensions. *Source* survey questionnaire in own study conducted in 2022

Survey questions
Dimension 1: Organizational strategy, structure and culture (O)
O1. ICT implementation strategy has been operationalized
O2. ICT implementation in the organization aims at achievement of competitive advantage
O3. ICT implementation strategy entails a long-term action plan
O4. ICT implementation strategy is formalized (written documentation)
O5. ICT implementation is identified as a tool for organizational strategy development
O6. ICT implementation strategy is operationalized throughout the organization
O7. ICT implementation is viewed from the perspective of competitive advantage achievement
O8: Degree of organizational structure flexibility (type of organizational structure)
Dimension 2: Workforce (W)
W1. ICT implementation strategy is supported by senior management
W2. The sought-after role of the manager is geared in the organization toward responsibility for knowledge transfer between employees
W3. The sought-after employee role in the organization is to simultaneously perform tasks and stimulate (generate) process streamlining
W4. All employees in the organization can submit process improvements
W5. Deployment of ICT implementation strategies in the organization has resulted in new organizational roles
W6. Implementation of ICT in the organization aims at improvement of the information system flexibility
Dimension 3: Smart organization (SO)
SO1. Number of implemented ICTs specific to Industry 4.0
Dimension 4: Smart processes (SP)
SP1. Information technologies are used to formalize (record) processes
SP2. Information technologies are used to monitor the progress of processes
SP3. Information technology tools are employed in business process management
SP4. ICT is used to streamline processes in the organization
SP5. ICT implementation strategy is operationalized across all processes in the organization
SP6. AI technology has been implemented in the organization
Dimension 5: Smart products and services (SPS)
SPS1. ICT implementation in the organization is expected to support individualization of services
SPS2. ICT implementation strategy is viewed from the perspective of stakeholder needs
SPS3. Modern technologies are integrated into processes in a manner allowing customers to discern the effects of its implementation
SPS4. ICT implementation strategy is reviewed from the perspective of added value generation in processes
SPS5. ICT implementation in the organization is designed to support virtual value creation
SPS6. ICT implementation in the organization has contributed to the improvement of customer relations

Table 3 Evaluation of exploitation and exploration strategy implementation. *Source* survey questionnaire in own study conducted in 2022

Survey questions	
Exploitation	**Exploration**
ES1. BPM is geared toward short-term profit generation	ER1. BPM is geared toward generation of long-term profits
ES2. BPM is geared toward improvement of existing processes (e.g., increased productivity, efficiency, etc.)	ER2. BPM geared toward modeling new processes that enable generation of new products and/or services
ES3. Processes are modeled for the long-term (a perspective of more than 1 year)	ER3. Processes are modeled dynamically in the organization, depending on changes in the organization or its environment
ES4. The organization is seeking solutions and tools to increase process efficiency or effectiveness	ER4. Solutions and tools are explored in the organization to increase the flexibility of processes (ability to dynamically reconfigure processes)
ES5. Actions are taken in the organization to increase the market share of the products and/or services hitherto developed	ER5. Efforts are being undertaken in the organization to generate new products and/or services
ES6. Supplier selection is contingent on their impact on process effect (products/services) cost reduction	ER6. Supplier selection in the organization is contingent on the potential to increase the innovativeness of the products and/or services offered or generate new products
ES7. Customer surveys aim at assessing the level of satisfaction with the products/services provided	ER7. Customer surveys in the organization aim at identifying customer needs, in the context of new products and/or services generation
ES8. Measures are taken in the organization to reduce the cost of products/services while maintaining the same level of quality	ER8. Efforts are undertaken in the organization to implement ICT technologies, in order to reduce process execution parameters (e.g., cost, execution time, etc.)
ES9. The organization employs material consumption analysis in order to explore for solutions reducing this consumption	ER9. Material consumption analysis is employed in the organization to explore for technologies increasing the quality of the products and/or services offered
ES10. Process management is geared toward increasing the market share of the process outputs (products and/or services) hitherto generated	ER10. Process management contributes to the search for areas generating new added value in the organization
ES11. Process management is geared toward improvement of processes related to the organization's genotype activities (core activity)	

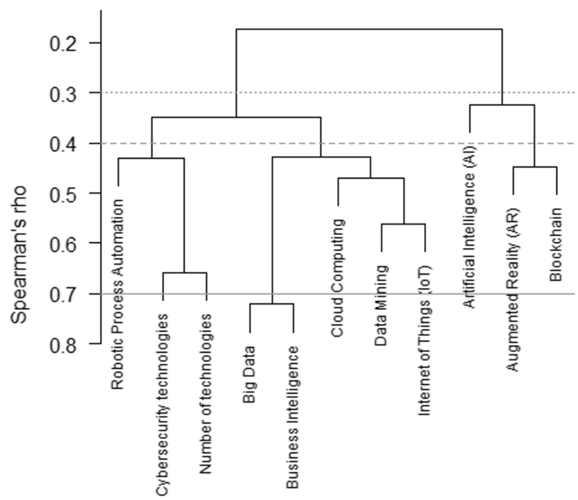

Fig. 1 Cluster analysis of variables describing the implementation maturity level of individual ICT technologies in the surveyed organizations

Intelligence, Data Mining, Internet of Things, Cloud Computing, Augmented Reality, Blockchain, Big Data, Business Intelligence, and Cybersecurity technologies. In order to determine the strength of the correlation, a conventional range of Spearman's rho coefficient has been adopted: $0.4 < |rho| < 0.7$ (alternatively $0.3 < |rho| < 0.7$), representing moderate strength of correlation, $|rho| > 0.7$ marked as strong correlation. The notional boundaries of these ranges are marked in Fig. 1 with horizontal lines. All values of Spearman's rho coefficient in our study were positive. Strong correlation occurred only between the degree of "Big Data" and "Business Intelligence" implementation. Based on at least moderate strength of correlation, two clusters (dotted line at rho = 0.3) or three clusters plus a single variable "Artificial Intelligence" (dashed line at rho = 0.4) could be distinguished. In the second case, RPA formed a cluster with "Cybersecurity technologies" and the number of implemented technologies.

Table 4 and Fig. 2 show the distribution of RPA implementation maturity level by organization size, number of market segments and the strategy adopted. The level is not dependent on the organization size or the number of market segments, but a clear, although of weak strength, association with the type of strategy can be observed. The association strength according to Cramer's V measure can be considered moderate when $0.3 < V < 0.5$, and strong when $V > 0.5$ (Cramer's V values are marked in Table 4 and in Figs. 2 and 3). Organizations which do not employ an ambidexterity strategy stand out negatively (by far a higher than average percentage of these organizations do not implement RPA (levels 1–2)). Positively are distinguishable organizations employing a hybrid ambidexterity strategy (by far a higher than average percentage of these organizations are advanced in implementing or have implemented RPA (levels 4–5)). Additionally, it has been found that the strategy adopted is not associated with organization size or the number of market segments (Cramer's $V < 0.13$).

In the next step, the role of the 5 dimensions of ICT implementation maturity assessment was examined with respect to RPA implementation level. The average value of the responses measured on a 5-point scale and assigned to a given dimension (Table 2) was used as the dimension score. The level of RPA implementation is positively moderately correlated with the overall measure of the 5 dimensions of ICT implementation maturity assessment (determined as the average of the 5 dimension scores), with particular positive moderate

Table 4 RPA implementation maturity level by organization size, number of market segments and organization strategy adopted

	N	Level 1 (%)	Level 2 (%)	Level 3 (%)	Level 4 (%)	Level 5 (%)	Total (%)
Total	340	22.1	24.4	15.3	12.9	25.3	100.0
Company size (Cramer's V = 0.092)							
Medium	181	21.5	22.7	15.5	11.6	28.7	100.0
Large	159	22.6	26.4	15.1	14.5	21.4	100.0
Segments (Cramer's V = 0.136)							
One	120	27.5	21.7	15.0	8.3	27.5	100.0
Many	220	19.1	25.9	15.5	15.5	24.1	100.0
Strategy (Cramer's V = 0.209)							
No_Amb	57	26.3	47.4	10.5	5.3	10.5	100.0
Amb_Contextual	85	25.9	25.9	17.6	7.1	23.5	100.0
Amb_Structural	58	31.0	12.1	17.2	10.3	29.3	100.0
Amb_Hybrid	140	14.3	19.3	15.0	20.7	30.7	100.0

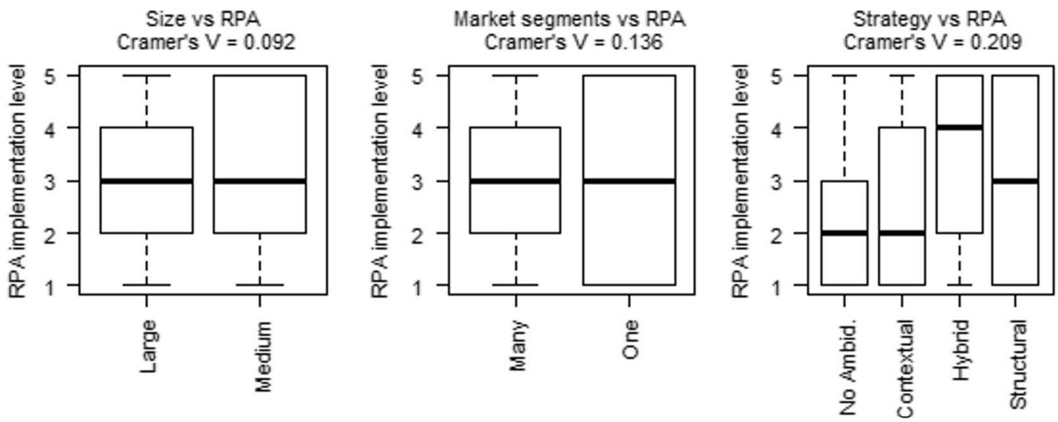

Fig. 2 Box plots of RPA implementation maturity level by organization size, number of market segments and organization strategy adopted

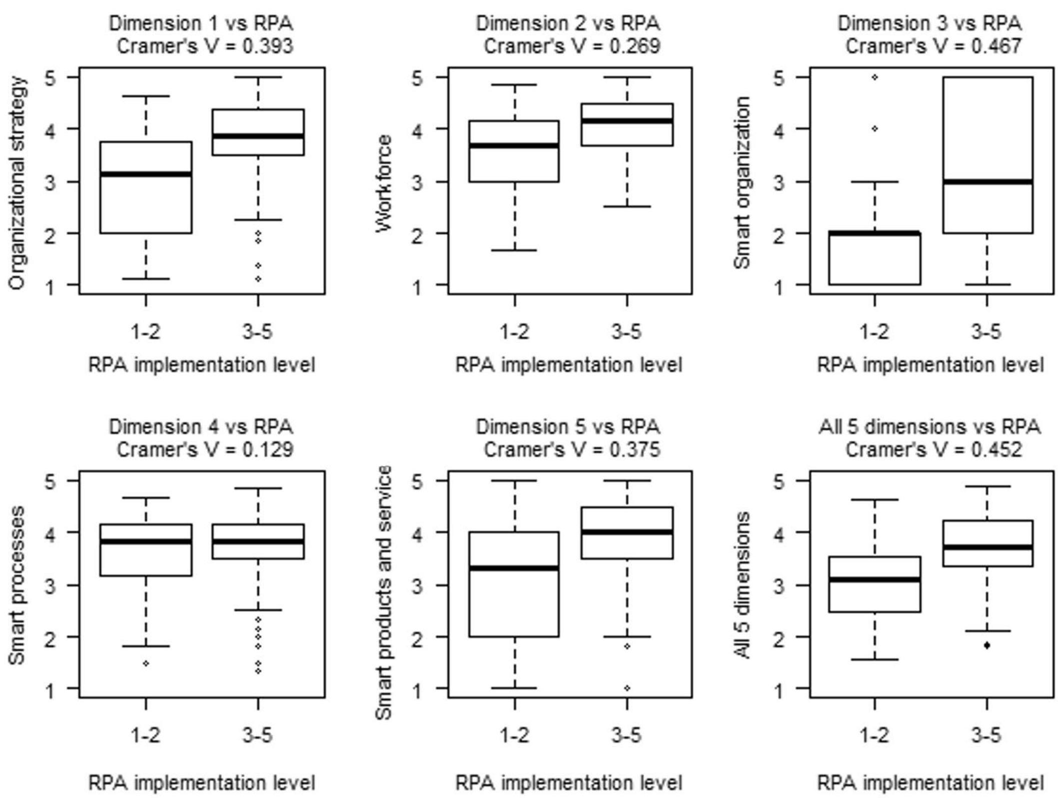

Fig. 3 Box plots of ICT implementation maturity assessments dimension by RPA implementation maturity level

correlation with the dimension scores of: “Organizational strategy,” “Smart organization,” “Smart products and services” (Spearman’s rho > 0.4).

Figure 3 illustrates these associations for two variants of RPA: The technology is not being implemented (levels 1–2) and the technology is in the process of implementation or has been implemented (levels 3–5). Moreover, the use of ambidexterity strategy (yes/no) was also found to be moderately associated with the overall measure of the 5 dimensions of ICT implementation maturity assessment, particularly with the dimension scores of: “Organizational strategy,” “Smart products and services” (Cramer’s V > 0.3).

Figure 4 shows the results of multiple correspondence analysis, taking variables with the following attributes into account:

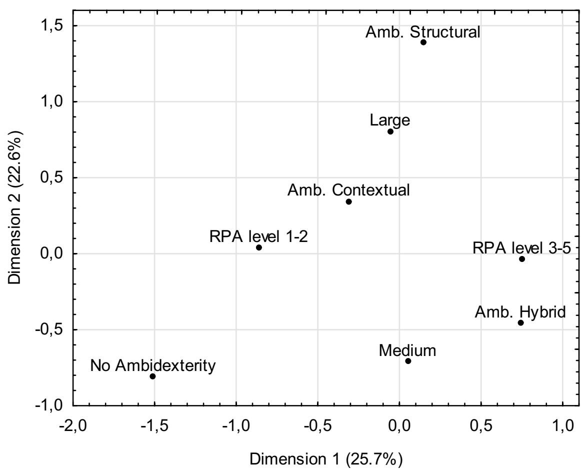

Fig. 4 Multiple correspondence analysis results for RPA implementation maturity level, strategy and organization size

- "*RPA*" the technology is not being implemented (levels 1–2), the technology is in the process of implementation or is has been implemented (levels 3–5);
- "*Strategy*" ambidexterity is not employed, ambidexterity in contextual form, ambidexterity in structural form, ambidexterity in hybrid form;
- "*Company Size*" medium, large.

Organizations not employing ambidexterity are most distinct from the average profile (the point farthest from the coordinate system's origin). These organizations are mostly medium in size and do not implement RPA (the "No Ambidexterity" point lies determinately closer to the "RPA levels 1–2" point than to the "RPA levels 3–5" point (see Fig. 4 and Table 4), and closer to the "Medium" point, relative to the "Large" point).

Ambidexterity in hybrid form co-occurs with levels 3–5 of RPA implementation and the medium-size of organizations (the "Amb. Hybrid" point is much closer to "RPA levels 3–5," relative to the "RPA levels 1–2" point (see Fig. 4 and Table 4), and much closer to the "Medium," relative to "Large" point). Organizations employing a contextual ambidexterity strategy are closer to the profile of a large organization with levels 1–2 of RPA implementation. The point representing organizations with a structural ambidexterity strategy is at a comparable distance to the "RPA levels 1–2" and "RPA levels 3–5" points, and much closer to the point "Large," relative to "Medium" point.

Discussion

Measurement of enterprises' maturity within ICT implementation not only constitutes a highly epistemological value, but also provides valuable feedback for business praxis. The use of maturity models not only allows assessment of the current level of technological sophistication of entities, but can also facilitate, through diagnosis of current potential, the digital transformation of the entire economy. Of relevance, in the study conducted, is the fact that it is not the scope of activity (market segments) or the size of the organization that mainly determines the level of RPA implementation maturity. As the authors of this study have conjectured, in line with the preliminary conclusions drawn from the analysis of the literature on the subject, a weighted balancing of the exploratory as well as exploitative qualities of BPM can itself be a factor in the effective formation of an enterprise's ICT solution implementation strategy. This is evidenced in this study by the identified association between the presence ambidextrous BPM, in relation to the extent of RPA-type solution implementation in the organization. This observation is particularly evident within the realm of entities not implementing any form of ambidexterity, relative to ambidextrous organizations. Noticeable is also the relationship between the adopted strategy of ambidexterity and the technological maturity of RPA—there are grounds for arguing that in the collective surveyed, the hybrid approach in achieving ambidexterity favors the RPA solution implementation more pronouncedly, compared to the other ambidexterity strategies. This is particularly true for medium-sized entities. The reciprocal gravitational force of individual ICT technologies should also not be ignored—the results of the cluster analysis indicate that individual, implemented ICT solutions can serve as a vehicle for stimulating implementation of other smart technologies. This is an aspect to be addressed by further research. The limitation of the presented study is the absence of the possibility to infer about the population of service enterprises in Poland due to a non-random sampling technique. Additionally, the article focuses solely on service organizations. These outlined limitations pave the way for further research directions suggested by the authors, centered on expanding the study to include technologies with which RPA is implemented (Fig. 1) and broadening the research sample to encompass manufacturing, trade, and service organizations in Poland.

Conclusion

Considering the results obtained, the conclusions should not be limited to the fact that the presence of organizational characteristics indicative of ambidexterity concept adoption can only unilaterally foster an increase in the maturity of ICT solution implementation. It should not be excluded that a high maturity level of such solutions also shows positive conjuncture and reciprocally drives intra-organizational demand for greater adoption of ambidexterity assumptions. This crystallizes the research gap, which highlights the need for further research on the feedback and mutual, complementary support of two forces: the degree of IC technology implementation maturity and the extent of realized BPM duality (and its strategy) in the enterprise.

In light of the results achieved, the paper's contributions extend beyond the identification of mere correlations to illuminating nuanced relationships. The investigation demonstrates that the level of Robotic Process Automation (RPA) implementation maturity is not predominantly tethered to the scale of operations (market segments) or the organization's size. Instead, it is shaped by a complex interplay between the exploratory and exploitative facets of BPM. This interrelationship significantly shapes an enterprise's strategic direction for executing ICT solutions. A pivotal discovery lies in the nexus between the employed ambidexterity strategy and the technological maturity of RPA. Notably, the hybrid approach to ambidexterity displays a pronounced affinity with RPA solution implementation, particularly among medium-sized entities.

Abbreviations

BPM Business process management
CAWI Computer-assisted web interview
DT Digital transformation
ICT Information and communication technologies
RPA Robotic process automation

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Author contributions

PS conceptualized the article, designed the research questionnaire, and conducted the empirical study. BJ performed the statistical analysis of the empirical data. JS developed the theoretical framework of the article. All authors (PS, JS, BJ) reviewed the article, prepared the discussion and conclusion sections, and participated in the editorial work. Summary in %: PS (33, 34%), BJ (33, 33%), JS (33, 33%).

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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