Human TECHNOLOGY

ISSN: 1795-6889

https://ht.csr-pub.eu Volume 19(1), May 2023, 23-40

EMPLOYEES' ATTITUDES TOWARDS IMPLEMENTING ROBOTIC PROCESS AUTOMATION TECHNOLOGY AT SERVICE COMPANIES

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Abstract: *Robotic Process Automation (RPA) technology emerged as an innovative solution that supports the maintenance of operational processes and ensures business continuity, especially during the coronavirus pandemic. A survey was conducted for the purposes of this study. The main objective of the survey was to identify employees' attitudes towards RPA implementation in Polish service companies. The attitudes related to their involvement in the design and implementation of RPA solutions and their awareness of the fact that performing repetitive tasks is inefficient were scored the highest. The surveyed managers were of the opinion that employees waste time because they are occupied rewriting data between systems instead of developing the company, so they should be transferred to doing more complex and value-added work. Moreover, the involved statistical analyses also considered the correlations between employees' attitudes and determinants of RPA adoption.*

Keywords: *Robotic Process Automation, RPA, employees' attitudes, software robots.*

DOI: https://doi.org/10.14254/1795-6889.2023.19-1.3

INTRODUCTION

Humanity is on the threshold of the Industry 4.0 revolution, where advanced technologies such as artificial intelligence, robotics, data analytics, or Internet of Things can create breakthrough applications like virtual agents, social robots, or autonomous vehicles (Schwab, 2017). In general, the effects of technology adoption on productivity (or labor savings) and the effects of automation through robots and AI on employment are hotly contested topics among researchers, traders, and labor economists. Meanwhile, the literature argues that the rate at which new technologies that increase productivity are destroying jobs may outpace the rate at which people can find new uses for those who have lost their jobs (Vermeulen et. al, 2018). Some arguments provided in this debate stress how the introduction of automation, robots, and artificial intelligence affects a large share of workers and can lead to a future of high unemployment (Brynjolfssonc & McAfee, 2011; Ford, 2015; Frey & Osborne, 2017). In opposition to that, there is a substantial number of scientific papers arguing that, although some people will be replaced by automation, technological advancement will also increase the need for labor. Despite the fact that automation boosts productivity and hence raises unemployment, there are counter-effects such as higher product demand, increased demand for new skills and competencies, and even new professions required for novel goods and services (Vermeulen, 2018; Autor, 2015; Autor & Salomons, 2018; Gregory & Salomons, 2016; Carbonero & et al. 2020; Smithikrai, 2022).

In this paper, the authors present the results of the research conducted in Polish service companies aimed at identifying and discussing the employees' attitudes towards supporting their work with the use of RPA technology and effective cooperation with hybrid systems in a workplace. Are they satisfied after implementing RPA solutions or do they express their reluctance and fears of keeping their jobs? The present descriptive study was conducted on a sample of 132 managers of banks and other financial institutions.

The authors formulated the following research questions:

1. What are the employees' attitudes towards implementing RPA technology at enterprised and effective cooperating with hybrid systems in a workplace?

2. What are the correlations between employees' attitudes and the determinants and barriers to RPA technology adoption?

The paper is structured as follows. The literature review in the first Section is followed by the presentation of the research method. In the third chapter, the results of the analysis of empirical data are introduced and discussed. The conclusions are formulated in the last section. In this part of the paper, research limitations are also described as well as future research areas are suggested.

LITERATURE REVIEW

Recent technology advancements are accelerating more quickly than ever in order to remain ahead of the consequences and obtain new capabilities (Agarwal et. al, 2020). Some authors attempt to investigate as many possible future, emerging, and disruptive technologies that could be used to mitigate the effects of the coronavirus. The IT sector's technologies were critical during the COVID-19 pandemic and will also play a vital role in the post-pandemic world, particularly those which can lessen the human workload, manage the company and ensure business continuity (Nadikattu, 2020, Kedziora & Smolander, 2022). Robotics, artificial intelligence, data analysis, cloud computing, and Virtual Reality are among the most frequently mentioned technologies (Bullock et al. 2020; Kononiuk & Gudanowska – eds., 2021; Mbunge et. al 2021; Ejdys & Gulc, 2022; Halicka & Surel, 2022; Jurczuk, 2022).

For several years now, technological change has dominated discussions about the future of global labor markets. The enormous impact of ICT on people today might be especially obvious in areas such as work and education (Jurek et al., 2021a; Jurek et. al., 2021b). There is reason to believe that there will be major upheavals as a result of digitization and automation. Robotization is an important aspect of this technological change. While the process has already been going on for several decades, it is the massive expansion of the tasks that robots are performing that has made robotization a hot topic (Carbonero, 2020).

Although the global pandemic has mainly bad economic consequences, at the same time there are some active technological advancements. It should be emphasized that recently, RPA and AI have primarily reached their peak (Lasso-Rodriguez, 2020; Winkler, 2020; Sobczak, 2022). RPA is an emerging technology automating simple business tasks and it links artificial intelligence and software capabilities to mimic human worker activity (Asiatiani et. al., 2022; Van der Aalst et. al, 2018). With the use of this technology, routine and rule-based tasks can be shifted from people to software robots (Geyer-Klingeberg et al., 2018). This possibilities are widely used in CRM systems (Roshchyk et al., 2022), trading technologies (Maknickienė et al., 2020), forecasting in business (Kolková & Ključnikov, 2022), fostering the further development of knowledge management (Oliinyk et al., 2021), technology acceptance model (Ryadi, Kurniasari & Sudiyono, 2021). In recent years, the use of software robots has become one of the most significant and rapidly expanding technologies (Kedziora et. al, 2021). Software robots are considered a disruptive solution and one of the most cutting-edge digital transformation trends that organizations can implement to reduce costs, save time, maximize resources through automating repetitive tasks, and maintain business continuity in the process of unprecedented and unexpected crisis events. In addition, it also aids in ensuring that an uncompromised customer service level and normal operational efficiency are maintained and execution of the processes is more efficient (Asatiani et. al. 2022; Siderska, 2020; Kedziora et. al, 2020). Better yet, it is designed for human and digital workers to work together, collaborate and move projects back and forth as well as play with each other's strengths, and cover their weaknesses (Kulp, 2021). Many organization have implemented robots to tackle the difficulties the COVID-19 outbreak has brought forth (Kedziora, 2022). In comparison to manual labor, robots and stand-alone systems provide a number of benefits (Shen et. al, 2021). Robots can act as employees to help respect social distancing restrictions (Nah & Siau, 2020). Consequently, there is a wide scope

for adjusting robots to perform routine and repetitive tasks with accuracy and dependability. (Javaid et. al, 2020).

The debate on the proliferation of robots is blooming, with the number of studies constantly increasing. Mainly the impact of robots on employment is a highly often debated topic in academic and public debates (Carbonero, 2020). Throughout history, there has been plenty of research on the effects of automation technologies and employees' concerns about losing their employment. Although Keynes foresaw potential technological unemployment, he believed it to be a passing period of economic maladaptation (1930/1965). Hurd outlined new professions and job enhancements that automation would bring (1958). Ivanov and Kuyumdzhiev analyzed data from more than 500 Bulgarians to determine their attitudes toward the automation of their jobs. The analysis reveals that certain populations are more afraid of automation than others, as shown by their opinions and demographics (2020). Rago recognized the shift of automation technologies but believed the fear of automation was unfounded, as automation generated more jobs owing to lower product prices and the creation of new jobs (1965). Over the next fifty years, the growing adoption of automation technologies has fueled fear of automation not only among manufacturing workers but also among service workers. Each automation technology has both enhancing as well as replacing impacts. (Decker et al., 2017; Frey, 2019; Ivanov & Webster, 2019). Improving the effects means improving work performance and employee productivity by adopting new technologies. With the substitution effect, the new technology replaces workers who previously performed the same task. The proliferation of automation technologies is changing the nature of what human workers do (Ernst et al., 2019), raising hopes and fears that employees will lose their jobs and be replaced (Fiaidhi et al., 2018; Nam, 2019; Spencer, 2018). However, greater productivity and the automation of cognitively routine work is a boon, not a threat. The numerous evidence prove the positive impact of industrial robots on productivity and labour market changes (Şahin, L. (2020). Because of this, new technology always has disruptive impacts throughout the adoption and development phases, and it typically takes some time to reveal its true value (Cramer D., Kasparov G., 2021).

Although the topic is hot and all the more willingly taken up in the subject literature, many authors stress that the wide-world debate and deepened research are still necessary. Researchers examine factors for ICT technologies' success and strategic effects resulting from the adoption of such solutions. Gupta (2019) considered the driving features, factors, and strategies responsible for the adoption and acceptance of ICT technologies. The consequences of digital transformation of business models are discussed by Straková et al. (2022). Bhalerao & Patil (2021) explored the factors preventing the adoption of ICT in SMEs and discussed the benefits due to such implementation by companies, while Chairoel et. al. (2015) identified conceptual factors affecting ICT adoption in Indonesian SMEs.

The growing interest of researchers is also noticed in the field of identification of factors influencing the successful implementation of RPA technology in companies as well as of investigation of benefits, challenges, and suitability of the technology. Many authors underline the need to identify and understand determinants and barriers to adopting IT solutions, including RPA technology. E-Fatima et. al. (2022) critically examined the potential barriers to the adoption of RPA technology in the beef supply chains, focusing on the efficient implementation of such solutions. Pramod (2021) gathered the applications, benefits, and challenges of providing such solutions to companies. Brzeziński (2022) identified the

benefits of RPA implementation in the logistics of a production company. Also, very recent studies were presented by Sharma et. al. (2022) with the main aim to examine the contextual determinants of RPA adoption in service industries in the emerging economy. This subject was also covered in the author's previous article (Siderska, 2021).

Although software robots provide many benefits, organizations still face various challenges due to a lack of frameworks and knowledge. Prior studies have provided limited scientific knowledge on the workers' perspectives, attitudes, and reactions as well as factors that restrain or obstruct the overall RPA technology adoption process and effective implementation in relation to employess' attitudes (Costa et. al. 2022).

Although increasingly people must interact with robot technologies, many humans are reluctant to work with robots. Robert (Robert, L.J.) introduced a new work-specific scale AWRO for assessing employees' willingness and attitude toward working with a robot. Lattika et. al. (2021) conducted research on over 1000 Americans and proved that they had a more positive attitude toward robots as equipment than as coworkers.

Software robots more and more often play the role of coworkers, teammates, or even supervisors, which have been evolving from a futurological idea to real adaptations, and previous teams of employees are being transformed into hybrid systems. Gladden posted a few future research questions related to features of such artificial agents that make them capable of being incorporated into the companies and related to the need of identifying workers' opinions towards effective cooperating within hybrid systems in a workplace, consisting of humans and agents (Gladden et. al, 2022). This research gap justified the studies undertaken by the authors in this paper and constituted the fundamentals of the analyses.

As previous studies have provided limited scientific knowledge on the workers' perspectives and in response to the research gap stressing the need for considering human reactions to RPA, the authors examine in this paper the employees' attitudes towards adopting this technology at companies and effective cooperating within hybrid systems in a workplace.

RESEARCH METHODS

The results of the analyses in this article are the continuation of the studies undertaken by Siderska in 2020. In her previous paper, titled "*Adaptation of Robotic Process Automation technology to ensure business continuity during COVID-19 pandemic",* Siderska presented the identified 22 features of RPA solutions, related to perceived usefulness, ease of use, security, and functionality of such technology. Moreover, she conducted also the diagnosis of the impact of the ongoing COVID-19 pandemic on companies' operations. The statistical analyses assumed then the identification of the differences in the evaluation of individual RPA technology features, mainly in terms of perceived usefulness, ease of use, security, and functionality. With the use of the 5-point Likert scale respondents also assessed the determinants and barriers to RPA technology adoption. To check the connections among determinants and barriers to decision-making on adopting the RPA solutions and the evaluation of this technology, analyses of the Pearson correlation coefficient have been also done then. To complete the assumed considerations, linear regression analyses were performed for particular determinants of RPA technology implementation. The research was

conducted then among 110 representatives of Polish banks, financial and insurance institutions, media, utility units and e-commerce enterprises. The survey was directed to the chief technology officers, chief information officers, chief operating officers, heads of back offices, security, financial and sales departments as well as other employees responsible for technology and development of enterprises operating in the service. All these results were presented and discussed in this paper (Siderska, 2021).

According to identified research gaps, the authors examine in this present paper only the workers' perspective, not the technology-oriented perspective, with the main aim to recognize and introduce workers' and managers' opinions and attitudes related to the implementation of software robots at service organizations. Such an approach had not been considered and analyzed by Siderska and other authors before.

Using the computer-assisted web interview (CAWI) method, quantitative data was gathered as part of a diagnostic survey. Deliberate sampling was chosen by the authors as RPA is still an emerging technology in Poland and thus not many companies have adopted such a solution so far and it is hard to estimate the population.

The survey has been conducted among the representatives of Polish service enterprises in May-July 2021. The study was based on nationwide research carried out on 132 respondents from banks (59%), financial and insurance institutions (41%). The survey was conducted among the management staff of these organizations (CTOs, CIOs, and COOs). To answer the posted research questions, statistical analyses were engaged with the use of the Statistica v.13.1 packages. The last steps of the research process assumed the analysis of the obtained results and the formulation of conclusions.

RESULTS AND DISCUSSION

The research included the evaluation of qualitative characteristics. The analysis of such data has its specificity, consisting of the application of adequate statistical tools for comparison. To characterize the structure of the examined variables measured on a rank scale, basic descriptive statistics about employees' attitudes and managers' opinions were calculated in the form of measures of position and variability. Spearman rank correlation coefficients were calculated to ascertain the strength of the association between the variables measured on the Likert (rank) scale. Counts and structure index values (percentages) were calculated and presented in tables for variables measured on a nominal dichotoscale. All analyses assumed a significance level of 0.05 and were performed using the Statistica v.13.1 packages.

$$r_S = 1 - \frac{6\sum_{i=1}^{n} d_i^2}{n(n^2-1)}$$

where:

$d_i = Rx_i - Ry_i$

is the difference between the ranks of X and Y for the observation i .

The analysis of the research results started with the investigation of the basic descriptive statistics for the analyzed employess' attitudes towards RPA adoption and the assessments of how important the indicated attitudes of employees ("emp_1 - emp_6" variables) and managers' opinions were in the success of the implementation of RPA technology in the surveyed companies (variables "inv_1 - inv_7" and "st1 - st11") (table 1).

Table 1. Basic descriptive statistics for employees' attitudes (variables "emp_1 - emp_6") and opinions of managers (variables "inv_1 - inc_7").

Abbr.	Employees' attitudes	M	Me	Min	Max	SD
emp_1	Employees' involvement in the design and implementation of RPA solutions	**4.06**	**4.00**	2.00	5.00	0.86
emp _2	Employees' satisfaction with the decision to start implementing RPA solutions	3.60	4.00	2.00	4.00	0.62
emp _3	Employees wanted to be pioneers in implementing RPA solutions	3.35	3.00	2.00	5.00	0.87
emp _4	Employees feel satisfaction after implementing RPA solutions	3.10	3.00	1.00	5.00	1.36
emp _5	Employees' resistance and reluctance	3.16	3.00	1.00	5.00	1.47
emp _6	Employees' fears of keeping their jobs	3.70	4.00	1.00	5.00	1.35
inv_1	Employees who perform repetitive tasks are inefficient	3.86	4.00	2.00	5.00	1.04
inv_2	Young employees are not motivated to perform boring, repetitive tasks	2.85	3.00	1.00	5.00	1.09
inv_3	The wage pressure in Poland is the highest in Europe, which increases the cost of back office labor	3.22	3.00	2.00	5.00	0.132
inv_4	It is very difficult to find specialists with the required competencies on the market	3.02	3.00	1.00	4.00	1.07
inv_5	The creators of systems implemented in the enterprise no longer work in it	2.51	2.00	1.00	5.00	1.19
inv_6	Employees squander time because they are occupied rewriting data between systems and do not have time for operations that advance the company. (Asatiani & Penttinen, 2016)	**4.03**	**4.00**	2.00	5.00	1.02
inv_7	Understanding that automation of business processes is requisite (Kucia et. al. 2021, Santos et. al. 2018)	3.40	4.00	2.00	5.00	0.98

The analyses for employees' attitudes gave rise to the conclusion that the highest score was for the variableemp_1, assuming eEmployees' involvement in the design and implementation of RPA solutions). It is a very constructive result and the appropriate way to manage the implementation of technological innovations in the enterprise. Involving employees in the process of adapting such technologies influences their positive attitude and reduces their fear of being replaced by machines. The mean of the variable emp_6 (Employees' fears of keeping their jobs) is almost the same as that of the variable emp_2 (Employees' satisfaction with the decision to start implementing RPA solutions). In the analysis for managers' opinions, the highest scoring answer was variable inv_6 (Employees squander time because they are occupied rewriting data between systems and do not have time for operations that advance the company) and variable inv_1, assuming that employees who perform the repetitive task are inefficient. Those surveyed expressed also their understanding that automation of business processes is requisite and will be common in the near future.

Subsequent analyses aimed to verify whether there were statistically significant correlations between employees' attitudes (variables "emp_1 - emp_6") and barriers to technology adoption (variables "barriers_1 - barriers_7"). For this purpose, Spearman's rank correlation coefficient was used (table 2).

Table 2. Correlation of Spearman's rank order (employees' attitudes and barriers).

Pair of variables	N	R Spearman	t(N-2)	p	Pair of variables	R Spearman	t(N-2)	p
emp_1 & barriers_1	132	0.08	0.71	0.479	emp_4 & barriers_1	0.00	0.04	0.966
emp_1 & barriers_2	132	-0.10	-0.96	0.337	emp_4 & barriers_2	-0.02	-0.22	0.826
emp_1 & barriers_3	132	-0.30	-2.92	0.004	emp_4 & barriers_3	-0.27	-2.56	0.012
emp_1 & barriers_4	132	-0.21	-2.04	0.045	emp_4 & barriers_4	-0.05	-0.48	0.632
emp_1 & barriers_5	132	0.02	0.19	0.851	emp_4 & barriers_5	-0.02	-0.16	0.873
emp_1 & barriers_6	132	0.04	0.41	0.684	emp_4 & barriers_6	0.10	0.96	0.342
emp_1 & barriers_7	132	0.02	0.18	0.856	emp_4 & barriers_7	-0.18	-1.68	0.096
emp_2 & barriers_1	132	0.08	0.78	0.435	emp_5 & barriers_1	0.02	0.15	0.878
emp_2 & barriers_2	132	-0.07	-0.61	0.545	emp_5 & barriers_2	-0.03	-0.27	0.785
emp_2 & barriers_3	132	-0.04	-0.34	0.732	emp_5 & barriers_3	-0.18	-1.72	0.089
emp_2 & barriers_4	132	-0.22	-2.09	0.039	emp_5 & barriers_4	-0.06	-0.53	0.594
emp_2 & barriers_5	132	-0.13	-1.22	0.226	emp_5 & barriers_5	-0.01	-0.14	0.892
emp_2 & barriers_6	132	-0.04	-0.36	0.720	emp_5 & barriers_6	0.11	1.04	0.303
emp_2 & barriers_7	132	-0.12	-1.14	0.256	emp_5 & barriers_7	-0.21	-2.01	0.048
emp_3 & barriers_1	132	-0.05	-0.46	0.649	emp_6 & barriers_1	0.13	1.18	0.241
emp_3 & barriers_2	132	0.17	1.59	0.116	emp_6 & barriers_2	-0.15	-1.40	0.166
emp_3 & barriers_3	132	0.14	1.28	0.205	emp_6 & barriers_3	-0.12	-1.14	0.257
emp_3 & barriers_4	132	0.05	0.46	0.646	emp_6 & barriers_4	-0.25	-2.44	0.017
emp_3 & barriers_5	132	-0.12	-1.16	0.250	emp_6 & barriers_5	-0.00	-0.02	0.982
emp_3 & barriers_6	132	0.01	0.13	0.901	emp_6 & barriers_6	0.00	0.02	0.984
emp_3 & barriers_7	132	0.04	0.33	0.739	emp_6 & barriers_7	-0.16	-1.52	0.132

The analysis of the relationship between employees' attitudes and barriers to technology implementation gave rise to six statistically significant negative weak correlations $p<0.05$. It was found that the attitudinal feature emp_1 (Employee involvement in the design and implementation of RPA solutions) was negatively related to the characteristics barriers_3 (Numerous exceptions and frequent process changes) and barriers_4 (Many paper documents entering the processes). It can therefore be concluded that as the importance of the results for attitudes increased, the significance of the results for barriers to technology implementation decreased. A significant negative correlation was also found between the variable emp_2 (Employees' satisfaction with the decision to start implementing RPA solutions) and the variable barriers_4 (Many paper documents entering the processes), thus it can be concluded that as the importance of the results for attitudes increased, the significance of the results for barriers to technology implementation decreased. The same negative correlations were found between the variable emp_4 (Employees feel more satisfied after implementing RPA solutions) and the variable barriers_3 (Numerous exceptions and frequent process changes). It was found that the characteristic emp_5 (Employee resistance and reluctance) was negatively related to the variable barriers_7 (Problems with maintaining a proper level of data). It was also found that the attitudinal variable emp_6 (Employees' fears of keeping their jobs) was negatively related to the feature barriers_4 (Numerous paper documents entering the processes). Thus, it can be concluded that in the case of the analyzed relationships, when the importance of the results for attitudes increased, the significance of the results for barriers to technology implementation decreased.

Subsequent analyses were concerned with verifying the association between the employees' attitudes (variables "emp_1 - emp_6") and determinants of technology implementation (variables "st1-st11"), (table 3).

Table 3. Correlation of Spearman's rank order (employees' attitudes and determinants)

Pair of variables	N	R Spearman	t(N-2)	p	Pair of variables	R Spearman	t(N-2)	p
emp_1 & st_1	132	0.02	0.16	0.87	emp_4 & st_1	0.07	0.64	0.53
emp_1 & st_2	132	0.05	0.48	0.63	emp_4 & st_2	0.03	0.29	0.77
emp_1 & st_3	132	0.16	1.54	0.13	emp_4 & st_3	0.04	0.34	0.73
emp_1 & st_4	132	0.10	0.94	0.35	emp_4 & st_4	0.03	0.24	0.81
emp_1 & st_5	132	0.16	1.52	0.13	emp_4 & st_5	0.07	0.69	0.49
emp_1 & st_6	132	0.07	0.65	0.52	emp_4 & st_6	0.04	0.38	0.71
emp_1 & st_7	132	0.04	0.35	0.72	emp_4 & st_7	0.00	0.03	0.98
emp_1 & st_8	132	0.16	1.48	0.14	emp_4 & st_8	0.12	1.15	0.25
emp_1 & st_9	132	0.12	1.11	0.27	emp_4 & st_9	0.02	0.15	0.132
emp_1 & st_10	132	0.06	0.53	0.60	emp_4 & st_10	0.05	0.44	0.66
emp_1 & st_11	132	-0.00	-0.03	0.98	emp_4 & st_11	0.03	0.26	0.80
emp_2 & st_1	132	-0.04	-0.40	0.69	emp_5 & st_1	0.06	0.56	0.57
emp_2 & st_2	132	-0.07	-0.66	0.51	emp_5 & st_2	-0.04	-0.37	0.71
emp_2 & st_3	132	0.20	1.93	0.06	emp_5 & st_3	-0.03	-0.28	0.78
emp_2 & st_4	132	0.04	0.40	0.69	emp_5 & st_4	-0.08	-0.71	0.48
emp_2 & st_5	132	0.18	1.66	0.10	emp_5 & st_5	-0.04	-0.33	0.75
emp_2 & st_6	132	-0.01	-0.13	0.90	emp_5 & st_6	-0.04	-0.32	0.75
emp_2 & st_7	132	-0.12	-1.13	0.26	emp_5 & st_7	-0.08	-0.72	0.47
emp_2 & st_8	132	0.01	0.07	0.95	emp_5 & st_8	0.03	0.25	0.81
emp_2 & st_9	132	0.03	0.26	0.79	emp_5 & st_9	-0.02	-0.22	0.83
emp_2 & st_10	132	0.08	0.74	0.46	emp_5 & st_10	-0.03	-0.23	0.82
emp_2 & st_11	132	0.02	0.22	0.83	emp_5 & st_11	0.01	0.11	0.92
emp_3 & st_1	132	-0.05	-0.50	0.62	emp_6 & st_1	0.02	0.21	0.84
emp_3 & st_2	132	0.06	0.60	0.55	emp_6 & st_2	-0.07	-0.67	0.50
emp_3 & st_3	132	-0.06	-0.56	0.57	emp_6 & st_3	0.18	1.70	0.09
emp_3 & st_4	132	0.05	0.47	0.64	emp_6 & st_4	-0.01	-0.06	0.96
emp_3 & st_5	132	0.02	0.22	0.83	emp_6 & st_5	0.12	1.08	0.28
emp_3 & st_6	132	0.01	0.07	0.95	emp_6 & st_6	-0.01	-0.13	0.90
emp_3 & st_7	132	0.10	0.132	0.38	emp_6 & st_7	-0.14	-1.36	0.18
emp_3 & st_8	132	0.02	0.16	0.87	emp_6 & st_8	0.02	0.20	0.85
emp_3 & st_9	132	0.03	0.32	0.75	emp_6 & st_9	-0.05	-0.49	0.63
emp_3 & st_10	132	0.08	0.72	0.47	emp_6 & st_10	0.03	0.27	0.79
emp_3 & st_11	132	0.05	0.45	0.65	emp_6 & st_11	0.01	0.11	0.91

The analysis of the results in table 3 gave rise to the conclusion that employees' attitudes were not significantly correlated with the determinants of the use of RPA solutions in the company ($p>0.05$).

The subsequent analyses were concerned with verifying the links between statements in employees' attitudes (variables "emp_1 - emp_6") and managers' opinions (variables "inv1-inv7")

Table 4. Correlation of Spearman's rank order (employees' attitudes and managers' opinions).

Pair of variables	N	R Spearman	t(N-2)	p	Pair of variables	R Spearman	t(N-2)	p
emp_1 & inv_1	132	0.03	0.3	0.76	emp_4 & inv_1	0.02	0.2	0.83
emp_1 & inv_2	132	0.06	0.5	0.59	emp_4 & inv_2	-0.03	-0.3	0.75
emp_1 & inv_3	132	0.21	2.0	0.05	emp_4 & inv_3	0.21	2.0	0.05
emp_1 & inv_4	132	0.25	2.4	0.02	emp_4 & inv_4	0.19	1.8	0.08
emp_1 & inv_5	132	0.10	1.0	0.34	emp_4 & inv_5	0.01	0.1	0.93
emp_1 & inv_6	132	0.10	0.9	0.36	emp_4 & inv_6	0.06	0.6	0.58
emp_1 & inv_7	132	0.05	0.5	0.64	emp_4 & inv_7	0.01	0.1	0.94
emp_2 & inv_1	132	-0.11	-1.0	0.30	emp_5 & inv_1	-0.03	-0.3	0.80
emp_2 & inv_2	132	0.20	1.9	0.07	emp_5 & inv_2	-0.05	-0.4	0.66
emp_2 & inv_3	132	0.08	0.7	0.46	emp_5 & inv_3	0.16	1.5	0.13
emp_2 & inv_4	132	0.19	1.7	0.08	emp_5 & inv_4	0.16	1.5	0.14
emp_2 & inv_5	132	0.19	1.8	0.08	emp_5 & inv_5	0.02	0.2	0.87
emp_2 & inv_6	132	0.01	0.1	0.94	emp_5 & inv_6	-0.02	-0.2	0.86
emp_2 & inv_7	132	0.21	2.0	0.05	emp_5 & inv_7	-0.01	-0.1	0.93
emp_3 & inv_1	132	0.01	0.1	0.91	emp_6 & inv_1	-0.06	-0.5	0.61
emp_3 & inv_2	132	0.01	0.1	0.93	emp_6 & inv_2	0.10	0.9	0.35
emp_3 & inv_3	132	-0.02	-0.2	0.85	emp_6 & inv_3	0.12	1.1	0.25
emp_3 & inv_4	132	-0.11	-1.0	0.32	emp_6 & inv_4	0.25	2.4	0.02
emp_3 & inv_5	132	-0.06	-0.6	0.56	emp_6 & inv_5	0.17	1.6	0.11
emp_3 & inv_6	132	-0.03	-0.3	0.80	emp_6 & inv_6	0.04	0.4	0.72
emp_3 & inv_7	132	0.02	0.1	0.132	emp_6 & inv_7	0.08	0.7	0.46

The analysis of the relationship between employees' attitudes and barriers to technology implementation and gave rise to four statistically significant positive weak correlations $p<0.05$. It was found that the feature related to employees' attitudes emp_1 (Employees' involvement in the design and implementation of RPA solutions) was positively related to the variable inv_4 (It is very difficult to find specialists with the required competencies on the market). So it can be concluded that as the importance of the results for attitudes increased, so did the significance of this statement. It was found that the attitudinal variable emp_2 (Satisfaction of employees with the decision to start implementing RPA solutions) was positively related to the feature inv_7 (Understanding that automation of business processes is requisite). Thus, it can be concluded that as the importance of the results for attitudes increased, so did the significance of this statement. It was found that the attitudinal feature emp_4 (Employees feel more satisfied after the implementation of RPA solutions) was positively correlated with the variable inv_3 (The wage pressure in Poland is the highest in Europe, which increases the cost of back office labor). Therefore, it can also be concluded that with an increase in the significance of the results for attitudes, the significance of this statement also increased. It has been proved that the attitudes feature emp_6 (Employees' fears about keeping their jobs) was positively related to the variable inv_4 (It is very difficult to find specialists with required competencies on the market).

CONCLUSIONS

The results of this study contribute to scientific knowledge and also have practical implications for managers and decision-makers in the field of process automation related to the adoption of RPA algorithms in enterprises. All the more important is that RPA is considered as a technology with the prospect of further growth in adoption.

The analyses of the employees' attitudes allow to conclude that the highest score was for the feature related to employees' involvement in the design and implementation of RPA solutions. Such engagement is the result of respecting the organizational culture by managers, which plays a key role during crisis moments. Building it in the era of the COVID-19 pandemic is especially crucial because the involvement of employees, their cooperation, and proper identification with the organization allow for appropriate changes in management and support the company to survive the crisis.

The respondents indicated the most frequent barriers to technology adoption related to unproperly prepared processes in enterprises as they are still non-optimized, non-standardized, and non-digitized with frequent changes and a large number of exceptions, and a significant proportion of paper documents entering the processes.

The factors highly assessed by managers and thus significantly influencing decisions on the implementation of RPA technology in enterprises during the pandemic were: understanding that investing in innovative technologies is essential in achieving competitive advantage; the ability to maintain processes' business continuity and fulfill operational objectives as well as achieving lower operating costs. These ratings confirm the usefulness and functionality of this technology and the appropriateness of its use in ensuring business continuity during the pandemic.

The huge enthusiasm that accompanies the robotization of business processes makes managers perceive this technology as a universal solution to their problems. Meanwhile, research conducted by an international team of researchers shows that it does not always happen as expected. It turns out that while robots are increasingly replacing human labor, there are also cases in which humans take over robots' tasks again. Researchers called such a phenomenon re-manualization and it results from the fact that some managers who introduce robots are too enthusiastic, their lack of understanding for the specifics of this solution and the use of a robot without prior preparation of the team for this fact (Modliński, et. al, 2022).

Modern technologies should support people in their everyday life and work, and not replace them. Innovative technological and IT solutions should support people's creativity, and allow them to perform activities requiring intelligence, sensitivity, and empathy. Some authors claim that interrelations between computers and creativity are constantly being redefined as technology rapidly evolves (Wojciechowski, A. & Korjonen-Kuusipuro, K., 2021). Simple, tedious, routine activities should be transferred to algorithms and machines. The authors are convinced that artificial intelligence, automation, and robotization will not replace humans. Both humans and algorithms offer different opportunities and strengths. The real question is, how can human intelligence with artificial intelligence develop augmented and hybrid intelligence?

RPA software spending worldwide has almost quadrupled in the last four years. Over the past four years, investment in RPA software has nearly doubled globally. However, according to Ernst & Young, between one-third and half of the organizations that made the

switch to RPA experienced project failure (2016). A contributing factor to such failure is the aim to entirely eliminate human involvement in the process. This confirms the authors' belief that algorithms alone, without human supervision, are not enough. Their role should be to support employees, relieve them from tedious and simple work, and release their potential. It is people with their creativity, sensitivity, and the ability to draw conclusions that are the foundation of every enterprise. Certainly, automation and robotization will develop dynamically in the future, so it is extremely important now to inform employees about plans for the implementation of such solutions in the enterprise so that they are part of this process, and do not feel threatened and fear for their jobs.

People have to rely on their digital co-workers. To build that trust, leaders need to help them understand what these tools can and cannot do. Leaders must demonstrate their role in supporting employees in the human-machine team by clearly defining business processes and demonstrating how human-machine teams create value. In today's economy, human-machine cooperation is gaining ground. It is fundamental to make efforts to achieve strategic business goals and customers and employees will begin to anticipate it. Employees are changing rapidly, and companies are looking for automation to ensure stability. Businesses are experiencing the pressure of automation due to low unemployment, but they are also seeing the strategic benefits of human-machine collaboration (Kulp, 2021).

RPA focuses on developing better, more effective ways to carry out repetitive tasks in a way that significantly more closely complements human abilities than completely replaces them. Organizations should continue to use business process automation solutions as this can be partially used as a business continuity enabler in the eventuality of a similar crisis. It is primarily intended to free employees from monotonous, time-consuming and simple tasks, and provide more demanding opportunities for the company to evolve. Moreover, it redirects the employees' potential to the demanding tasks of increasing competitiveness and improving service quality. The time is now for business processes to be redesigned so that people and machines can work together to provide the best experiences for both customers and employees.

Limitations

The presented investigations should be considered as a pilot study. The analysis was carried out on a not representative group of service enterprises and the selection of the sample was deliberate. Such a procedure was adopted because relatively few enterprises in Poland have implemented RPA technology to automate simple business activities and processes. It is also worth noting that the research was conducted only at the time of the coronavirus restrictions. The aim was to identify employees' attitudes towards RPA technology adopted to ensure business processes in organizations. It is a specific time of crisis and it is thus important to conduct similar research in other, different streams.

Future research

As part of the ever-evolving digital transformation, Robotic Process Automation is attracting
a lot of business attention. While RPA is a hot topic in the business world, a theoretical and

succinct examination of RPA is still lacking in academic research. There is not enough research and literature on RPA as a specialist area of information technology (Aldossari & Zin 2019). Further research could include a thorough evaluation of RPA technology, elaborating on roadmaps for effective implementation, and revealing factors influencing the adoption of RPA technology. The authors suggest undertaking a scientific discourse and conducting comprehensive, in-depth scientific research aimed at formulating recommendations addressed to the management staff of enterprises, thus providing examples of good practices and success stories. They would be important from the point of view of creating an organizational culture in enterprises in which employees accept such innovative technologies and automation and are involved in the process of adopting such solutions to support their common work. The authors can also provide a discussion about the future-oriented development of computer-related functions, integration, and processes for software robots. The authors are convinced that software robots will collaborate with humans and work side-by-side with them, freeing up human attention for tasks requiring creativity and social skills. Thus, a new understanding of the function of human resources is required, together with the identification of new roles in business processes. In the conditions of the future human-robot interaction and collaboration, it seems to be a key issue.

ACKNOWLEDGEMENT

This research was funded as a part of the work No. WZ/WIZ-INZ/2/22 at the Faculty of Engineering Management at the Bialystok University of Technology and financed from a research subsidy provided by the minister responsible for science.

REFERENCES

Acemoglu, D., & Restrepo, P. (2017). Robots and Jobs: Evidence from US Labor Markets; NBER Working Paper; *Social Science Electronic Publishing*. Inc.: Rochester. NY. USA.

Acemoglu, D., & Restrepo, P. (2018). Artificial Intelligence. Automation and Work; NBER Working Paper; *Social Science Electronic Publishing*. Inc.: Rochester. NY. USA.

Acemoglu. D., & Restrepo. P. (2016). The Race Between Machine and Man: Implications of Technology for Growth. Factor Shares and Employment; NBER Working Paper. *Social Science Electronic Publishing*. Inc.: Rochester, NY, USA.

Acemoglu. D., & Restrepo. P. (2016). *The Race Between Machine and Man: Implications of Technology for Growth. Factor Shares and Employmen*. NBER Working Paper; Social Science Electronic Publishing. Inc.: Rochester, NY, USA.

Agarwal, S., Punn, N. S., Sonbhadra, S. K., Tanveer, M., Nagabhushan, P., Pandian, K. K., & Saxena, P. (2020). Unleashing the power of disruptive and emerging technologies amid COVID-19: A detailed review. *arXiv preprint arXiv:2005.11507*.

Aldossari, M., & Zin, A. M. (2019). The use of automation and robotic innovations in the transformational companies: Systematic literature review. *Journal of Theoretical and Applied Information Technology*, *97*(13), 3661-3690.

Anagnoste, S. (2017, July). Robotic Automation Process-The next major revolution in terms of back office operations improvement. In *Proceedings of the International Conference on Business Excellence* (Vol. 11, No. 1, pp. 676-686).

Anagoste, S. (2018). Robotic Automation Process–The operating system for the digital enterprise (Proceedings of the 12th International Conference on Business Excellence. De Gruyter Open. 12 (1).

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

Asatiani, A., Copeland, O., & Penttinen, E. (2023). Deciding on the robotic process automation operating model: A checklist for RPA managers. *Business Horizons*, *66*(1), 109-121. https://doi.org/10.1016/j.bushor.2022.03.004.

Autor, D. H. (2015). Why are there still so many jobs? The history and future of workplace automation. *Journal of economic perspectives*, *29*(3), 3-30.

Autor, D. H. (2015). Why are there still so many jobs? The history and future of workplace automation. *Journal of economic perspectives*, *29*(3), 3-30.

Autor, D. H., & Salomons. A.M. (2018). Is automation labor-displacing? Productivity growth. employment. and the labor share. In *Proceedings of the BPEA Conference Drafts*. Detroit. MI. USA. No. w24871

Bhalerao, K., & Patil, V. (2021). A study of barriers and benefits of ICT adoption among SMEs, *International Journal of Research Managemen*t, 1, 2021, 15-18 (6).

Brynjolfsson, E., & McAfee, A. (2019). A Race Against the Machine: How the Digital Revolution is Accelerating Innovation. Driving Productivity, and Irreversibly Transforming Employment and the Economy; *Digital Frontier Press*: Lexington. MA. USA.

Brzeziński, Ł. (2022). Robotic Process Automation in Logistics – A Case Study of a Production Company, *European Research Studies Journal*, XXV, 2B, 2022, 307-315

Bullock, J., Luccioni, A., Pham, K. H., Lam, C. S. N., & Luengo-Oroz, M. (2020). Mapping the landscape of artificial intelligence applications against COVID-19. *Journal of Artificial Intelligence Research*, *69*, 807-845.

Carbonero, F.; Ernst, E.; Weber, E. (2020). Robots Worldwide: The Impact of Automation on Employment and Trade. Beiträge zur Jahrestagung des Vereins für Socialpolitik. Gender Economics. ZBW - Leibniz Information Centre for Economics. Kiel. Hamburg

Chairoel, L., Widyarto, S., & Pujani, V. (2015). ICT adoption in affecting organizational performance among Indonesian SMEs. *The International Technology Management Review*, *5*(2), 82-93. doi:10.2991/itmr.2015.5.2.3

Costa, S. A. S., Mamede, H. S., & Silva, M. M. (2022). Robotic Process Automation (RPA) adoption: a systematic literature review. *Engineering Management in Production and Services*, 14(2), 1-12. doi:10.2478/emj-2022-0012

De Cremer, D., & Kasparov, G. (2021). AI should augment human intelligence, not replace it. *Harvard Business Review*, *18*. https://hbr.org/2021/03/ai-should-augment-human-intelligence-not-replace-it

Decker, M., Fischer, M., & Ott, I. (2017). Service Robotics and Human Labor: A first technology assessment of substitution and cooperation. *Robotics and Autonomous Systems*, *87*, 348-354.

Dey, S., & Das, A. (2019). Robotic process automation: assessment of the technology for transformation of business processes. *International Journal of Business Process Integration and Management*, *9*(3), 220-230.

E-Fatima, K., Khandan, R., Hosseinian-Far, A., Sarwar, D., & Ahmed, H. F. (2022). Adoption and Influence of Robotic Process Automation in Beef Supply Chains. *Logistics*, *6*(3), 48. https://doi.org/10.3390/logistics6030048

Ejdys, J., & Gulc, A. (2022). Factors influencing the intention to use assistive technologies by older adults. *Human Technology*, *18*(1), 6–28. https://doi.org/10.14254/1795-6889.2022.18-1.2.

Enriquez, J.G., Jimenez-Ramirez, A., Dominguez-Mayo, F.J., & Garcia-Garcia, J.A. (2020). Robotic Process Automation: A Scientific and Industrial Systematic Mapping Study. *IEEE*, 8, 39113–39129.

Ernst & Young (2016). Get ready for robots. Why planning makes the difference between success and disappointment. https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/emeia-financial-services/ey-get-ready-for-robots.pdf

Ernst, E., Merola, R., & Samaan, D. (2019). Economics of Artificial Intelligence: Implications for the Future of Work. *IZA Journal of Labor Policy*, *9*(1), 20190004. doi: https://doi.org/10.2478/izajolp-2019-0004

Fiaidhi, J., Mohammed, S., & Mohammed, S. (2018). The robotization of extreme automation: The balance between fear and courage. *IT Professional*. *20*(6). 87-93. doi:10.1329/MITP.2018.2876979

Ford, M. (2015). The Rise of the Robots: Technology and the Threat of Mass Unemployment, *Oneworld Publications*. Oxford, UK.

Frey, C. B. (2019). The technology trap. In *The Technology Trap*. Princeton University Press.

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

Geyer-Klingeberg, J., Nakladal, J., Baldauf, F., & Fabian, V. (2018). Process Mining and Robotic Process Automation: A Perfect Match. In Proceedings of the 6th International Conference on Business Process Management (BPM). Sydney. NSW. Australia.

Gladden, M., Fortuna, P., & Modliński, A. (2022). The Empowerment of Artificial Intelligence in Post-Digital Organizations: Exploring Human Interactions with Supervisory AI. *Human Technology*, *18*(2), 98–121. https://doi.org/10.14254/1795-6889.2022.18-2.2

Gregory, T., Salomons, A., & Zierahn, U. (2016). Racing with or against the machine? Evidence from Europe. *Evidence from Europe (July 15, 2016). ZEW-Centre for European Economic Research Discussion Paper*, (16-053).

Gudanowska, A., Kononiuk, A., Siderska, J., & Debkowska, K. (Eds.) Uwarunkowania Ucyfrowienia Procesów Produkcji i Wzrostu Kompetencji Cyfrowych Społeczeństwa; Oficyna Wydawnicza Politechniki Białostockiej: Białystok. Poland. 2020. (In Polish)

Gupta, A. (2019) ICT Adoption: An Agenda for Research, Kindler Vol. XVIII No. 1&2.

Halicka, K., & Surel, D. (2022). Smart Living Technologies in the Context of Improving the Quality of Life For Older People: The Case of the Humanoid Rudy Robot. *Human Technology*, 18(2), 191–208. https://doi.org/10.14254/1795-6889.2022.18-2.5

Hinde, W., & Jones, T. (2020). Starting with RPA: The Diagnosis and Treatment of Technology Debt in Healthcare. Available online: https://www.westmonroe. com/perspectives/point-of-view/starting-with-rpa-the-diagnosis-and-treatment-of-technology-debt-in-healthcare (accessed on 2 February 2020).

Houy, C., Reiter, M., Fettke, P., Loos, P., Hoesch-Klohe, K., & Ghose, A. (2012). Advancing Business Process Technology for Humanity: Opportunities and Challenges of Green BPM for Sustainable Business Activities. In *Green Business Process Management*; vom Brocke, J., Seidel, S., Recker, J., Eds.; Springer: Berlin/Heidelberg, Germany.

Hurd, C. C. (1958). The social problem of automation. In *Proceedings of the Western Joint Computer Conference: Contrasts in Computers*. IRE-AIEE-ACM 1958. Los Angeles. US. 6-8 1958, 13-16, doi:10.1145/1457769.1457774

Ivancic, L., Vugec, D.S., & Vuksic, V.B. (2020). Robotic Process Automation: Systematic Literature Review. In Business Process Management: Blockchain and Central and Eastern Europe Forum; Springer: Cham. Switzerland, 280–295.

Ivanov, S., & Webster. C. (2019b). Economic Fundamentals of the Use of Robots. Artificial Intelligence and Service Automation in Travel. Tourism and Hospitality. In Ivanov. S.. & Webster. C. (Eds.) (2019). *Robots. Artificial Intelligence and Service Automation in Travel. Tourism and Hospitality*. ISBN: 978-1-78756-6132-0. Emerald Publishing, 39-55.

Ivanov, S., Kuyumdzhiev, M., & Webster, C. (2020). Automation fears: Drivers and solutions. *Technology in Society*, *63*, 101431.

Javaid. M., Haleem. A., Vaishya. R., Bahl. S., Suman. R., Vaish. A. (2020). Industry 4.0 technologies and their applications in fighting COVID-19 pandemic. *Diabetes Metab. Syndr. Clin. Res. Rev*., 14. 419–422.

Jovanović, S. Z., Đurić, J. S., & Šibalija, T. V. (2018). Robotic process automation: overview and opportunities. *International Journal Advanced Quality*, *46*(3-4), 34-39.

Jurczuk, A. (2022). Future-oriented digital skills for process design and automation. *Human Technology*, *18*(2), 122–142. https://doi.org/10.14254/1795-6889.2022.18-2.3

Jurek, P., Korjonen-Kuusipuro, K., & Olech, M. (2021). When technology use causes stress: Challenges for contemporary research. *Human Technology*, *17*(3), 190–196. https://doi.org/10.14254/1795-6889.2021.17-3.1

Jurek, P., Olech, M., & Brycz, H. (2021). Perceived technostress while learning a new mobile technology: Do individual differences and the way technology is presented matter? *Human Technology*, *17*(3), 197–212. https://doi.org/10.14254/1795-6889.2021.17-3.2

Kedziora D., & Smolander K. (2022). Responding to Healthcare Emergency Outbreak of COVID-19 Pandemic with Robotic Process Automation (RPA). *Proceedings of the 55th Hawaii International Conference on System Sciences* (HICSS). 6207-6216

Kedziora, D. (2022). Botsourcing, Roboshoring or Virtual Backoffice? Perspectives on Implementing Robotic Process Automation (RPA) and Artificial Intelligence (AI). *Human Technology*, *18*(2), 92–97. https://doi.org/10.14254/1795-6889.2022.18-2.1

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

Kedziora, D., & Penttinen, E., (2020). Governance models for robotic process automation: The case of Nordea Bank, *Journal of Information Technology Teaching Cases*, 2021, 11(1) 20–29.

Keynes. J. (1930/1963). Economic possibilities for our grandchildren. In J. M. Keynes. *Essays in Persuasion*. New York: W.W.Norton & Co., 358–373.

Kolková, A., & Ključnikov, A. (2022). Demand forecasting: AI-based, statistical and hybrid models vs practice-based models - the case of SMEs and large enterprises. *Economics and Sociology*, *15*(4), 39-62. doi:10.14254/2071- 789X.2022/15-4/2

Kucia, M., Hajduk, G., Mazurek, G., & Kotula, N. (2021). The implementation of new technologies in customer value management—a sustainable development perspective. *Sustainability*, *13*(2), 469.

Kulp, T. (n.d.). Human-Machine Collaboration in 2021: The Machines Are Ready. Is Your Business? Digital Workspace. https://www.reworked.co/digital-workplace/human-machine-collaboration-in-2021-the-machines-are-ready-is-your-business/

Lasso-Rodriguez, G., & Winkler, K. (2020). Hyperautomation to fulfil jobs rather than executing tasks: the BPM manager robot vs human case. *Romanian Journal of Information Technology and Automatic Control*, *30*(3), 7-22.

Latikka, R., Savela, N., Koivula, A., & Oksanen, A. (2021). Attitudes toward robots as equipment and coworkers and the impact of robot autonomy level. *International Journal of Social Robotics*, *13*(7), 1747-1759. https://doi-org.bazy.pb.edu.pl/10.1007/s12369-020-00743-9

Madakam, S., Holmukhe, R. M., & Jaiswal, D. K. (2019). The future digital work force: robotic process automation (RPA). *JISTEM-Journal of Information Systems and Technology Management*, *16*, 1–14.

Maknickienė, N., Maknickas, A., & Martinkutė-Kaulienė, R. (2020). Trading support method based on computational intelligence for speculators in the options market. *Journal of International Studies*, *13*(3), 231-247. doi:10.14254/2071- 8330.2020/13-3/15

Mbunge, E., Akinnuwesi, B., Fashoto, S. G., Metfula, A. S., & Mashwama, P. (2021). A critical review of emerging technologies for tackling COVID-19 pandemic. *Human behavior and emerging technologies*, *3*(1), 25-39.

Modliński, A., Kedziora, D., del Rio Ortega, A., Jimenez Ramirez, A. (2022). Lecture Notes of Business Information Processing, Rolling back to manual work: An exploratory research on Robotic Process Re-Manualization. doi:10.1007/978-3-031-16168-1_10.

Nadikattu, R. R. (2020). Information technologies: Rebooting the world activities during COVID-19. *Available at SSRN 3622733*.

Nah, F.F.N., Siau, K. (2020). Covid-19 pandemic—Role of technology in transforming the business to the new normal. In Lecture Notes in Computer Science; Springer: Cham. Switzerland, 585–600.

Nam, T. (2019). Citizen attitudes about job replacement by robotic automation, *Futures*, *109*, 39-49, doi: 10.1016/j.futures.2019.04.005

Oliinyk, O., Bilan, Y., & Mishchuk, H. (2021). Knowledge Management and Economic Growth: The Assessment of Links and Determinants of Regulation. *Central European Management Journal*, *29*(3), 20-39. https://doi.org/10.7206/cemj.2658-0845.52

Pramod, D. (2022). Robotic process automation for industry: adoption status, benefits, challenges, and research agenda. *Benchmarking: An International Journal*, 29(5), 1562-1586. https://doi.org/10.1108/BIJ-01-2021-0033

Rago, L. J. (1965). Tooling up for automation hampered by myths and fears. *Business & Society*, *5*(2), 33-36. doi: https://doi.org/10.1177/000765036500500206

Reddy, K. N., Harichandana, U., Alekhya, T., & Rajesh, S. M. (2019). A study of robotic process automation among artificial intelligence. *International Journal of Scientific and Research Publications*, *9*(2), 392-397.

Robert, L. (2021). A Measurement of Attitude toward Working with Robots (AWRO): A Compare and Contrast Study of AWRO with Negative Attitude toward Robots (NARS) accepted to HCII 2021. Preprint, Available at SSRN: https://ssrn.com/abstract=3879544 or http://dx.doi.org/10.2139/ssrn.3879544

Romão, M., Costa, J., & Costa, C.J. (2019). Robotic Process Automation: A Case Study in the Banking Industry. In *Proceedings of the 14th Iberian Conference on Information Systems and Technologies* (CISTI). Coimbra, Portugal.

Roshchyk, I., Oliinyk, O., Mishchuk, H., & Bilan, Y. (2022). IT Products, E-Commerce, and Growth: Analysis of Links in Emerging Market. *Transformations in Business & Economics*, *21*(1), 209-227.

Ryadi, W. T., Kurniasari, F., & Sudiyono, K. A. (2021). Factors influencing consumer's intention towards e-grocery shopping: An extended technology acceptance model approach. *Economics, Management and Sustainability*, *6*(2), 146–159. https://doi.org/10.14254/jems.2021.6-2.11

Şahin, L. (2020). Impacts of industrial robot usage on international labor markets and productivity: Evidences from 22 OECD countries. *Journal of International Studies*, *13*(3), 59-67. doi:10.14254/2071-8330.2020/13-3/4

Santos, F., Pereira, R., & Vasconcelos, J. B. (2020). Toward robotic process automation implementation: an end-to-end perspective. *Business process management journal*, *26*(2), 405-420.

Schwab. K. (2017). The Fourth Industrial Revolution; Penguin: London. UK.

Sharma, C., Bharadwaj, S. S., Gupta, N., & Jain, H. (2023). Robotic process automation adoption: contextual factors from service sectors in an emerging economy. *Journal of Enterprise Information Management*, *36*(1), 252-274. https://doi.org/10.1108/JEIM-06-2021-0276

Shen, Y., Guo, D., Long, F., Mateos, L. A., Ding, H., Xiu, Z., ... & Tan, H. (2020). Robots under COVID-19 pandemic: A comprehensive survey. *Ieee Access*, *9*, 1590-1615.

Siderska, J. (2020). Robotic Process Automation—a driver of digital transformation?. *Engineering Management in Production and Services*, *12*(2), 21-31.

Siderska, J. (2021). The adoption of robotic process automation technology to ensure business processes during the COVID-19 pandemic. Sustainability, 13, 8020. https://doi.org/10.3390/su13148020

Smithikrai, C. (2022). Antecedents and Consequences of Proactive Work Behavior Among Thai Employees. *The Journal of Behavioral Science*, *17*(1), 43-57. Retrieved from https://so06.tci-thaijo.org/index.php/IJBS/article/view/254132

Sobczak, A. (2022). Analysis of the Conditions Influencing the Assimilation of the Robotic Process Automation by Enterprises. *Human Technology*, *18*(2), 143-190. https://doi.org/10.14254/1795-6889.2022.18-2.4

Spencer, D. (2018). Fear and hope in an age of mass automation: Debating the future of work. *New Technology, Work, and Employment*. 33(1), 1-12. doi: https://doi.org/10.1111/ntwe.12105

Straková, J., Talíř, M., & Váchal, J. (2022). Opportunities and threats of digital transformation of business models in SMEs. *Economics and Sociology*, *15*(3), 159- 171. doi:10.14254/2071-789X.2022/15-3/9

Sułkowski, Ł., & Kaczorowska-Spychalska, D. (2021). Determinants of the adoption of AI wearables-practical implications for marketing. *Human Technology*, *17*(3), 294-320. https://doi.org/10.14254/1795-6889.2021.17-3.6

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.

Van der Aalst, W. M., Bichler, M., & Heinzl, A. (2018). Robotic process automation. *Business & information systems engineering*, *60*, 269-272.

Vermeulen, B., Kesselhut, J., Pyka, A., & Saviotti, P. P. (2018). The impact of automation on employment: just the usual structural change?. *Sustainability*, *10*(5), 1661. doi:10.3390/su10051661

Wojciechowski, A., & Korjonen-Kuusipuro, K. (2021). Can artificial intelligence become an artist?. *Human Technology*, *17*(2), 118. https://doi.org/10.14254/1795-6889.2021.17-2.2

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Human Technology
ISSN 1795-6889
https://ht.csr-pub.eu