The concept of the doctoral dissertation

Piotr Bejger, MSc, PhD Student

Initial topic of the doctoral dissertation:

Robotization as a response to selected challenges in financial accounting of Polish companies

Justification for the topic:

Financial accounting is an element of modern enterprise management, being both one of the sources of information used to make decisions and giving a view on the results of company management decisions. It is an important source of information for the company's key stakeholders, including in particular the management board, owners, regulators (including tax authorities), and others (employees, business partners). Financial accounting is closely related to the economic environment, including legal regulations, technological environment and social environment, and this environment has and will have a strong impact on the maintenance of financial accounting.

Currently, in the global economy, companies are dealing with three trends that generate additional work: an increase in regulations, bureaucratization and control, a rapid increase in processed data, and a dynamic development of technology that generates additional problems (Willcocks, 2020, pp. 295-296). These trends are also impacting the financial accounting. On the other hand, we can observe socio-demographic trends of decreasing available labor supply, which also apply to financial accounting.

Financial accounting is strictly regulated by both external regulations (legal regulations, accounting standards, voluntary codes or sets of best practices) and internal regulations (accounting policies, policies of capital groups, processes and procedures, internal control). In recent years, the number and complexity of these regulations concerning financial accounting has been steadily growing, and they are enforced by more and more efficient control mechanisms (internal control, external audit, fiscal control, other regulatory controls). It can be noted that in the recent years, i.e. from 2016 to 2021, e.g. the following regulations were implemented:

- amendments to the Accounting Act introducing the requirement to prepare financial statements in electronic form,
- introducing a requirement for additional disclosures in the notes, including, for example, disclosure of expenditure on research and development, intangible assets and others,
- companies applying International Financial Reporting Standards as adopted by the European Union (hereinafter IFRS), since 2018 had to implement the new IFRS 15 Revenue from Contracts with Customers and IFRS 9 Financial Instruments; and from 2019 the new IFRS 16 Leases. Each of these standard impacts usually significant area of accounting (revenues, fixed assets, financial instruments) and requires the introduction of significant changes in accounting, what generated additional work (including additional procedures, additional registers, additional controls etc.),
- in 2016-2021, the new tax regulations were constantly introduced in Poland, directly affecting the work of the accounting department, the new law concerned e.g. the obligation to prepare a standard audit file for tax (SAFT), the obligation to verify contractors (including the validity of tax identification numbers, verification of bank account numbers), extending the obligations regarding transfer pricing documentation (including the obligation to conduct and document the benchmarks studies for prices applied with related parties, the obligation to calculate the profitability of intra-group transactions , obligation to inform about capital groups), obligation to prepare tax strategies, obligation to inform about planned transactions affecting taxes, etc.,
- in 2018, the provisions of the General Data Protection Regulation (GDPR) came into force, which resulted in the need to implement additional procedures in all areas of business operations and dealing with personal data, which impacted also accounting,
- apart from historical data, there is currently an ongoing debate in accounting and reporting regulations on increased focus of reporting on the measures concerning the future. In addition to the current requirement to assess going concern or prepare financial forecasts for valuation purposes, ideas like confirming whether dividend policies will not impact the company's insolvency, information on long-term and medium-term strategy and other[1]

[1] See e.g. Department for Business, Energy & Industrial Strategy, UK (2021)

In the area of financial accounting, the above changes cause an increasing workload of enterprises due to the need to meet increasing requirements.

The second change in each area of the company's operation in recent years is the rapid increase in production and demand for data. World studies show that 90% of currently functioning data was created in the last two years, and the volume of data is growing by 50% every year. In the area of financial accounting, this trend is visible, inter alia, in:

- increased regulatory requirements described in the previous point, which require processing and generation of significant amount of additional data (e.g. each time verification of bank account numbers of the company's suppliers, additional tax documents, additional consents regarding the processing of personal data, etc.),
- continuous increase in competition resulting in greater demand for information in the area of management accounting (where parameters are analyzed at an increasing level of detail and in an increasing number of dimensions), implying greater requirements in the area of financial accounting,
- contemporary management techniques require increasing data analytics, and this impacts the increased demand for data from accounting, e.g. data generated by financial and/or management accounting can be combined with other sets of data, like customer behavior data to generate better business insight. This requires the accounting data to be recorded in much granular level, what cause increase in data collected and processed in the financial and accounting systems.

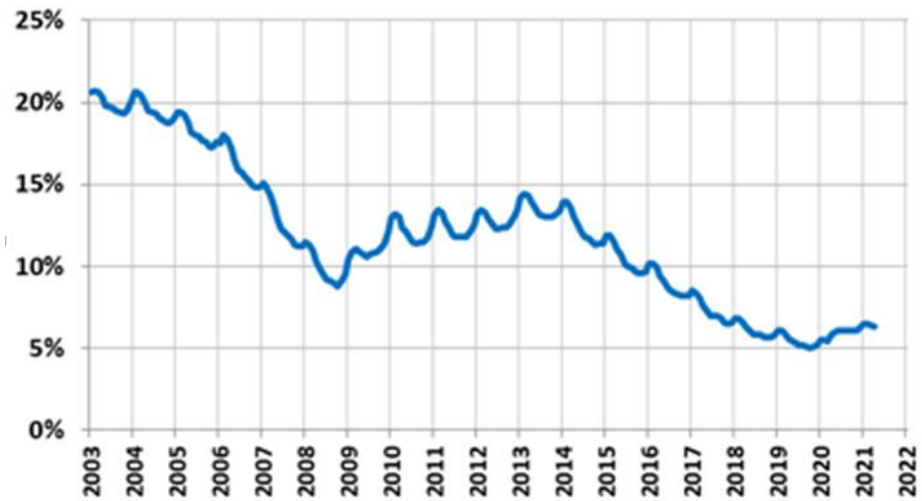
The above increase of data implies a significant increase in the work required to process it. And additionally the pace of processing data is expected to increase to enable a competitive advantage of the enterprise and meet the owners' expectations.

Maintenance of financial accounting in today's world is inherently associated with the use of information systems and technology, which is designed to support financial and accounting processes. The continuous development of technology is aimed at solving existing problems, eg improving work, meeting new needs, increasing competitiveness, etc. However, along with the development of technology, in recent years we can observe emerging new problems generated by it. The examples of these problems are:

- problems with cybersecurity, i.e. the risks associated with unauthorized access to data, theft, remote takeover of control over devices, the risk of business continuity or disruption. In recent years, the number of incidents and cyberattacks has been systematically increasing, generating real costs both to the individual companies and to entire economies. Addressing this risk requires taking mitigating actions and implementing solutions to minimize it (e.g. performing additional procedures, implementing additional software), and thus the increased costs and increased workload for the selected departments in the companies are generated,
- fake news – as the volume of data grows, so does the volume of information and information sources (new websites, social networks), which are generated both by people and by algorithms. Besides real information, a lot of fake news are created, aimed at achieving various goals. Analysis and verification of information becomes more and more important, and also generates additional work and costs,
- negative impact on human work (to be further developed in subsequent sections).

The above-mentioned three groups of factors cause a considerable increase of work, which is impacting also financial accounting.

By analyzing and observing the social environment, one can notice trends indicating that the available human resources are and will be more and more limited, and these changes have an impact on financial accounting. In Poland, there are mainly negative demographic trends. The population in Poland is expected to decline from 38 million people now to less than 35 million people in 2050, and the share of post-working age people in this population is expected to increase from 7 to 10 million people. You can already observe shortages of qualified staff in many recruitment processes, which is best illustrated by the record low levels of unemployment in Poland.



Rys. 1 The unemployment rate in Poland

Source: Stopa bezrobocia rejestrowanego w latach 1990–2020. stat.gov.pl.

In addition, it was found that skill matching has not kept pace with increasing market and technology demands. According to the analyzes of the World Economic Forum (2020, p. 97), technological skills in Poland were assessed in the survey of management boards at the level of 55.6% on a scale between the minimum and maximum result obtained by individual countries. 52 countries were assessed, with 42 countries having a result above Poland, including e.g. 62.5% Germany, 69.4% USA, 61% Great Britain and 71.7% China. The result below Poland was recorded only for 9 countries, including countries such as Spain (55.2%), South Africa (29.9%), Pakistan (50.7%), Mexico (42.9%), Japan (50.8%), Italy (50.7%), India (49.2%), Brazil (36.9%), Argentina (50.1%). Currently, Poland is one of the last places in the European Union in terms of digitization of the economy, state and workforce - the degree of digitization of Polish enterprises in 2016 was on average 34% lower than in Western Europe (average for France, the Netherlands, Germany, Sweden, Great Britain and Italy) and 56% lower than in the USA (after McKinsey & Company, 2016, p. 10), and digital skills at the elementary or higher level were represented by 40-46% of the population, compared to the EU average of 55-58% (Eurostat data for 2015-2019). It is anticipated that new technologies will require additional skills in the future. At G20 level, a surplus of 95 million low-skilled workers was projected to exist in 2020, with a shortage of 45 million medium-skilled and 40 million highly-skilled workers[2].

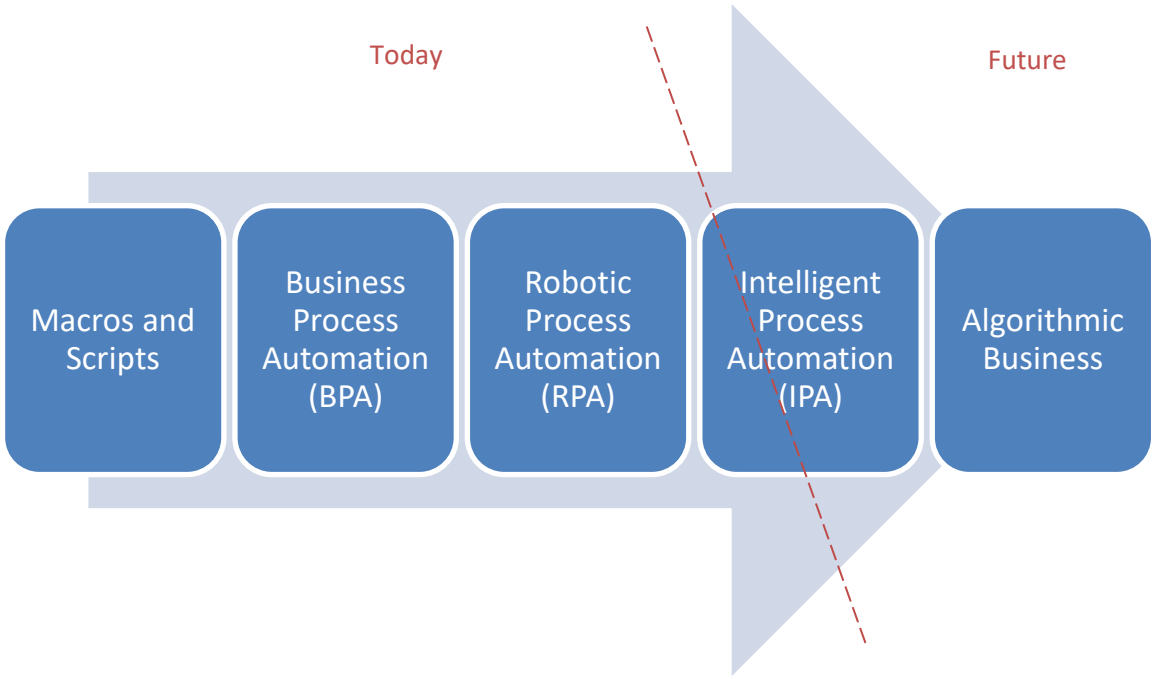
[2] *No Ordinary Disruption*. Dobbs R, Manyika J and Woetzel J (2015), New York: Public Affairs, za Willcocks (2020)

Additionally, it should be noted that people are susceptible to negative factors generated by technology like addictions and ineffectiveness. There is increasing number of studies indicating that new technologies, such as smartphones, video games, the internet, instant messaging and the like, lead to addiction. The wide access to these technologies (e.g. already in 2017, 66% of the world's population had a mobile phone, and 34% were active users of social media[3]), which are relatively new, is used by many corporations to generate significant income. As a result these corporations are encouraged to motivate their customers to use technology more extensively (including solutions such as continuous notifications, endless information, online games giving immediate rewards and imposing penalties for stopping gaming, etc.). Recently the average daily time of using a smartphone exceeded 3 hours[4] and "Generation Z" employees admit to using smartphones for up to 2 hours during the working day[5]. The addiction to video games, which is significantly reducing work efficiency, was recently formally confirmed to be a problem by adding it to the list of diseases by the International Health Organization as of January 1, 2022. The above leads to a real reduction in the efficiency of employees at work.

Connecting the information on the trends in regulations and technologies in the field of financial accounting that generate additional work with a decline in human resources, one can hypothesize that a human being requires significant support.

It can be seen that in today's world, automation and technology are dynamically developing. The available technologies in many areas supplement and replace the human work, and this trend is also observed in the area of financial accounting. The successive stages of automation fall into the stages of technology development, and in recent years, the possibility of automating office processes using robotization (Robotic Process Automation, RPA) has emerged and developed.

[3] see https://wearesocial.com/uk/special-reports/digital-in-2017-global-overview
[4] https://mobiletrends.pl/ile-godzin-dziennie-wpatrujemy-sie-w-ekran-smartfona/
[5] *Irresistible*. Alter A (2017) London: Random House za Willcocks (2020)



Rys. 4. Stages of development of technology for the automation of mental work
Source: Own study based on Osinubi (2018, s.14)

Robotic Process Automation (RPA) is a type of automation using a configurable IT tool (software) which, after programming, using business rules, performs a sequence of actions to automatically execute the process in various applications (systems), in the same way a human would do (i.e. using user interface), without changing the code of other systems, and with human help to resolve exceptional (unforeseen) situations, if they occur.

There are a number of conditions that enable implementation of RPA. They can be divided into conditions relating to the processes and conditions relating to the data.

The conducted literature studies show that the following characteristics of processes support or enable robotization of the process:

- high degree of reliance on unambiguous rules,
- limited number of exceptions that need to be resolved by human,
- stable IT environment,
- adequately advanced IT infrastructure,
- need to interact with many systems,
- quantifiable costs for the operation of the process.

On the other hand, the following characteristics of the data, which is processed is needed to enable robotization of the process:

- high structurization of the data,

- digitization of data (i.e. its digital form),
- text and numerical data format,
- high volume of data justifying robotization.

It must be noted, that not all of the characteristics mentioned above must be met to enable implementation of RPA, but the more of them are in place, the process is better positioned for robotization.

A preliminary analysis of processes in financial accounting indicates the possibility of meeting many of the identified conditions of robotization. These include:

- the standardization of financial accounting processes resulting from the accounting policies and procedures,
- functioning of financial accounting processes in the IT environment,
- high level of structurization of data, which is used in financial accounting, or the possibility of structuring them,
- digitization of data used in financial accounting or possibility to achieve that

Research conducted in various countries around the world shows that the use of RPA in financial accounting is possible and even often used. However, it should be noted that a number of determinants of financial accounting result from legal regulations that are specific to individual countries or markets. There are also other characteristics as well, such as labor costs, education level, IT infrastructure and others, which can differ between countries.

Taking into account the main purpose of implementing RPA as per its definition, which is to automate human work with IT programs or algorithms, the question should be asked whether, in Polish conditions, this technology is able to help solve the growing problems, which are raising in accounting. If this is possible, it should be also analysed, which processes in financial accounting are most suitable for robotization.

The main assumptions of the dissertation

Research area: financial accounting**,**

Subject of research: Robotic Process Automation (RPA, robotization) in financial accounting

Research subject:

- in the theoretical part: business conditions for companies operating in Poland, which need to maintain financial accounting records
- in the empirical part: selected companies operating in Poland (survey of companies with which the author has relations – at least 40 companies)

Time range of the research:

2021-2022

Research problems:

A research problem for the science of financial accounting that requires examination:

- Applicability of RPA in financial accounting in Poland
- Identification of most suitable sub-processes in financial accounting for robotization
- Assessment of the benefits of implementing RPA in Polish companies
- Verification of which of the problems in financial accounting in Poland can be solved through the implementation of RPA

Work hypothesis:

Implementation of RPA in financial accounting in companies operating in Poland is feasible in its key sub-processes and supports resolving key problems arising in that area, resulting from the mismatch between the growing amount of work and the decline in available human resources.

Main objective:

Identification and assessment of the feasibility of application of RPA in financial accounting in companies operating in Poland as an effective solution to selected key problems in this area.

Detailed objectives:

- Identification of key problems in the area of financial accounting in companies operating in Poland in 2021/2022 (chapter 1)
- Analysis and definition of RPA, which is one of the stages of the development of automation in contemporary business environment, and identification of characteristics enabling its implementation (chapter 2)
- Analysis of the characteristics of financial accounting processes related to the feasibility of implementation of RPA, including the analysis of specific processes in financial accounting (chapter 3)
- Empirical verification of the applicability of RPA in financial accounting and in its sub-processes and empirical analysis of matching the key benefits from RPA in relation to the key problems identified in financial accounting (chapter 4).
- Summary and conclusions for business practice in Poland and further scientific research on the application of RPA in financial accounting (chapter 5)

Research methods

Literature studies
Methods of inductive and deductive reasoning
Descriptive analysis, critical analysis, synthesis
Empirical research – a survey of financial directors/chief accountants of selected companies

Initial structure of a doctoral dissertation:

Chapter 1. Key challenges related to financial accounting in Poland in 2021/2022

1. Identification of factors that create challenges in maintaining financial accounting
2. Regulatory factors in financial accounting in Poland
3. Technological factors in financial accounting
4. Socio-demographic factors impacting financial accounting in Poland
5. Analysis of research on the future of the accounting profession
6. Summary of the key factors that may pose potential problems in accounting in Poland
7. Empirical studies on the main challenges related to financial accounting in Poland

Chapter 2. Process automation using RPA

1. The definition and types of automation of processes
2. Definition of robotic process automation (RPA)
3. Characteristics of processes subject to RPA
4. Data in the process being subject to RPA
5. IT solutions used for RPA
6. Analysis of benefits and costs of RPA
7. Risks and threats related to robotization
8. Summary

Chapter 3. Characteristics of financial accounting required for robotization

1. Analysis of the characteristics of financial accounting processes in Poland, relating to robotization
2. Data in financial accounting in Poland
3. Assessment of the possibility of robotization of the main financial accounting processes
   3.1. Sales
   3.2. Purchasing
   3.3. Fixed assets
   3.4. Inventory and production
   3.5. Taxes

3.6. Treasury

3.7. Period end closing

3.8. Reporting

Chapter 4. Empirical research on the application of RPA in Poland and matching of its key benefits to the key challenges in financial accounting

1. Objectives of the empirical research
2. Criteria for determining the research sample
3. Structure of the questionnaire
4. The results of the empirical study
5. Conclusions

Summary

1. Conclusions for the practice of financial accounting in Poland
2. Conclusions for further scientific research on the application of RPA in accounting in Poland.

Bibliography

- Alter, A (2017) *Uzależnienia 2.0. Dlaczego tak trudno się oprzeć nowym technologiom*, Wydawnictwo Uniwersytetu Jagiellońskiego, Kraków, 2018
- Anagoste, S. (2018). *Robotic Automation Process – The op-erating system for the digital enterprise.* Proceedings of the 12th International Conference on Business Excellence, 54-69. doi: 10.2478/picbe-2018-0007
- Aguirre, S. & Rodriguez, A. (2017) *Automation of a Business Process Using Robotic Process Automation (RPA): A Case Study*, Applied Computer Sciences in Engineering,
- Arthur, B.W. (2009) *The nature of technology: What it is and how it evolves*, Free Press, New York,
- Automation Anywhere Enterprise (2019) *Kurs RPA: Automation Anywhere,* LinkedIn, 26.08.2019
- Barkin I. (2019) *Course on RPA: Introducing Robotic Process Automation*, LinkedIn Learning and Lybda.com,

- Balakrishnan, T., Chui, M.Hall, B.Henke, N. (2020) *The state of AI in 2020*, McKinsey&Company, accessed on June 8, 2021 from the website https://www.mckinsey.com/business-functions/mckinsey-analytics/our-insights/global-survey-the-state-of-ai-in-2020#
- Bame, Y. (2017) *Life without a smartphone? 38% of teens think they couldn't last even a day*, accessed on 8 June 2021 r. from the website https://today.yougov.com/topics/technology/articles-reports/2017/06/05/38-teens-think-they-couldnt-last-even-day-without-
- *Being human with increasingly advanced technology in the workspace, are we in danger of losing the human touch?* (2016) Hays Journal, Issue 11
- Bitner, M., Starościk, R., Szczerba, P. (2016) *Czy robot zabierze ci pracę? Sektorowa analiza komputeryzacji i robotyzacji europejskich rynków pracy,* Warszawski Instytut Studiów Ekonomicznych, Warszawa 2016, accessed on 12 December 2021 r. from the website: www.wise-europa.eu/wp-content/uploads/2016/03/PolicyWorking-WISE-_nr1_141029.pdf.
- Blagoev, B., (2021), *End-user satisfaction as a result of RPA – a finance and accounting perspective,* accessed on 27 December 2021 r. from the website http://essay.utwente.nl/86762/1/Blagoev_BA_BMS.pdf
- Bytniewski, A. (2012) *Robotyzacja systemu rachunkowości jako sposób wspomagania rachunkowości zarządczej i controllingu,* Prace naukowe Uniwersytetu Ekonomiczengo we Wrocławiu, nr 251
- Bytniewski, A. (2015) *Architektura zintergrowanego system informatycznego*
- Brynjolfsson, E., Rock, D., Syverson, C., (2017) *Artificial Intelligence and the modern productivity paradox: A clash of expectations and statistics*, Working Paper 24001, National Bureau of Economic Research, accessed on 24 October 2021 r. from the website https://www.nber.org/system/files/working_papers/w24001/w24001.pdf
- Capgemini Consulting (2016): *Robotic Process Automation-Robots conquer business processes in back offices,* https://www.capgemini.com/consulting-de/wp-content/uploads/sites/32/2017/08/robotic-process-automation-study.pdf
- Capgemini Research Institute (2020) *The AI-powered enterprise: Unlocking the potential of AI at scale,* accessed on 8 June 2021 r. from the website

https://www.capgemini.com/wp-content/uploads/2020/07/State-of-AI_Report_Web.pdf

- Carter, L. (2001) *Cisco's virtual close*, Harvard Business Review, 04.2001
- Chowdhury, R. & Mulani, N. (2018) *Auditing Algorithms for Bias*, Harvard Business Review, 10.2018
- Cohn, M. (2019) *Robotic process automation comes to accounting*, Accounting Today,
- Davenport, T.H., Patil, D.J. (2012) *Data Scientist: The Sexiest Job of the 21st Century,* Harvard Business Review, accessed on 10 October 2021 r. from the website https://hbr.org/2012/10/data-scientist-the-sexiest-job-of-the-21st-century
- Das, A. (2019) *Robotic process automation: assessment of the technology for transformation of business processes*, International Journal of Business Process Integration and Management, July 2019
- Department for Business, Energy & Industrial Strategy, Wielka Brytania (2021) *Restoring trust in audit and corporate governance: proposals on reforms,* accessed on 5 November 2021 from the website: *https://www.gov.uk/government/consultations/restoring-trust-in-audit-and-corporate-governance-proposals-on-reforms*
- Department for Digital, Culture, Media & Sport, Wielka Brytania (2021) Cyber Security Breaches Survey 2021, Official Statistics, 24 Marca 2021, accessed on 5 November 2021 from the website: https://www.gov.uk/government/statistics/cyber-security-breaches-survey-2021/cyber-security-breaches-survey-2021
- Dialani. P. (2019) *4 Robotic proces automation tredns for 2020*, Analytic Insight, accessed on 29 September 2021 from the website: https://www.analyticsinsight.net/4-robotic-process-automation-trends-for-2020/,
- Dobbs, R., Manyika, J., Roxburgh, C., Lund, S., (2012), *The World at work: Jobs, pay and skills for 3.5 billion people*. June 2012, McKinsey Global Institute, accessed on 11 November 2021 from the website https://www.mckinsey.com/featured-insights/employment-and-growth/the-world-at-work

- Doguc, O. (2020) Robot Process Automation (RPA) and its future, Istambul Medipol University, DOI:10.4018/978-1-7998-1125-1.ch021, w książce: Advances in E-Business Research (strony 469-492)
- Duke, E., Montag, C. (2017) Smartphone addiction, daily interruptions and self-reported productivity, Addictive Brhaviours Reports 6, 2017, 90-95
- Eurostat (2020) *Individuals' level of digital skills* accessed on 13 czerwca 2021 from the website https://appsso.eurostat.ec.europa.eu/nui/setupDownloads.do
- Fersht, P. i Slaby, J.R. (2012) *Robotic automation emerges as a threat to traditional low-cost outsourcing*, HfSRes. 1–18, Październik 2012.
- Forrester Research (2014) *Building a Center of Expertise to Support Robotic Automation*,
- Forrester (2019) *Predictions 2020, On the precipice of far-reaching change*,
- Felstead A, Gallie D, Green F, (2013) *Work Intensification in Britain: First Findings from the Skills and Employment Survey 2012.* London: Centre for Learning and Life Chances in Knowledge Economies and Societies, Institute of Education, accessed on 28 November 2021 from the website https://www.cardiff.ac.uk/__data/assets/pdf_file/0006/118653/5.-Work-Intensification-in-Britain-mini-report.pdf
- Frey, C.B., Osborne, M.A. (2013) *The Future of Employment: How Susceptible Are Jobs to Computerisation?,* accessed on 12 December 2021 r from the website : www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf.
- Gartner Summits, (2011) „Gartner Customer 360 Summit: CRM Strategies and Technologies to Understand, Grow and Manage Customer Experiences", accessed on 8 June 2021 from the website https://www.gartner.com/imagesrv/summits/docs/na/customer-360/C360_2011_brochure_FINAL.pdf
- Gawin, B. i Marcinkowski, B. (2013) *Symulacja procesów biznesowych, Standardy BPMS i BPMN w praktyce*, Wydawnictwo Helion,
- Gawkowski, K. (2018) *Cyberkolonializm. Poznaj świat cyfrowych przyjaciół i wrogów*, Warszawa

- Geyer-Klingeberg, J., Nakladal, J., Baldauf, F. i Veit, F. (2018) *Process Mining and Robotic Process Automation: A Perfect Match*, 16th International Conference on Business Process Management 2018, Industry Track Session, Sydney, Australia
- Goldsmith, J. (1994) *This Is Your Brain on Tetris. Did Alexey Pajitnov invent a pharmatronic?* Weird, 5 stycznia 1994 r., accessed on 22 November 2021 from the website : https://www.wired.com/1994/05/tetris-2/
- Grade, A., Jessel, B. i Gulati, K. (2017) *Rethinking robotics? Take a step back* Automation, Henley Business School – Capco Institute, Paper Series in Financial Services, #46
- GrantThorton (2021) *Barometr Prawa. Barometr stabilności otoczenia prawnego w polskiej gospodarce*, Edycja 2021
- Gudanowska, A. i Kononiuk, A. (2020) *Uwarunkowania ucyfrowienia procesów produkcji i wzrostu kompetencji cyfrowych społeczeństwa,* Oficyna wydawnicza Politechniki Białostockiej, Białystok 2020
- Gupta, P. (2001) *Growth scenario of IT industries in India*, Communications of the ACM 44:7, 2001, s. 40–41;,
- GUS, (2016) Prognoza ludności resyzującej dla polski na lata 2015-2050, Główny Urząd Statystyczny, 11.1.2016, accessed 11 November 2021 from the website https://stat.gov.pl/obszary-tematyczne/ludnosc/prognoza-ludnosci/prognoza-ludnosci-rezydujacej-dla-polski-na-lata-2015-2050,8,1.html
- Hołda, A., 2004, *System poznawczy oraz struktura rachunkowości i rewizji finansowej,* Zeszyty Naukowe Akademii Ekonomicznej w Krakowie nr 619, Wydawnictwo Akademii Ekonomicznej w Krakowie, Kraków, s. 37-48
- Hońko, S. (2019) *Nie bójmy się robotów*, Rachunkowość, listopad 2019,
- *How Robotic Process Automation Is Transforming Accounting and Auditing*, (2018) The CPA Journal (July 2018)
- Jastrzębowski, A (2018) *Zakres i znaczenie współcześnie identyfikowanych funkcji rachunkowości*, Rozprawa doktorska, uniwersytet Ekonomiczny w Poznaniu
- Keynes, J.M. (1946) *Ogólna teoria zatrudnienia, procentu i pieniądza*, Wydawnictwo Naukowe PWN, Warszawa,2003

- Kohlbeck, M., Vakilzadeh, H. (2020) *False News Determinants and its Association with Financial Reporting Quality,* Departament of Accouning, University of Wisconsin-Whitewater accessed on 9 January 2022 from the website : https://ssrn.com/abstract=3652483
- Kramer, J., (red.), (1994), *Badania rynkowe i marketingowe*, Państwowe Wydawnictwo Ekonomiczne, Warszawa, s. 213.
- Kubicek, B., Korunka, C. (2017) *Job demands in a changing world of work*, Research Handbook on Work and Well-Being, EE Pulishing, s. 59-76
- Lacity, M. (2017) *Reimagining Professional Services with Cognitive Technologies at KPMG*, Working Paper, University of Missouri-St. Louis Business, Czerwiec 2017
- Lacity, M. i Willcocks L. (2021) Becoming Strategic with Intelligent Automation, Mis Quarterly Executive
- Lacity, M. i Willcocks L. (2017) *Robotic Process Automation at Telefonica O2*, Mis Quaterly Executive, Marzec 2017,
- Lacity, M., Willcocks, L. i Craig, A. (2015) *Robotic Process Automation: Mature Capabilities in Energy Sector*, The Outsourcing Unit Working Research Paper Series, Paper 15/06, Październik 2015,
- Lacity, M., Willcocks, L. i Craig, A. (2017) *Automation, Robotizing Global Financial Shared Services at Royal DSM*, Henley Business School – Capco Institute, Paper Series in Financial Services, #46,
- Lacity, M., Willcocks, L. i Gunkel, G. (2017) *Smart sourcing: cognitive automation at Zurich Insurance*, Winter 2017
- Lazarus, S., (2018) *Achieving a Successful Robotic Process Automation Implementation: A Case Study of Vodafone and Celonis*, https://spendmatters.com/2018/06/07/achieving-a-successful-robotic-process-automation-implementation-a-case-study-of-vodafone-and-celonis/
- Lhuer, X (2016) *The next acronym you need to know about: RPA (robotic process automation)*, Digital McKinsey, December 2016,
- Likert, R. (1932). *A Technique for the Measurement of Attitudes*, Archives of Psychology no. 140, Czerwiec 1932, accessed on 6 March 2022 from the website https://legacy.voteview.com/pdf/Likert_1932.pdf.

- Łada, M. (2016) *Automatyzacja procesów rachunkowości zarządczej*, Prace naukowe Uniwersytetu Ekonomicznego we Wrocławiu nr 440/2016, s. 395
- Manyika, J., Chui, M., Bughin, J., Dobbs, R., Bisson, P., Marrs, A., 2013, Disruptive technologies: Advances that will transform life, business, and the global economy, McKinsey Global Institute
- McKinsey&Company (2018) Unlocking success in digital transformations, accessed on 10 October 2021 from the website: https://www.mckinsey.com/~/media/McKinsey/Business%20Functions/Organization/Our%20Insights/Unlocking%20success%20in%20digital%20transformations/Unlocking-success-in-digital-transformations.ashx
- McKinsey&Company (2016) *Cyfrowa Polska,* accessed on 13 June 2021 from the website: *https://www.mckinsey.com/pl/~/media/mckinsey/locations/europe%20and%20middle%20east/polska/raporty/cyfrowa%20polska/cyfrowa-polska.ashx*
- Morris R., Truskowski B. (2003) *The evolution of Storage Systems*, IBM Systems Journal, nr 42 (2), s. 205-217
- Obłój, K. (1998) *Strategia organizacji. W poszukiwaniu trwałej przewagi konkurencyjnej*, Polskie Wydawnictwo Ekonomiczne, Warszawa 1998
- Obłój, K. (2007) *Strategia organizacji.* PWE, Warszawa 2007
- Open Data Handbook, accessed on 10 October 2021 from website http://opendatahandbook.org/glossary/en/terms/,
- Osinubi F. (2018) *Looking into the Future. Leveraging the Power of AI and Robotics*, PwC Materials, Lipiec 2018, accessed on 15 November 2021 from the website https://www.pwc.com/ng/en/assets/pdf/leveraging-power-ai-and-robotics.pdf
- Olchowicz, I., 2003, Rachunkowość podatkowa, Difin, Warszawa
- PwC (2018) *Zmiany w MSSF i sprawozdawczości spółek publicznych. Przewodnik dla Komitetu Audytu i sporządzających sprawozdania finansowe,* Wrzesień 2018, accessed on 5 November 2021 from the website : https://www.pwc.pl/pl/pdf/zmiany-w-mssf-i-sprawozdawczosci-spolek-publicznych-raport-pwc.pdf

- PwC (2021) *CEO Survey*, *24th Annual Global CEO Survey*, *A leadership agenda to take on tomorrow* accessed on 11 November 2021 from the website :https://www.pwc.com/ceosurvey
- PwC (2021a) PwC 24th Annual Global CEO Survey, Wizja prezesów po pandemii, accessed on 11 November 2021 from the website : https://www.pwc.pl/pl/publikacje/24-badanie-CEO-Survey.html
- PWC (2016) *MSSF 16, Zmiana standard leasingowego. Czy jesteś na nią gotowy?* Czerwiec 2016, accessed on 7 November 2021 from the website : https://www.pwc.pl/pl/mssf/assets/mssf-16-broszura-pwc.pdf
- Reinsel, D., Gantz, J., Rydning, J. (2018) *The Digitization of the World. From Edge to Core,* Listopad 2018 r. accessed on 7 November 2021 from the website https://www.seagate.com/files/www-content/our-story/trends/files/idc-seagate-dataage-whitepaper.pdf
- Robb, M.B., Bay, W., Vennegaard, T. (2018) *The new normal: Parents, teens, and mobile devices in the United Kingdom*, ISC Annenberg, CommonSense, accessed on 22 November 2021 from the website https://www.commonsensemedia.org/sites/default/files/uploads/research/cs_digitaldevicesuk_release_web.pdf
- Robb, M.B., Bay, W., Vennegaard, T. (2019) *The new normal: Parents, teens, and mobile devices in Mexico*, ISC Annenberg, CommonSense, accessed on 22 November 2021 from the website https://www.commonsensemedia.org/sites/default/files/uploads/research/2019_thenewnormalmexico-final-release_eng-092519_web.pdf
- Rydler, B., (2019) *Will a robot really take your job?* The economist, 29 Czerwca 2019
- Schiavone, J., Lynch, J. (2017). *Fake financial news is a real threat to majority of Americans: New AICPA survey.* accessed on 9 January 2022 from the website https://us.aicpa.org/press/pressreleases/2017/fake-financial-news-is-a-real-threat-to-majority-of-americans-new-aicpa-survey.
- Schumpeter, J. (1960) *Teoria rozwoju gospodarczego,* PWN
- Schwab, K., The Fourth Industrial Revolution, World Economic Forum, 2016
- Schwartz, J. (2020) *Work Disrupted*, New York, August 2020

- Siderska J. (2020) *Robotic Process Automation – a driver of digital transformation?,* Engineering Management in Production and Services, vol 12, issue 2, 2020, s. 21-31,
- Słownik Języka Polskiego PWN, accessed on 20 September 2021 from the website https://sjp.pwn.pl/slowniki/automatyzacja.html,
- Spira, J.B., Feintuch, J.B. (2005) *How interuptions impact Knowledge Worker Productivity, Wrzesień 2005 r.,* accessed on 11 November 2021 from the website *http://iorgforum.org/wp-content/uploads/2011/06/CostOfNotPayingAttention.BasexReport1.pdf*
- Szewczak, N. *10 najbardziej pożądanych zawodów w 2019 roku*, Business Insider, 7 marca 2019 r., accessed on 12 December 2021 from the website : https://businessinsider.com.pl/rozwoj-osobisty/kariera/najbardziej-pozadane-zawody-w-2019-roku/hs2k5wx
- Szymczyk-Madej, K., Madej, J., 2012, Cechy systemu informatycznego rachunkowosci, w: Nowak, E., Niepowicz, M. (red.), Rachunkowosc a controlling, Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, Wrocław, s. 476-487.
- Śledziewska, K. i Włoch R. (2020) Gospodarka Cyfrowa. Jak nowe technologie zmieniają świat, Wydawnictwo Uniwersytetu Warszawskiego, Warszawa, 2020
- Twenge, J.M. (2019) *iGen.* Smak słowa Sp. z o.o.
- van der Aalst, W. M. P., Bichler, M., Heinzl, M. (2018) Robotic Process Automation. Business & Information System Engineering, 60(4), s.269-272. https://doi.org/10.1007/s12599-018-0542-4
- Waśniewski, T. i Gos, W. (2002) Rachunkowość przedsiębiorstw,
- Watson, M. (2018) *Why business leaders should think of AI as an umbrella Term*, Opex Analytics, accessed on 29 September 2021 from the website https://medium.com/opex-analytics/why-business-leaders-should-think-of-ai-as-an-umbrella-term-dba8badc55e4
- Waśniewski, T., Gos, W. (2002) *Rachunkowość przedsiębiorstw*, Fundacja Rozwoju Rachunkowości w Polsce, Warszawa, 2002.
- Willcocks, L. (2020) *Robo-apocalypse cancelled? Reframing the automation and future of work debate*, Journal of Information Technology, 2020, vol. 35(4) 286-302

- Willcocks, L., Hindle, J. i Lacity, M. (2019) *Becoming Strategic With Robotic Process Automation,* SB Publishing
- Willcocks, L., Hindle, J. i Lacity, M. (2020) *With the Customer in Mind: Becoming Strategic With Robotic Process Automation*, Sykes Quaterly, Luty 2020
- Willcocks, L. i Lacity, M. (2016) *Service automation: robots and the future of work*, SB Publishing
- Willcocks, L., Lacity, M. i Craig, A. (2015) Robotic Process Automation at Xchanging, , The Outsourcing Unit Working Research Paper Series, Paper 15/03, Czerwiec 2015
- Willcocks, L., Lacity, M. i Craig, A. (2015a) *The IT Function and Robotic Process Automation*, Paper 15/05 , The Outsourcing Unit Working Research Paper Series, Październik 2015,
- Wheelwright, T. (2021) *Cell Phone Behavior in 2021: How Obsessed Are We?* accessed on 11 November 2021 from the website https://www.reviews.org/mobile/cell-phone-addiction/
- WHO (2018) *WHO releases new International Classification of Diseases (ICD 11),* accessed on 11 November 2021 rom the website https://www.who.int/news/item/18-06-2018-who-releases-new-international-classification-of-diseases-(icd-11)
- Wolk, H., Francis, J., Tearney, M., (1984), Accounting Theory A Conceptual and Institutional Approach, Kent Publishing Company, Belmont
- World Economic Forum (2020) *The Future of Jobs Report 2020*

Internet websites:

- https://sjp.pwn.pl/slowniki/automatyzacja.html
- https://e-msi.pl/ocr-faktur/
- https://www.comarch.pl/erp/aktualnosci/inteligentne-zaczytywanie-faktur-comarch-ocr/
- https://pl.wikipedia.org/wiki/Czwarta_rewolucja_przemysłowa
- stat.gov.pl
- ekrs.ms.gov.pl

- ICPSR, The Inter-university Consortium for Political and Social Research - Monitoring the Future: A Continuing Study of American Youth (12th-Grade Survey) z lat 2018-2020, accessed on w dniu 14 November 2021 from the website https://www.icpsr.umich.edu/web/ICPSR/studies/38156/publications
- barometrzawodow.pl
- The Hacket Group (2019) Closing the Digital Gap. 2019 P2P Performance Study Results 24 września 2019, accessed on z 13 lutego 2022 r. from the website https://info.ivalua.com/hubfs/2019-P2P-Study-Digital-Gap-Hackett-Ivalua.pdf?hsLang=en

Regulations:

- The Accounting Act dated 29 September 1994 r. with subsequent changes
- Polish National Accounting Standards (Krajowe Standardy Rachunkowości),
- Internationa Financial Reporting Standards as approved by European Union
- Polish Accounting Standards Committee Positions
- The Act dated 11 March 2004 r. on value added taxes, Dz.U. 2004 nr 54 poz.535 with subsequent changes