Process Automation in Accounting Firms.
A Survey Insight from Practice in Poland

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Abstract

This paper presents the findings of a research study focused on accounting firms and their adoption of accounting process automation, including Robotic Process Automation (RPA), Optical Character Recognition (OCR), Electronic Data Interchange (EDI), and electronic invoicing systems. The primary goal of the research was to provide an updated insight into the current practices of accounting firms regarding the automation of accounting processes. Structured interview surveys were conducted at the end of 2023, using the Computer-Assisted Web Interview (CAWI) method, involving 24 accounting firms in Poland. The key findings reveal that approximately 70% of documents were received electronically in formats such as pdf, scan, image, or EDI, and nearly 80% of all paper documents provided by clients required subsequent scanning via OCR. This paper contributes to a better comprehension of process automation in accounting firms and offers an insight into the current state of this phenomenon in Poland.

Keywords: Robotic Process Automation, EDI, OCR, accounting firms

1. Introduction

The automation of accounting processes begun several decades ago with the development of the first computer-based accounting information systems (AIS). Presently, the use of AIS in accounting firms (AFs) has become standard practice. AFs are constantly seeking new opportunities to enhance their accounting processes. Among the solutions they employ is the integration of client systems with AIS systems used in AFs, a concept akin to the long-standing practice of electronic data interchange (EDI), as well as the adoption of emerging technologies such as Robotic Process Automation (RPA).

EDI can be regarded as the pioneering technology that facilitated the automation and integration of processes across different entities. As early as 1995, EDI was recognized as the most significant information technology for the accounting profession according to respondents in a survey conducted by the American Institute of Certified Public Accountants [2]. EDI is an information technology that standardizes the exchange of information between two parties involved in a transaction [2]. It involves the direct transmission of data via computers at disparate locations, which would otherwise be exchanged in printed form [25]. EDI encompasses the electronic exchange of data, messages, and documents – such as invoices, bills of lading, or purchase orders – between computer systems in different organizations, based on a standardized, structured, and machine-retrievable format [9]. By eliminating the need for data re-entry by the recipient partner and reducing the paperwork of the sending organization, EDI enhances customer service and cost efficiencies [2, 3], [25].

In the initial stage of development, like most new technologies, EDI was primarily used by large enterprises. Over time, smaller enterprises also adopted it [9], and the advent of the Internet has further increased accessibility for small firms [26]. Currently, AF also utilize EDI, as confirmed by previous studies conducted by the authors [21]. The

exchange of documents between a client and an AF mainly involves transmitting purchase and sales invoices from the client's information system to the financial-accounting system of the AF. This specifically occurs when the client's and the AFs' software originate from the same provider, facilitating the integration of these systems. Such document exchange can be considered a simplified form of EDI, which essentially enables the exchange of documents even when the software used by collaborating organizations comes from different providers.

For the implementation of automated processes in accounting within an organization, the solution of RPA has increasingly established itself in recent years [1], [10], [17], [22, 23, 24, 25]. Nowadays, RPA involves Artificial Intelligence (AI) and Machine Learning (ML) algorithms [8], as well as Optical Character Recognition (OCR) technology which allows typed or handwritten texts to be converted into machine-readable texts [15], [18]. It is a form of automation technology that uses software robots to automate business tasks typically performed manually by humans [14]. In accounting processes, it involves scanning paper documents or reading document uploaded as images/pdf files and recognizing them with OCR, suggesting the posting accounts to be debited or credited and finally entering the data automatically into the database of the AIS.

RPA was introduced in the early 2010s [30] and is still considered to be an emerging sub-area in the context of the automation of manual accounting processes [20]. AFs have been increasingly adopting RPA during the COVID-19 pandemic to perform the jobs that have been eliminated because of the economic downturn and the cash squeeze at companies trying to cut expenses [4], [6], [11], [30]. Currently, a relatively large number of AFs in Poland, typically micro or small firms, are utilizing RPA technology. This was confirmed by previous research conducted by one of the authors [21]. It was found there that approximately half of the surveyed entities were using RPA technology, processing about a half of all documents in this way.

A detailed search of the SCOPUS database revealed that issues related to digital transformation (DT), including the implementation of EDI and RPA technologies in AFs, were almost not studied at all. Apart from the works of the Authors, only two other studies on this subject were found. This indicates a significant research gap in this area. The Authors' intention is to partially fill this gap and to identify changes in the state of automation and robotization of processes in AFs compared to the previous study conducted in 2021-2022.

The primary goal of the research was to provide an updated insight into the current practices of accounting firms regarding the automation of accounting processes in the face of rapid advancements in this area. Detailed research questions and objectives are pointed out in section 4.

In the subsequent sections of the article, the following are presented: a) a researchers' interest in the implementations of EDI and RPA technologies, based on a quantitative analysis conducted on the SCOPUS database (with a particular focus on accounting processes), b) detailed research results regarding the application of these technologies in outsourcing accounting services, with a specific emphasis on AFs, c) research methods (objectives, research method, and questionnaire construction), d) research results and their discussion in the context of previous studies, and e) conclusions and directions for further research.

2.   Identifying the Research Gap

To assess the state of knowledge regarding the application of EDI and RPA in financial and accounting processes, an analysis of scientific papers indexed in the Scopus database was initially conducted. Scopus is recognized as a reputable bibliographic database frequently used in bibliometric analysis. An additional analysis conducted on the Web of Science database yielded fewer results compared to the Scopus analysis, and no additional papers were found beyond those in Scopus.

When searching the Scopus database, the following criteria were applied: a) papers in English published in the 21st century, b) types of papers: scientific articles published in journals or conference materials, books, or book chapters, c) research fields to which the

papers were assigned: Business management and accounting, Decision Science, Economics, Econometrics and Finance, Social Sciences, Computer Science.

When selecting papers related to EDI and RPA in the Scopus database, it was found that the researchers' interest in EDI topics has been decreasing in recent years, while the interest in RPA has been on the rise. Applying the criteria described above, 221 documents were found containing the phrase identifying 'Electronic Data Interchange' in author keywords. Between 2001-2005, 82 papers were published; between 2006-2010, 65 papers; between 2011-2015, 32 papers; between 2016-2020, 25 papers; in 2021, 7 papers; in 2022, 14 papers; and in 2023, only 5 papers. For RPA, after the year 2000, 519 papers were published, with the first one appearing in 2016. The number increased from 49 papers in 2019 to 143 papers in 2023.

Narrowing the search criteria to include the phrase 'accounting' resulted in a reduction in the number of selected papers to 32 for RPA and only 2 for EDI.

In the next step, the selection was further refined to include scientific papers where authors, in addition to identifying RPA or EDI, also indicated phrases related to outsourcing of accounting services in the keywords. The search did not yield any results initially. Therefore, the selection criteria were relaxed, and the search was extended to include metadata such as title and abstract. As a result, 8 papers related to RPA were found [5], [7], [12, 13], [16], [19], [22], [29], and no papers related to EDI.

The bibliometric analysis conducted indicates a research gap in the area of applying automation and robotization processes in outsourcing accounting services. Previous studies, few in number, are briefly described in the following subpoint.

3. Process Automation in Accounting Firms in the Light of Previous Research

Of the 8 papers mentioned in the previous section, only 4 dealt with RPA technology in AFs. The first paper [19] presents the findings of a study conducted in 70 small AFs in Taiwan, aiming to identify the success factors for implementing RPA. The study utilized the Technology Acceptance Model and the Information System Success Model. Results revealed a positive correlation between male gender, higher familiarity with the system, and strong CEO support with the successful implementation of RPA systems in AFs. In the second article [29], the authors share their consultancy experience with auditors from both Big 4 and mid-sized AFs. They outline four practical business process scenarios, prototype RPA solutions for accounting and audit tasks, and discuss implementation benefits and challenges. From a practical standpoint, insights from both the current and future state Business Process Model and Notation, along with practical findings from RPA development, are highlighted. In the third article [7] the authors analyze the relevance of RPA for the main processes of external accounting as well as propose a generic process model and discuss the critical success factors for the implementation of RPA. The fourth article [22] introduces a novel research initiative planned for Polish AFs offering accounting services to MSE's. It presents results from the initial phase, which involved a preliminary pilot study. Unstructured interviews were conducted with owners and employees of two AFs – one with three employees and the other with twelve. Challenges encountered during RPA implementation and operation included difficulties in reading invoices printed on dot matrix printers. Employees in the larger firm expressed a view that manual data entry was faster compared to filing, scanning, and verification. Both firms' owners suggested that standardizing software used by AFs and their clients, along with implementing automatic data import (the simplest form of EDI), would be more effective than relying solely on RPA software. However, it was noted that only a small percentage of clients engaged in such collaborative approaches with the AFs. In the case of the smaller firm, two out of 30 clients, the "largest" ones, contributed approximately 70% of all documents, while in the larger firm, only 8 out of 300 clients directly transferred 360 documents to the firm's AIS.

After conducting a pilot study, the authors carried out a deepened research between 2021 and 2022 in nineteen AFs through direct structured interviews. The study aimed to determine the methods clients use to transmit documents to AFs (including the use of

EDI) and the extent of their adoption of RPA technology [21]. The key findings from this study were as follows: a) less than 60% of the documents processed by the 19 AFs are e-documents; b) RPA is used by roughly half of the AFs; c) more than half of the documents delivered to firms applying RPA software are automatically recognized and proceeded by RPA; d) almost 63% of AFs have integrated their accounting systems with the client's software (EDI is applied); e) the application of EDI is relatively low (apart from one case, in most firms, clients using EDI represent a vast minority and, on average, only one in four documents is delivered via EDI to AFs by clients who use it).

Due to the limited number of articles found in the Scopus database and the specific 'Polish' context of the authors' study, they decided to additionally search the BAZEKON database, which encompasses articles from Polish journals in the domains of management and economics. This additional search yielded one relevant article, authored by [31]. The study detailed the implementation of RPA in an AF and revealed that the application of RPA software significantly reduced the operating time for a batch of 150 documents from 70 hours to a mere 6 hours and 38 minutes, reflecting an impressive reduction of over 90%.

4. Research Methodology

4.1. Research Questions and goals

The main research problem is illustrated by the following question: "What are the current practices of accounting firms in automating accounting processes in AFs in Poland?" To answer this general question, the following specific research questions were formulated:
1) What software is mostly used by AFs for servicing clients?
2) In what form and in what number do clients send documents to the AF?
3) What is the level of use of RPA/OCR in AFs?
4) What are the reasons for deciding to use or not to use RPA/OCR?
5) What are the benefits of AFs that have implemented RPA/OCR and what are their intentions for further automation?
6) Did the implementation of RPA/OCR result in a reduction in employment?
7) What is the level of use of EDI between clients and AFs?

The principal goal of the research was to gain an up-to-date insight into the current practices of accounting firms in the field of automation of accounting processes. To achieve this goal, we addressed of the following specific objectives:
1) Determining the financial and accounting software that AFs use most often.
2) Indication of the dominant form of submitting documents to the AF.
3) Determining the implementation status of intelligent RPA/OCR software.
4) Understanding the reasons for the decision and the effects of implementing RPA/OCR software.
5) Determining the status of integration of AFs' AIS with clients' software.

4.2. Research Methods of Data Gathering and Analysis

The research methodology employed for this study was Computer Assisted Web Interview (CAWI). The interview structured questionnaire was developed based on the experiences from a previous study by one of the authors, of which results were described in the publication by [21]. The interviews were carried out in person with the owners of the AFs and consisted of over 40 questions categorized into five groups.

The first group encompassed general questions, including the founding year of the firm, the number of employees, the number of serviced clients, and the number of clients for whom the firm provides several specific services like regular books of accounts, setting financial statements, VAT record-keeping and others. It also included inquiries about the financial and accounting software used. In the second group, the questions focused on the number of clients who submit accounting documents in both paper and electronic forms, as well as the quantity of those accounting documents. The third group addressed questions about the implementation and future plans for using EDI and the

fourth group contained questions directed at AFs not utilizing RPA software. In the fifth group, the questions related to AFs employing RPA software. These questions covered the name of the software, whether it comes from the same provider as the accounting system used for clients postings, the number of documents processed with its use, the method, costs, and outcomes of implementation (including achieved benefits and employment reduction), as well as challenges encountered in the operation of this software.

The structured interviews were conducted from September 2023 to mid-December 2023 with the owners of the AFs in a series of personal meetings. In contacting the owners, we sought assistance from students majoring in Finance and Accounting at the Bydgoszcz University of Technology, who also worked in AFs. As a result, 24 complete interviews were conducted in this way and subjected to further analysis.

5. Research Results

For the sample of 24 AFs studied, basic descriptive statistics are presented in Table 1. Within the research set of AFs, there is notable dispersion, and two outliers stand out. The first outlier is a medium-sized firm employing 18 individuals and serving an extensive clientele of 400 entities, the majority (350) of which engage in VAT record-keeping and maintain a simplified register of revenue and expenses for tax purposes. The second outlier falls within the category of medium-sized enterprises based on its employment size (55 persons), although it could be considered a large firm within this professional context. On the opposite end of the spectrum, there are two one-person firms providing services to a combined total of 68 clients. For 59 of these clients, the mentioned firms offer simplified services as outlined in Table 1.

Table 1. Descriptive statistics of the sample.

Item (per month, if not stated otherwise)	Total	SD	Max	Min	Mean	Median
Number of employees	174	10.9	55	1	7.25	3
Number of clients serviced	2,537	88.7	400	25	105.7	60
Number of software packages used	45	0.9	4	1	1.9	2
Number of clients using e-documents	308	24.8	151	0	13	0
Number of e-documents received	18,885	2,080	7,800	0	787	0
Number of clients using pdf/scan/image docs	1,375	52.4	151	0	57	29
Number of pdf/scan/image docs received	55,150	3,691	15,000	30	2,298	750
Number of clients using paper documents	1,140	66.0	300	0	48	30
Number of paper documents received	30,885	1,471	5,000	0	1,287	900

Utilizing the number of employees (including the owner) as the basis, we categorized the responding AFs into three clusters: 19 micro-firms (with a headcount of up to 9 people), 4 small firms (with 10 to 49 employees), and 1 medium-sized firm (with 50 to 249 employees). Table 2 presents key statistics regarding the sample, segmented according to the official criteria for business entities to fit into the specified clusters. It is important to note that we did not inquire about annual revenue or balance sheet totals, making the number of effective employees the sole criterion used for these classifications. Within the microbusinesses cluster, we observed 12 accounting firms with a headcount of up to 3 people, including the owner themselves. Among these, 2 were one-person firms. Notably, for these two self-employed proprietors, the predominant services offered were VAT record-keeping and simplified revenue and expense recording for tax purposes, excluding traditional bookkeeping and financial reporting. Conversely, the small-sized firms within this cluster provided the entire spectrum of identified services, excluding banking. Additionally, the sole medium-sized firm in this category offered a comprehensive range of services, covering all aspects.

Table 2. Descriptive statistics by size of AF.

Item (per month, if not stated otherwise)	Total	Micro	Small	Medium
Number of AFs in the sample	24	19	4	1
Number of clients serviced	2,537	1,421	956	160
Number of employees	174	68	51	55
Clients per employee coefficient	14.6	20.9	18.7	2.9
Number of clients sending e-documents	308	258	50	0
Number of e-documents received (EDI)	18,885	13,385	5,500	0
e-documents per client coefficient	61.3	51.8	110.0	0.0
e-documents per employee coefficient	429.2	343.2	1,100.0	0.0
Number of clients using pdf/scan/image documents	1,373	692	541	140
Number of pdf/scan/image documents received	55,150	17,150	28,000	10,000
pdf/scan/image documents per client coefficient	21.7	12.1	29.3	62.5
pdf-scan-picture documents per employee coefficient	317.0	252.2	549.0	181.8
Number of clients using paper documents	1,140	705	415	20
Number of paper documents received	30,885	20,685	9,200	1,000
Paper documents per employee coefficient	177.5	304.2	180.4	18.2
Paper documents per client coefficient	12.2	14.6	9.6	6.3
Total number of documents processed	104,920	51,220	42,700	11,000
Total number of documents per client	41.4	36.1	44.7	68.8
Total number of documents per employee	603.0	753.2	837.3	200.0

We also inquired about the quantity and types of accounting software used by the AFs. As shown in Table 3, a set of few high-quality software options exists, and the market is dominated by 3-4 leading accounting software providers. This observation holds true not only for these types of firms but also extends to the accounting departments in Polish companies that do not outsource their accounting activities.

Table 3. The accounting software used by AFs.

The accounting software used in AFs	# of software used	Micro	Small	Medium
Rachmistrz or Rewizor (by Insert)	9+7=16	8+6=14	1+0=1	0+1=1
Optima Comarch ERP	8	4	3	1
Enova 365	4	2	1	1
Sage Symfonia	2	0	2	0
MK Rzeczpospolitej	2	2	0	0
Other	13	11	2	0
Total	45	33	9	3

Referring to the types of accounting services provided by AFs polled, we gathered the data presented in Table 4. The data suggest that a majority of the researched firm provide a wide variety of accounting services to their clients, with an exception to banking services offered by 8 micro-firms, 1 small and 1 medium-sized firm. Only 4 micro-firms did not provide the services of maintaining books of accounts and setting financial statement, and just 1 one-person firm did not provide HR and payroll services at all.

Table 4. The types of services provided.

Types of services provided	# of AFs	# of clients serviced
Books of accounts	20	472
Financial statements	20	474
VAT register	24	1,901
Simplified revenues and expenses register for tax purposes	24	1,743
Banking	10	151
HR and payroll services	23	1,200
Foreign currency transactions	24	648

Our next field of research interest concentrated on the use of RPA in AFs. We asked 26 questions on this issue. As suggested in Table 6, all the non-micro-firms and 14 micro-firms (of 19) used RPA/OCR. Among 9 various kinds of software labelled to be used by the firms, the most frequent ones were: Saldeo (8 cases), Comarch (4 cases), and Insert (2 cases), with multiple choices possible. We also asked of time, cost and

personnel effort for the software implementation. For majority the interested firms it turned out to last between 1 to 3 months on average, costing from up to PLN 1,000 (an rough equivalent of USD 250) per month for license fees (up to ca. 100 clients, i.e. for micro-firms) to some PLN 5,500 (USD 1,375) per month (for the medium-sized firm, up to 160 clients), and engaging own workforce or exceptionally employing an external consultor or a provider's consultant to implement.

Table 6. The RPA in AFs.

The use of RPA/OCR	# of AFs	# of clients serviced	Total # of clients	% of total # of clients
YES	19	1,303	2,127	61.3
Micro	14	622	1,011	61.5
Small	4	541	956	56.6
Medium	1	140	160	87.5
NO (all Micro)	5	70	410	17.1
Total	24	1,373	2,537	54.1

The RPA-using firms also indicated that the underlying reason why to implement the software was to shorten the time load by from 5% up to 60% with no headcount cuts, except for only 1 micro-firm that reduced 2 of 7 people. For those firms that did not implemented any such software the main reasons were declared ignorance, perceived high cost, and a failure in previous attempts to do so.

Our last field of interest in the survey was the use of EDI where we asked 6 questions the main results of which are presented in Table 7.

Table 7. The EDI in AFs.

The use of EDI (documents sent directly to the AFs' information systems)	# of AFs	# of clients serviced	Total # of clients	% of total # of clients
YES	8	308	956	32.2
Micro	7	157	780	20.1
Small	1	151	176	86.0
NO but pdf/scan/image docs	16	854	1,581	54.0
Total	24	1,612	2,537	63.6

In our sample of 24 AFs, a notable finding is that 15 out of 16 firms currently not using EDI have expressed a strong interest in considering the implementation of this tool. Additionally, one firm stated that its clients are not yet ready for EDI adoption. Conversely, for the firms already operating with EDI, the breakdown of paper documents, pdf/scan/image documents, and e-documents in relation to the total number of processed documents (44,100) is as follows: 31.3%, 24.3%, and 42.8%, respectively.

6. Conclusions and Further Research

We conducted an investigation involving 24 Polish AFs to examine the accounting services they offer to clients across various dimensions: the proportion of electronic versus paper documents processed, the adoption of RPA/OCR software, and the incorporation of EDI.

Approximately 70% of all accounting documents received by the surveyed firms on a monthly basis are processed in electronic formats such as pdfs, scans, images, or through EDI. Notably, the rate is considerably higher for the cluster of small and medium-sized firms, reaching 81.0%. In contrast, for micro-businesses, the rate falls to around 59.6%.

Regarding RPA/OCR usage, 5 out of the 24 AFs, all micro-firms, did not use the tool. The remaining 19 firms (14 micro-firms, 4 small, and 1 medium-sized) processed 81.8% of the documents (104,920) and served 83.8% of the clients (2,537). Direct use of RPA, without OCR, accounted for 31.1% of all documents and 44.1% of electronically processed documents.

Compared to previous studies, there is a slight increase in DT of AFs in Poland. By the end of 2023, 70% of documents were processed electronically, up from 60% in 2021-2022. Of the 24 AFs surveyed, 8 reported that 18,885 documents (18.0%) were sent via

EDI. For clients, this was 308 out of 2,537 (12.1%). The EDI-processed document rate has increased from around 6% in the previous study, but EDI usage remains relatively low.

These findings support our strong belief that electronic data processing is a dominant feature in transforming modern accounting services. Although our findings do not indicate rapid progress in Poland, they suggest that digitalization in Polish AFs has at least been maintained, if not slightly improved, from 2020 to 2023.

From an economic and societal perspective, the development of digital services across all human activities is crucial for overall progress. Digitalization saves significant human effort by reducing repetitive tasks, allowing more focus on creative work. For the accounting profession, this digital transformation is expected to enhance AFs' ability to serve clients more efficiently and at lower costs, benefiting all market players and the economy as a whole.

The study contributes to a better comprehension of the automation of accounting processes in AFs in Poland, emphasizing the necessity for additional research in this domain. The inherent limitations of this study, including the relatively small sample size of surveyed AFs and the specific regional focus, underscore the significance of conducting more comprehensive research with a wider range of respondents and an international perspective.

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