

Robotic Process Automation, Deep Learning, and Natural Language Processing in Algorithmic Data-driven Accounting Information Systems

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ABSTRACT. This paper analyzes the outcomes of an exploratory review of the current research on algorithmic data-driven accounting information systems. The data used for this study were obtained and replicated from previous research conducted by ACCA and Financial Reporting Council. I performed analyses and made estimates regarding the harnessing of artificial intelligence in the audit, tax, and the management accounting domains. Data collected from 4,600 respondents are tested against the research model by using structural equation modeling.

Keywords: accounting information system; algorithm; big data; artificial intelligence

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1. Introduction

Big data will have extensive effects for current management accounting practices through shaping budgeting operations, while its utilization in auditing brings about difficult tasks as regards auditors’ outcomes and decision-making. Cutting-edge technologies facilitate remarkable sharing of data (Durica et al., 2019; Hecht et al., 2019; Kovacova et al., 2019; Lăzăroiu et al., 2020a, b; Popescu et al., 2018), usage of groundbreaking hardware/software, and devices that may integrate with and improve management and financial accounting, in addition to auditing tasks. (Moll and Yigitbasioglu, 2019) Automation and artificial intelligence substitute coherently auditing and control tasks. (Kocsis, 2019) Digitalization may activate amendments in the administration of accounting that may influence the deployment of networked technologies. (Knudsen, 2020)

2. Conceptual Framework and Literature Review

Accountants and auditors have escalated the harnessing of cutting-edge technologies in decision-making (Andrei et al., 2016a, b; Eskridge, 2019; Kliestik et al., 2020a, b; Kuc-Czarnecka, 2019; Peters et al., 2020) so as to systematize and monitor the stream of data in the companies (Belas et al., 2020; Kuncoro, 2019; Lăzăroiu et al., 2019; Popescu et al., 2017a, b), substituting routine recurrent tasks, and enabling the analysis of large volumes of information. (Gunz and Thorne, 2020) Accountants and decision-makers necessitate a groundbreaking set of skills to inspect and elucidate advanced kinds of data. (Knudsen, 2020) Usage of distributed ledgers and big data facilitated by cloud-based analytics devices and artificial intelligence (Dușmănescu et al., 2016; Kliestik et al., 2018; Krylov, 2019; Nica et al., 2018) will computerize decision-making considerably, enhancing financial visibility and permitting prompter intervention because of the repetitious character of accounting. (Moll and Yigitbasioglu, 2019) Blockchain constitutes a breakthrough technology that has gained traction. (Kocsis, 2019)

3. Methodology and Empirical Analysis

The data used for this study was obtained and replicated from previous research conducted by ACCA and Financial Reporting Council. I performed analyses and made estimates regarding the harnessing of artificial intelligence in the audit, tax, and the management accounting domains. Data collected from 4,600 respondents are tested against the research model by using structural equation modeling.

4. Results and Discussion

The implementation of cutting-edge technologies as a substitution for repetitive tasks, as decision support, and the harnessing of artificial intelligence in the audit, tax, and the management accounting domains may act for certain administrative and ethical characteristics of the professional accountants' role. (Gunz and Thorne, 2020) Cloud-based systems enable access to users' financial information instantaneously by use of a shared ledger. Immediate usage of performance data offers prospects for management accountants to suggest swift restorative actions. (Moll and Yigitbasioglu, 2019) In audit analytics, business intelligence collects data from heterogeneous sources and inspects them to make strategic decisions. (Kocsis, 2019) Blockchain, virtual currency, and data visualization will relevantly impact the accounting profession. (Chiu et al., 2019) The deployment of social media in the accounting domain leads to advanced routines that may alter the role of accountants. (Knudsen, 2020) (Tables 1–7)

Table 1 Potential uses for artificial intelligence: quality corporate data and a mix of accounting, technology and governance skills (% , relevance)

Production	Artificial intelligence can enhance efficiency by replacing mechanistic human processing of underlying transactions and transforming that data into accounting and management information; ultimately feeding into annual reports.	88
Distribution	Artificial intelligence can efficiently and effectively support auditors and boards in the internal and external validation processes needed to ensure that annual reports are credible and compliant.	86
Consumption	Investors are already using artificial intelligence to enhance effectiveness of investment analysis by extracting meaning and value not only from company reporting but also from various sources of alternative data.	83

Sources: Financial Reporting Council; my survey among 4,600 individuals conducted June 2020.

Table 2 Various artificial intelligence can be used to automate elements of the finance and accounting process handing off to humans at various stages such as (% , relevance)

Transactional processes		
Optical Character Recognition in accounts payable and invoicing. With exceptions being dealt with by humans.		78
Accounting processes		
Robotic Process Automation to help process into accounting system, consolidation. With journals, adjustments, estimates being dealt with by humans supported by artificial intelligence.		76
Analysis processes		
Algorithms to help with ratio analysis and management information reporting creation. With management information interpretation and analysis being dealt with by humans.		74

Sources: Financial Reporting Council; my survey among 4,600 individuals conducted June 2020.

Table 3 Various artificial intelligence and related technologies can be used to automate elements of the preparation of the annual report such as (% , relevance)

Preparing		
With Robotic Process Automation to map requirements to systems. With Robotic Process Automation to roll-forward the annual report.		87
Producing		
With Robotic Process Automation to notify content owners. Natural language processing to source likely material.		85
Positioning		
With artificial intelligence to undertake sentiment analysis.		82

Sources: Financial Reporting Council; my survey among 4,600 individuals conducted June 2020.

Table 4 How production use cases express the digital characteristics (% , relevance)

Compatible	Artificial intelligence like Robotic Process Automation is highly compatible with current and legacy systems. Ultimately the most benefit might come from wholesale redesign and optimization with artificial intelligence in mind.	88
Easy	Artificial intelligence is a developing field. As such it currently requires some specialist skills and assistance. This reduces ease of use but should improve as the workforce gains experience.	86
Cost efficient	Artificial intelligence aims to improve cost efficiency as a core rationale. However more complex artificial intelligence might be expensive to deploy for unique use cases.	85
Timely	Artificial intelligence improves timeliness by developing iterations more quickly and more extensively than is possible for a human.	82

Sources: Financial Reporting Council; my survey among 4,600 individuals conducted June 2020.

Table 5 How distribution use cases express the digital characteristics (% , relevance)

Accessible	Artificial intelligence potentially makes it easier for reviewers of information to locate key elements needed for their review. Artificial intelligence tools also enhance the accessibility of data external to the company.	87
Compliant	Artificial intelligence provides new ways for internal and external parties to check the compliance of company reporting.	85
Prompt	Artificial intelligence could support more timely reporting by facilitating faster audit and review.	82
Free	Artificial intelligence does not enhance or reduce access to free company reporting.	80

Sources: Financial Reporting Council; my survey among 4,600 individuals conducted June 2020.

Table 6 How consumption use cases express the digital characteristics (% , relevance)

Engaging	Artificial intelligence techniques for consuming and utilizing corporate data are not likely to make for engaging information. However, artificial intelligence's ability to consume wide data sets may add to the richness of analysis.	86
Contextual	Users of company reporting want to understand the context of the information. By consuming a wide range of alternative data, artificial intelligence might provide more context.	83
Useable	Artificial intelligence aims to make all data useable through analysis and processing. This significantly increases the scope of data that becomes decision useful.	81
Credible	Artificial intelligence, if built effectively, can identify and weigh the credibility of the data and source of that data.	79

Sources: Financial Reporting Council; my survey among 4,600 individuals conducted June 2020.

Table 7 How comfortable would you be with machine-learning-based decision making on the following specific tasks? (% , relevance)

Classifications of transactions and/or assets and liabilities for accounting and tax purposes	59
Accounting measurement	52
Decisions on audit testing	47
Fraud detection	45

Sources: ACCA; my survey among 4,600 individuals conducted June 2020.

5. Conclusions and Implications

Blockchain technology, cloud-based analytics and artificial intelligence software will further groundbreaking kinds of self-regulating accounting services and auditing instantaneously, enhancing performance and assurance. (Moll and Yigitbasioglu, 2019) Altering the inner workings of accounting, digitalization makes its confines gradually indistinct, is activating cutting-edge types of power relations, and raises advanced matters associated with knowledge production (data acquisition, provision, and harnessing) for decision making. (Knudsen, 2020)

Survey method

The interviews were conducted online and data were weighted by five variables (age, race/ethnicity, gender, education, and geographic region) using the Census Bureau's American Community Survey to reflect reliably and accurately the demographic composition of the United States. Sampling errors and test of statistical significance take into account the effect of weighting. Stratified sampling methods were used and weights were trimmed not to exceed 3. Average margins of error, at the 95% confidence level, are +/-2%. For tabulation purposes, percentage points are rounded to the nearest whole number. The precision of the online polls was measured using a Bayesian credibility interval. An Internet-based survey software program was utilized for the delivery and collection of responses.

Data and materials availability

All research mentioned has been published and data is available from respective outlets.

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Author contributions

The author confirms being the sole contributor of this work and approved it for publication.

Conflict of interest statement

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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