Intelligent accounting digital maturity model for small and medium-sized accounting firms

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Abstract

Purpose – This paper aims to present a digital maturity model for intelligent automation, specifically designed for small and medium-sized accounting firms. Intelligent automation facilitates the execution of complex accounting tasks, leading to notable improvements in operational efficiency, client satisfaction and employee engagement. Despite these benefits, smaller firms often face challenges in adopting automation due to constrained resources and limited expertise. The proposed maturity model supports firms in evaluating their current level of digital advancement and provides a structured pathway for progressing towards more sophisticated automation capabilities.

Design/methodology/approach – The model was developed following a design science-based procedure model. The development began with a systematic literature review. Subsequently, the model was refined on the basis of feedback from 15 expert interviews conducted in Finland. Finally, it was evaluated in three accounting firms.

Findings – The final digital maturity model encompasses 11 dimensions. Four of the dimensions are typical for digital maturity models: technology, processes, vision and leadership and data and cybersecurity. The remaining dimensions are tailored to accounting firms: role of the accountant, sales to cash, purchase to pay, payments, general ledger, reporting and customer communication and payroll. Each dimension is scaled across five levels: non-existent, initial, proficient, advanced and continuous improvement.

Originality/value – The developed digital maturity model advances the limited academic literature on digital maturity models in accounting, demonstrates the application of intelligent automation within accounting firms and serves as a practical tool to support these firms in their automation efforts.

Keywords SME, IPA, Accounting, Artificial intelligence, Design science, AI, DMA, Digital maturity model, Intelligent accounting, Intelligent process automation, Automated accounting

Paper type Research paper

1. Introduction

This interdisciplinary article presents a practical intelligent accounting digital maturity model (IADMM) for small and medium (SME)-sized accounting firms to enhance their use of intelligent accounting and adopt new technologies. Intelligent accounting, or artificial intelligence (AI)-based digital accounting is a subset of digital accounting and refers to the automation of accounting tasks and decision-making through AI technologies such as machine learning (ML) and cognitive computing (Marshall and Lambert, 2018; Leitner-Hanetseder *et al.*, 2021). By using the newest AI technologies, intelligent accounting can

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autonomously handle complex accounting problems and decision-making processes (Dong, 2024). Even though all accounting automation provides cost savings, reduces errors and improves accounting quality (Kokina and Blanchette, 2019), intelligent accounting will cause major changes in accounting work, as increasingly sophisticated processes and judgments will be carried out using AI-based technologies rather than by humans (Leitner-Hanetseder *et al.*, 2021).

Despite growing interest, intelligent accounting has yet to become mainstream largely due to the limited adoption of AI technologies. Small and medium-sized enterprises (SMEs) in particular lag behind; while 41% of large enterprises in the EU have implemented AI solutions, only 11% of small enterprises and 21% of medium-sized enterprises have done so (Eurostat, 2025). This gap is largely due to limited financial resources and insufficient knowledge about AI among smaller companies. To remain competitive, SMEs must embrace emerging technologies. Successful adoption of new technologies begins with a clear understanding of an organization's current digital capabilities, which maturity models help assess by providing a structured framework for evaluating technology usage and identifying improvement needs (Proença and Borbinha, 2016). Although researchers and consultants have developed a wide range of maturity models – particularly digital maturity models for technology adoption – only a few specifically focus on the accounting function (Williams *et al.*, 2019; da Silva *et al.*, 2024).

This study addresses two key gaps: the limited focus on digital maturity models within accounting literature and the low levels of intelligent accounting adoption in SMEs. To bridge these gaps, this study introduces IADMM. Many SMEs outsource their accounting processes to external firms, which is why the model is specifically designed for SME-sized accounting firms. Through these firms, more efficient and intelligent accounting practices can be effectively introduced into SMEs. To support this objective, the following research question has been formulated:

RQ1. What foundational structure should an intelligent accounting digital maturity model for small and medium-sized accounting firms have?

This research uses design science methods such as those used by Eulerich *et al.* (2022) and Geerts (2011). Specifically, it uses the procedure model of Becker *et al.* (2009) for developing the IADMM. Development started with a systematic literature review, followed by 15 interviews. Eventually, the model was tested in three small accounting firms.

This paper makes three significant contributions to the existing literature. Firstly, it enhances the maturity model and accounting literature by introducing a contemporary IADMM, addressing the need to further explore the digitalization and maturity of accounting firms (Hentati and Boulila, 2023). Secondly, the developed model facilitates insights into how accounting processes in SME-sized accounting firms are conducted across five levels, ranging from manual to intelligent accounting. This work addresses the need for more empirical studies on technologies applied in accounting (Moll and Yigitbasioglu, 2019; Tiron-Tudor *et al.*, 2024) and contributes to the literature on accounting and organizational change by illustrating how these firms are transforming through the adoption of intelligent technologies. These changes affect not only the execution of accounting tasks but also organizational structures, roles and decision-making processes. By modelling these developments, the paper provides a framework for understanding how accounting organizations evolve in response to technological innovation. Thirdly, this research contributes to the development of innovative frameworks for emerging technologies by using design science-based development methods (Eulerich *et al.*, 2022). Finally, this paper has significant practical relevance. The maturity model, developed with input from accounting professionals, serves as a practical tool for SME-sized accounting firms to enhance their accounting processes.

This paper is structured as follows. Section 2 reviews the literature, explaining the concept of intelligent accounting and discussing maturity models. Section 3 outlines the research methodology, explains how the model was developed, and presents the developed maturity model. Section 4 provides the conclusions of the paper.

2. Literature review

2.1 Intelligent accounting

Accounting encompasses bookkeeping, reporting, preparing financial statements and auditing, as well as sub-processes like invoicing and tax reporting (Jaatinen *et al.*, 2021). The development of accounting has evolved significantly from the computerization of financial accounting in 1970–1990 to digitally processed financial administration i.e. digital accounting from 1990 onwards, with robotics and automation being introduced in the mid-2010s (Jaatinen *et al.*, 2021; Lehner *et al.*, 2022).

Digital accounting is a widely used term among accounting practitioners, and in research it serves as a summarizing concept for the digitalization and automation of accounting processes enabled by emerging technologies (Lehner *et al.*, 2019). Alternatively, digital accounting may simply involve storing documents in digital format without automation or AI. Therefore, distinguishing between different phases of digitalization in accounting is important, as each innovation builds upon the previous one and has a distinct impact on accountants' work (Knudsen, 2020).

Digital accounting encompasses several levels. It begins with the digitization of accounting documents through the adoption of e-invoicing and other machine-readable formats. The next phase involves achieving real-time accounting by integrating data flows from various sources into accounting information systems. Eventually, accounting tasks can be automated (Knudsen, 2020; Jaatinen *et al.*, 2021; Lehner *et al.*, 2022), and this ongoing development in digital accounting may ultimately lead to fully autonomous accounting systems (Lehner *et al.*, 2019). AI and other emerging technologies build on rule-based automation and transform it into intelligent automation, which is characterized by its adaptability and capacity for continuous improvement (Coombs *et al.*, 2020). Thus, the culmination of digital accounting development is intelligent accounting – a concept rooted in intelligent automation – where accounting systems not only automate tasks but also learn, adapt and generate strategic financial insights. Intelligent (or AI-based) accounting involves the use of AI technologies such as ML and cognitive computing to automate both routine tasks and decision-making processes (Marshall and Lambert, 2018; Leitner-Hanetseder *et al.*, 2021).

Accounting and auditing firms use accounting information systems to manage processes such as sales to cash, purchase to pay and payroll. These systems have evolved from basic, locally installed setups to advanced, cloud-based Enterprise Resource Planning (ERP) solutions (Tiron-Tudor *et al.*, 2024). These cloud-based systems are maintained by service providers, offering cost-effective, scalable access for both customers and accounting firms (Ma *et al.*, 2021). The systems can receive accounting documents in a structured format and offer real-time data, e-invoicing capabilities, digital bank statements and automated transaction processing (Moll and Yigitbasioglu, 2019). Future predictions envision fully autonomous accounting systems that optimize operations and support business objectives through advanced technologies (Lehner *et al.*, 2022). However, we are not there yet, and currently, these cloud-based systems contain only some automation possibilities. Thus, companies might seek to develop their own automations.

Emerging technologies continue to expand the possibilities for automation in accounting. Among these, rule-based robotic process automation (RPA) has so far proven particularly effective, especially in tasks that are governed by clear rules and involve digital data (Kokina and Blanchette, 2019; Tiron-Tudor *et al.*, 2024). Citizen developers – employees without programming expertise – can easily begin automating simple, repetitive tasks using low-code RPA platforms, making RPA an accessible entry point for enhancing accounting automation (Bock and Frank, 2021; Tiron-Tudor *et al.*, 2024). RPA can also be integrated with AI, which encompasses a range of technologies and applications relevant to accounting. These include ML for transaction processing and fraud detection, intelligent optical character recognition for data extraction and predictive analytics for interactive dashboards (Petkov, 2020; Leitner-Hanetseder *et al.*, 2021).

AI and its sub-technologies, along with data analytics and blockchain, are increasingly recognized as central to the future of accounting. Their combined impact is expected to reshape accounting practices, enhance decision-making and improve the reliability and efficiency of financial processes (Igou *et al.*, 2023; Baiod and Hussain, 2024). Blockchain in particular is anticipated to transform auditing and validation services by enabling secure, transparent and immutable record-keeping (Abdennadher *et al.*, 2022). However, despite their potential, these technologies are not yet widely adopted, especially among SMEs (Bakarich and O'Brien, 2021). When adopting new technologies in accounting, it is crucial to proceed with caution and consider multiple perspectives. This involves upskilling the company's workforce, dedicating budgets for the technology, ensuring management and staff support for the adoption and securing adequate IT resources (Jackson and Allen, 2024).

2.2 Digital maturity models

Evaluating 'maturity' involves assessing how well an organization performs in a specific discipline (Rosemann and De Bruin, 2005). Maturity models help organizations systematically evaluate their current status and identify areas for improvement (Proença and Borbinha, 2016). Digital maturity models specifically measure the maturity of information technology areas, incorporating terms such as "digital", "Industry 4.0", "smart", "data-driven" or "cloud" (Williams *et al.*, 2019; Becker *et al.*, 2009). These models are also used for digital maturity assessments (Kalpaka, 2023), and they can provide maturity indexes (Hentati and Boulila, 2023). Maturity models have become widely used in IT and other technology fields to measure the maturity of IT infrastructure management, enterprise architecture management and knowledge management (Rosemann and De Bruin, 2005). Subsequently, various digital maturity models have been developed (da Silva *et al.*, 2024; Williams *et al.*, 2019).

Maturity models are typically displayed in a grid or matrix layout, with the relevant technological dimensions listed vertically and the maturity scale, usually comprising five levels, arranged horizontally. Dimensions, also referred to as attributes, categories or elements, represent distinct areas of expertise, processes or design within a specific field, such as intelligent accounting, and they must be detailed enough to support the domain's requirements (Proença and Borbinha, 2016). Meanwhile, stages or levels, indicate the maturity of a dimension or domain, with varying numbers of levels depending on the model. Each level should clearly state its requirements and be easily distinguishable from other levels (De Bruin *et al.*, 2005).

Although there are hundreds of digital maturity models in the IT domain, the literature on maturity models within the accounting domain is relatively sparse. The existing literature includes Hentati and Boulila (2023), who developed a digital maturity index tailored for accounting service providers to assess the digitalization levels of accounting firms. This index diverges from traditional maturity models by using a questionnaire format, facilitating ease of analysis and the dimensions encompass technological practices in auditing, reporting and taxation (Hentati and Boulila, 2023). The electronic invoice process maturity model (EIPMM), proposed by Cuylen *et al.* (2016), included four dimensions: strategy, acceptance, processes and organization and technology. This model is particularly practical, focusing on e-invoicing. Similarly, Mantelaers and Zoet (2018) developed a continuous auditing maturity model structured around four dimensions (systems, data, organization and people) and five maturity levels (initial, *ad hoc*, defined, managed and optimized). In addition, Soguel and Luta (2021) constructed a two-level model to assess the extent to which accounting standards have been implemented in the regulations of Swiss cantons. Pekkola *et al.* (2015) developed a maturity model for management control systems and reflective practices, encompassing dimensions such as cultural, planning, cybernetic, reward and compensation and administrative controls.

3. Research methods

3.1 Research design

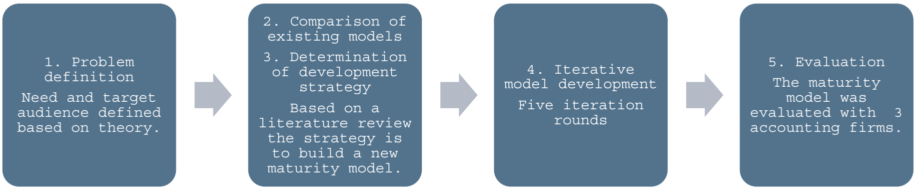
This study adopts a design science approach to develop a maturity model that offers practical solutions for end users. This methodology has been successfully applied in prior research, including studies by Eulerich *et al.* (2022), Geerts (2011) and Cuylen *et al.* (2016). To ensure a systematic, analytical and critical development process, the procedure model proposed by Becker *et al.* (2009) was selected. This model outlines five sequential phases for maturity model development: problem definition, comparison of existing models, determination of development strategy, iterative model development and evaluation. These phases are illustrated in Figure 1 and are discussed in detail in the following subsections.

3.2 Step 1: Problem definition

The first phase involves defining the problem, domain and target group, while assessing the relevance and demand for the model (Becker *et al.*, 2009). The need for a digital maturity model in the context of intelligent accounting is driven by the increasing impact of automation technologies on accounting processes, as discussed in Chapter 2.1. Although smaller firms currently use less AI and other advanced technologies, these innovations are expected to significantly influence operations within the next five years (Bakarich and O'Brien, 2021). To remain competitive, SMEs must increase their adoption of AI and automation. Since small firms typically outsource their accounting functions, the primary target group for the proposed maturity model is SME-sized accounting firms.

3.3 Steps 2 and 3: Comparison of existing models and determination of the development strategy

The second and third phases involve comparing existing maturity models to identify their limitations and to define a suitable development strategy. This process includes determining whether to create a new model or enhance an existing one (Becker *et al.*, 2009). To support this decision, a systematic literature review was conducted. The initial search focused on high-quality accounting journals, including *The Accounting Review*, *Accounting, Organizations and Society*, *Contemporary Accounting Research*, *Journal of Accounting and Economics*, *Journal of Accounting Research*, *Review of Accounting Studies* and *Management Accounting Research*. These journals were searched using keywords such as "maturity model", "digital", "automated", "RPA", "robotic", "AI", "information systems" and "fintech". No restrictions were placed on publication years. A total of 1,444 article titles were reviewed, but none addressed maturity models.



Iteration round	Iteration 1	Iteration 2	Iteration 3	Iteration 4	Iteration 5
Design level	Initial model	Whole model	Whole model	Whole model	Whole model
Approach/ data	Literature review 11/2023-2/2024	6 expert interviews in 4/2024	Logical reorganisation in 5/2024	9 expert interviews in 8-11/2024	Logical reorganisation in 12/2024
Designed Sections	Dimensions and stages	Dimensions and stages	Stages and descriptions	Dimensions and descriptions	Dimensions and stages
Testing	Qualitative expert interviews	Internal review and theoretical validation	Qualitative expert interviews	Internal review and theoretical validation	Done in phase 5. Evaluation with 3 accounting firms
Model structure	Dimensions: 8 Stages: 0 through 4	Dimensions: 9 Stages: 1 through 5	Dimensions: 9 Stages: 1 through 5	Dimensions: 13 Stages: 1 through 5	Dimensions: 11 Stages: 1 through 5
Key Changes		- Payroll dimension added - Descriptions edited - Reorganising stages - Stages renumbered	- Descriptions edited and reorganized	- Dimensions Reporting, Accountants role, Payments and Customer service added - Descriptions edited	- Dimensions People and Skills, and Customer service removed - Dimension Strategy and Management changed to Vision and Leadership - Descriptions edited

Figure 1. Development process of the IADMM across five iteration rounds
Source: Created by the author, drawing on Becker *et al.* (2009) for conceptual foundation and Cuylen *et al.* (2016) for layout inspiration

To broaden the scope of the review, a second search was conducted across eight databases: EBSCOhost, ScienceDirect, Emerald, IEEE Xplore, ProQuest, Sage Journals and Google Scholar. This search used the terms “accounting” AND “maturity model”, resulting in 1,183 articles being screened. From this search, 12 articles containing accounting-related maturity models were identified and are presented in Table 1.

Each of these articles was carefully reviewed to assess their relevance for the development of the IADMM. Among them, two models were found to be most closely related to the intended scope: the EIPMM by Cuylen *et al.* (2016), and the digital maturity index for accounting by Hentati and Boulila (2023). However, the EIPMM focuses exclusively on invoice processing and does not address other essential accounting processes. Meanwhile, the digital maturity index is designed to measure the digital maturity rate of accounting firms, rather than to describe digitalization levels in a structured maturity model

Table 1. Accounting-related maturity model studies found in database search

Nr	Database	Journal	Author and date	Title
1	EBSCOHost	*Measuring Business Excellence*	Pekkola *et al.* (2015)	A maturity model for evaluating an organization's reflective practices
2	EBSCOHost	*International Journal of Management, Accounting and Economics*	Tavallaei *et al.* (2015)	Assessing the evaluation models of business intelligence maturity and presenting an optimized model
3	EBSCOHost	*International Journal of Public Sector Management*	Soguel and Luta (2021)	On the road towards IPSAS with a maturity model: a Swiss case study
4	Emerald	*Mediterranean Conference on Information Systems*	Mantelaers and Zoet (2018)	Continuous auditing: a practical maturity model
5	Emerald	*European Journal of Economics and Business Studies*	Lebedev (2019)	Management accounting maturity levels continuum model: a conceptual framework
6	Emerald	*Access to Science, Business, Innovation in Digital Economy*	Karcıoğlu and Binici (2023)	Developing a maturity model to identify digital skills and abilities of accounting professionals: evidence from Turkey
7	Emerald	*Quality – Access to Success*	Ardiansah *et al.* (2021)	Investigating the maturity level of computer-based accounting systems in small and medium-sized enterprises: empirical evidence in Indonesia
8	Google Scholar	*Electronic Markets*	Cuylen *et al.* (2016)	Development of a maturity model for electronic invoice processes
9	Google Scholar	*Computational Intelligence and Neuroscience*	Xiang (2022)	Evaluation of enterprise accounting data management based on maturity model
10	Google Scholar	*Journal of Accounting and Organizational Change*	Hentati and Boulila (2023)	Digital maturity index for accounting firms
11	Google Scholar	*Proceedings of the Central European Conference on Information and Intelligent Systems*	Dobrinić (2020)	Digital maturity of auditing companies in the republic of Croatia
12	IEEE Xplore	*International Conference on Information Retrieval and Knowledge Management*	Zahrullaili and Noordin (2018)	Towards developing a comprehensive business intelligence maturity model for Malaysian public sector: application of mixed methodology

Source(s): Author's own work

format. Given the absence of maturity models that specifically address intelligent accounting in the existing literature, it was concluded that a new model should be developed to fill this gap.

3.4 Step 4: Five iteration rounds of model development

The iterative process of maturity model development involves selecting the design level, determining the approach, designing the model sections and conducting testing, all supported by thorough documentation. This structured process leads to the formulation of the proposed maturity model through multiple refinement rounds, as outlined by Becker *et al.* (2009). In this study, five iteration rounds were conducted, as illustrated in Figure 1.

The primary objective of the first iteration round was to construct the initial version of the IADMM. To establish the foundational structure of the model, relevant dimensions and maturity levels were identified through a comprehensive review of existing literature. This included two review articles that collectively analysed 65 maturity models (da Silva *et al.*, 2024; Williams *et al.*, 2019), as well as the maturity model studies retrieved from the database search presented in Table 1. On the basis of this analysis, five core dimensions – technology, strategy and management, processes, people and accounting data and cybersecurity – were adopted from the most applicable sources, as shown in Table 2. In addition, three dimensions representing key accounting processes – sales to cash, purchase to pay and general ledger and reporting – were incorporated, drawing inspiration from the classification of management control systems proposed by Pekkola *et al.* (2015) in their maturity model framework.

Following the establishment of the model's structure, the maturity levels were defined as 0 (non-existent), 1 (initial), 2 (encouraged), 3 (enabled) and 4 (continuous improvement), following the framework used by Cuylen *et al.* (2016). Once the structural foundation was in place, detailed descriptions for each level within the model's dimensions were developed on the basis of relevant literature, including Hentati and Boulila (2023), Cuylen *et al.* (2016), Karcıoğlu and Binici (2023), Xiang (2022), (Dimitriu and Matei, 2015; Siderska *et al.*, 2023; Kalpaka, 2023; Jaatinen *et al.*, 2021).

The second iteration round focused on refining the IADMM through expert input from the accounting field. In April 2024, six semi-structured interviews were conducted with

Table 2. Dimensions and their sources of the initial model

Dimension	Source
Processes	Williams *et al.* (2019); Cuylen *et al.* (2016); Dobrinić, 2020
Technology	Williams *et al.* (2019); da Silva *et al.* (2024); Cuylen *et al.* (2016); Dobrinić, 2020; Mantelaers and Zoet (2018)
Strategy and management	Williams *et al.* (2019); da Silva *et al.* (2024); Cuylen *et al.* (2016); Xiang (2022); Dobrinić, 2020
People	Williams *et al.* (2019); da Silva *et al.* (2024); Mantelaers and Zoet (2018)
Accounting data and cybersecurity	Xiang (2022); Mantelaers and Zoet (2018)
Sales to cash	Inspired by Pekkola *et al.* (2015)
Purchase to pay	-"-
General ledger and reporting	-"-

Source(s): Author's own work

professionals who were selected via purposeful sampling, as recommended by Shaheen *et al.* (2018). The aim was to engage individuals with practical experience in intelligent automation. Among the participants, two were intelligent accounting consultants and four were technology representatives from SME-sized accounting firms. All interviewees received a research announcement and provided informed consent. The interviews were conducted and transcribed using Microsoft Teams, following a structured interview guide designed to elicit insights into intelligent accounting practices. The participants were invited to comment on each dimension and maturity level of the IADMM while viewing the model.

After transcription, the interview data were analysed using NVivo qualitative data analysis software. Coding and interpretation were performed by a single researcher, which may limit intercoder reliability. However, the use of predefined dimensions based on the IADMM framework provided a structured and theory-driven basis for the analysis. The eight previously defined dimensions were used as coding categories, resulting in the following number of references: technology (59), strategy and management (35), processes (19), people (47), accounting data and cybersecurity (41), sales to cash (32), purchase to pay (32) and general ledger and reporting (30). In addition, several interviewees suggested the inclusion of a payroll dimension due to its significant automation potential and its relevance to accounting firms that frequently offer payroll services. This dimension was subsequently added to the NVivo coding scheme and received 21 references. The interviews contributed to the enhancement of the model by refining the level descriptions and introducing a new dimension. Furthermore, for clarity and consistency, the maturity levels were renumbered from 0–4 to 1–5.

The third iteration round was relatively brief and led by the author. During this phase, the IADMM underwent a comprehensive internal review, with the primary focus placed on reorganizing the descriptions of each maturity level to ensure logical coherence across all dimensions. This process involved refining both the language and the structural presentation of the model to enhance its intuitiveness, thereby improving its overall clarity and practical applicability.

The fourth iteration round focused on refining the IADMM through expert feedback. Nine interviews were conducted with consultants, software company representatives and managers from large accounting firms (see Appendix 1), selected for their experience in intelligent accounting. The interview and analysis process followed the same protocol as in the second round. Using NVivo, the predefined dimensions received the following number of references: technology (69), strategy and management (57), processes (36), people (26), accounting data and cybersecurity (47), sales to cash (30), purchase to pay (43) and general ledger and reporting (36).

On the basis of the feedback, general ledger and reporting was split into three new dimensions: reporting (35), accountant's role (66) and payments (14). A new dimension, customer service, was also added (9 references). The role of the accountant was emphasized due to the changing nature of accountants' work under automation, while customer service emerged as a key theme in larger firms. Descriptions of existing dimensions and levels were revised to reflect these insights.

The fifth and final iteration round, led by the author, focused on finalizing the IADMM. Interview data were re-analysed and compared with existing literature to ensure consistency across dimensions. Two dimensions were removed: people and skills – due to its emphasis on attitudes, which were considered unsuitable for objective measurement. Key elements from this dimension were integrated into strategy and management, which was renamed vision and leadership based on feedback suggesting that the term "strategy" may feel too formal for small firms. In addition, customer service was merged with reporting, forming the new dimension reporting and customer communication.

3.5 Final intelligent accounting digital maturity model

To answer the research question of what foundational structure an IADMM for SME-sized accounting firms should have, the final model consists of 11 dimensions and five levels. Four of the dimensions are typical for digital maturity models: technology, processes, vision and leadership and data and cybersecurity. The remaining dimensions are tailored to accounting firms, covering the role of the accountant and specific accounting processes: sales to cash, purchase to pay, payments, general ledger, reporting and customer communication and payroll. Each dimension is scaled across five levels: 1 (non-existent), 2 (initial), 3 (proficient), 4 (advanced) and 5 (continuous improvement). The model is explained by dimension in the following paragraphs, and the complete maturity model is presented in Appendix 2.

When the technology dimension is at level 1 (non-existent), accounting is conducted with locally installed systems or on paper. At level 2 (initial), the firm uses a cloud-based system without automation. At level 3 (proficient), the firm uses a cloud-based system with built-in automations and integrations, providing scalable access to AI and automation (Ma *et al.*, 2021). This level might be optimal for micro or small firms. At level 4 (advanced), the firm develops its own automations with RPA and AI for tasks not covered by the cloud system, focusing on integrations to avoid manual data transfers. At level 5 (continuous improvement), the firm uses the latest technologies and continuously monitors new ones.

The second dimension is processes, aligning with the emphasis of Kokina *et al.* (2021) on the importance of process management in automation projects. At level 1, the firm lacks unified processes, and each employee manages tasks individually, leading to inconsistent client management. At level 2, the firm lists regular tasks, discontinues unnecessary ones, and documents financial management processes with clear responsibilities. At level 3, unified processes are monitored and analysed for simplification, with task schedules tracked using a technical solution. At level 4, processes are analysed for automation potential. At level 5, process automations are regularly developed and maintained.

The third dimension is vision and leadership. This dimension also incorporates people and skills, which was excluded in the final iteration because measuring employee attitudes seemed inappropriate. Instead, management should provide change management activities like communication and training to foster suitable attitudes towards new technologies. At the lowest maturity level, management has no automation plans. At level 2, management has some automation plans and provides open communication and training. Interviewees highlighted the need for pricing models that accommodate automation, suggesting fixed monthly fees or a combination of fixed and transaction-based pricing. At level 3, automation is integral to operations, with employees trusting the automated processes and accepting occasional mistakes as part of development. Automation usage is monitored, aiming to use all possible automations. At level 4, the firm's strategy and business are based on intelligent accounting, with employees acting as automation developers. A budget is available for external software and automation, and employees are trained to enhance their automation skills. At the highest level 5, employees act as citizen developers, creating parts of the automations themselves, supported by either in-house or outsourced automation developers.

The fourth dimension is data and cybersecurity. This dimension covers data use, security and cybersecurity in accounting firms. At level 1, data are unstructured (paper, emails, PDFs). At level 2, the firm uses mainly structured data (e-invoices, digital bank statements) and considers data and cybersecurity elements. At level 3, the firm has a business continuity plan and provides data and cybersecurity training. At level 4, data are used to improve quality and processes, and a data security officer is appointed. At level 5, the firm uses customer accounting data as big data for industry-level insights. While only a few interviewees had experience with this, they saw it as a great opportunity.

The rest of the dimensions focus on accounting processes. The role of the accountant dimension describes how accountants' work changes with automation. At level 1, work focuses on data entry and statutory accounting. At level 2, accountants assist customers with internal reports. At level 3, they take on a consultative role, guiding customers in process development and automation. At level 4, accountants act as business challengers, suggesting improvements. At level 5, accountants specialize in areas such as customer consulting, technology, data security or process management.

The reporting and customer communication dimension evolves from accountants sending statutory reports to customers by email or mail at level 1 to customers themselves using cloud-based software for financial reports at level 2. At level 3, graphical reports and regular customer satisfaction monitoring are introduced. At level 4, AI technologies are incorporated for reporting insights and automation in customer communication, including a customer retention plan. At level 5, reporting includes cause-and-effect analysis, and customer service is available 24 / 7 with AI support.

The evolution of the sales to cash dimension begins at level 1, where customers send paper or PDF invoices, and data from external sales systems are entered manually. At level 2, sales information is processed digitally, and customers create invoices in partially integrated accounting software or sales systems, with invoices sent as e-invoices. At level 3 external sales systems are integrated fully with the accounting system, enabling automatic contract-based invoicing and the use of mobile devices. At level 4, invoicing initiation occurs automatically upon receipt of digital information, though there is also an approval step. Finally, at level 5, invoicing is fully automated using new technologies such as voice recognition, and sales data are accumulated for cost accounting.

The purchase to pay dimension's maturity evolves quite similarly as that of sales to cash. At level 1, the accounting firm's customers receive invoices and pay them manually, with invoices and receipts arriving at the accounting firm in paper or PDF format. At level 2, the accounting software receives structured invoices (e-invoices), which are then sent to the customer for approval, using a receipt management application. At level 3 automatic payments are made for approved invoices on their due date, using default accounts and built-in automations of the accounting software. At level 4, ML is used to enhance invoice processing when built-in automation is insufficient. Finally, at level 5, most purchase invoices and expense receipts are processed without human interaction, and data from purchase invoices are used in cost accounting and inventory management.

Payments have their own dimension, with digital bank statements and reference payment automation included from the lowest level, reflecting Finland's long-standing practices (Jaatinen *et al.*, 2021). At level 2, digital, machine-readable bank statements are automatically transferred to the accounting system, with default accounts used for entries. At level 3 software with built-in ML is introduced for recording bank statement transactions. At level 4, payments with incomplete data are allocated using AI. Finally, at level 5, AI examines accounts receivable discrepancies.

The maturity of the general ledger dimension primarily depends on the ability to input data into the accounting system in a structured format. At level 1, accounting-related information is received in various forms and from different channels, with all entries made manually and directly to the general ledger; no sub-ledgers are used. At level 2, information is received in a structured form in a unified location, and system internal audit reports are used. At level 3 system automations are implemented in general ledger processes, such as accruals and allocations. At level 4, custom automations and internal audit reports are developed for general ledger entries. Finally, at level 5, all recurring general ledger processes are automated, including financial statement entries and management report creation.

The final dimension, payroll – although primarily managed by human resources – represents a crucial service offered by accounting firms with substantial automation potential. This dimension encompasses data entry, beginning with unstructured data formats at level 1 and advancing to structured payroll information at level 2. Automation is further enhanced through integrated platforms at level 3. In this level, once data entry is automated, the emphasis shifts to automated payroll calculations, with monthly salaries being relatively straightforward to automate. Integrated data management systems elevate the maturity to level 4. The interviewees in the study observed that even complex salary structures can be automated with precise payroll information and a robust system, as evidenced at level 5.

3.6 Step 5: Evaluation

The evaluation step involved testing the generated maturity model with three cases, similar to Pekkola *et al.* (2015) The objective was to determine if the accounting firms could be classified using the maturity model and if they found it useful. The smallest firm (Firm 1) was a sole proprietorship, the second (Firm 2) employed about 10 people and the third (Firm 3) had around 30 employees. All provided accounting services to their customers. The evaluation was conducted through discussions with the company managers, scaling their companies using the model to assess its applicability. All discussions were conducted through Microsoft Teams, recorded and transcribed (Appendix 1).

Firm 1 was a small enterprise primarily using a locally installed accounting software and delivering services to comply with legal requirements. Accounting documents were received in an unstructured format: such as paper or PDFs, and the accountant keyed in the documents manually into the accounting system:

> They just send the materials to me in a traditional way. Like, some put it in an envelope, and then some might, like, you know, create a Google Drive account for themselves, give me access and rights to it, and I go fetch the materials from there. And then some know how to, like, put the stuff here as a PDF file or something and just email it to me as an attachment. (Firm 1 entrepreneur).

On the basis of discussion, we concluded that the firm primarily operated at maturity level 1 across most dimensions. However, in response to one client's request for modern cloud-based software and more automated services, the firm demonstrated level 3 maturity in several areas. This highlights a potential limitation of the maturity model: If a firm uses varied approaches to serve different clients, then the model may not fully capture the diversity of its practices, and results can vary depending on the customer context.

Firm 2 used a modern cloud-based accounting software with extensive automation features, and they could recognize themselves from the model. They were exclusively seeking clients willing to adopt cloud accounting and would not take "manual clients" anymore:

> Yes, because we really try to make use of all the automation and robotics built into the software. And of course, we also try to streamline things in our own processes. But yeah, there's always room for improvement.[…] Yeah, yeah, it's level 3 where we're at, and we try to make the most out of it. (Firm 2 entrepreneur).

This firm primarily operated at maturity level 3, which could be considered optimal and cost-effective for a small firm, as it used the software's automation without developing its own.

This approach relied on obtaining structured accounting data from clients and leveraging the automation capabilities of advanced accounting software. However, some manual processes remained to keep employees motivated but also because the automation did not work for all companies so well.

Firm 3, also a small accounting firm, started to use modern cloud-based accounting software several years ago and migrated all customers to the system. Automation is part of their strategy, which is followed closely:

> We switched to system X maybe seven or eight years ago. We made the change, forced the clients off the old one, and now systems X and Y are the tools we use. (Firm 2 entrepreneur).

Firm 3 hired in-house developers to enhance automation within the company. The automation technologies are mainly software robotics:

> We did like 95% of it ourselves, and then consultant's team helped us out a bit with the tricky parts. We've been working with software robotics for, what, at least five years, I'd say. (Firm 3 entrepreneur).

Despite its small size, this firm could be classified at least at maturity level 4, indicating that they had developed their own automation solutions and operated in a highly modern manner. In some dimensions, the firm even achieved the highest maturity level.

These three evaluation cases indicate that the maturity model works, allowing accounting firms to determine their maturity levels. The firms also found the model to be useful, as it provided insights and suggestions for improving their processes:

> It might really be that people kind of easily get stuck and fall into their own routines, and then they don't even notice any other way of thinking or like, way or style of working. (Firm 1 entrepreneur).

Regarding ease of use, Firm 2 noted that defining their maturity level required the presence of researchers, as they would not have been able to comprehend all the maturity levels or dimensions independently. "[…] if someone's just wondering, like, what level are we actually at? Then, in that case, it should be even simpler. The levels should be defined in a more straightforward way". This suggests that the model should be further developed to facilitate self-assessment especially for non-experienced users, and Firm 3 confirms it: "Not a whole lot of new things, really, but sure, there's definitely a use for the tool – especially if you're still in that more traditional world".

4. Conclusions

This research represents an interdisciplinary effort, combining elements of digital maturity models commonly found in IT literature with the accounting domain. The objective was to develop an IADMM for SME-sized accounting firms. The model was developed using design science methods and especially using Becker *et al.*'s (2009) procedure model. Based on a systematic literature review, 15 specialist interviews and five iteration rounds, the developed model contains 11 dimensions, each with five maturity levels. This digital maturity model has been successfully evaluated with small accounting firms.

This research contributes to the accounting literature in three key ways. Firstly, it builds upon existing maturity models in accounting by developing a model specifically tailored to intelligent accounting processes, addressing a critical need in the evolving landscape of AI and automation. While maturity models are well-established in the field of IT, their application to accounting remains relatively novel. The few existing models indicate growing relevance and interest in this area, yet none have specifically addressed intelligent accounting, which is increasingly topical in the current AI-driven environment. To illustrate the distinction, Hentati and Boulila (2023) developed a diagnostic tool to measure the digital maturity of accounting firms by using a questionnaire-based approach. By contrast, the IADMM advances this concept by offering a structured matrix of dimensions and maturity levels, each with descriptive criteria. This format aligns more closely with traditional maturity models and provides users with clear guidance on how to progress to higher levels of maturity. Similarly, the IADMM shares methodological similarities with the EIPMM developed by Cuylen *et al.* (2016), particularly in its use of a dimension-level structure. However, while the EIPMM focuses narrowly on e-invoicing, the IADMM encompasses the full range of processes typically found in small accounting firms, making it more comprehensive and applicable in practice. Moreover, as Cuylen *et al.*'s model was developed nearly a decade ago, it reflects the technological context of its time. Since then, accounting technologies and AI capabilities have evolved significantly, further highlighting the need for an updated and broader model such as the IADMM.

Secondly, this research provides an incremental contribution to the accounting and organizational change literature by offering insights into how accounting processes in SME-sized accounting firms are conducted across five maturity levels, ranging from non-automation to intelligent automation. This work responds to calls for more empirical studies on technologies applied in accounting (Moll and Yigitbasioglu, 2019) and complements existing literature on the use of RPA and other emerging technologies in accounting (Tiron-Tudor *et al.*, 2024). Although the IADMM was developed with SME-sized accounting firms in mind, its structure and dimensions are applicable to accounting firms of all sizes, and potentially to accounting departments within larger organizations. The model's emphasis on process maturity, technological adoption and organizational readiness makes it a versatile tool for assessing and guiding digital transformation across diverse accounting contexts.

The findings confirm that successful implementation of intelligent accounting technologies leads to significant changes in accountants' work roles, including role expansion and potential deskilling (Coombs *et al.*, 2020; Jaatinen *et al.*, 2021). Thus, the role of the accountant is an essential part of the maturity model. Prior research explored the future skills required in accounting (e.g. Kokina *et al.*, 2021; Igou *et al.*, 2023; Yigitbasioglu *et al.*, 2023) and both accountants and management should actively prepare for these changes. The IADMM's vision and leadership dimension supports change management and employee training, but individual accountants must also ensure their skills and attitudes remain aligned with the evolving work environment. More studies about the change, future role and skills are needed to keep accountants' jobs relevant. In addition, the IADMM developed in this study offers a foundation for future empirical research. It can be used to quantify digital maturity in accounting firms, making it suitable for statistical testing in both longitudinal and cross-sectional studies. Such applications could further illuminate how digital transformation unfolds across different organizational contexts and timeframes, and how it shapes accounting work and organizational structures over time.

Thirdly, this paper makes methodological contributions; the design science-based development method used in this research is quite rare in the accounting literature. The design science research methodology focuses on creating new useful artifacts (concepts, models, methods) for practical purposes (Geerts, 2011; Eulerich *et al.*, 2022).

In addition, this research holds significant practical relevance. The maturity model offers a valuable tool for accounting firms planning to adopt new technologies. By applying the model, firms can evaluate their current level of maturity in intelligent accounting and receive guidance on how to advance to higher levels. At present, the maturity model is manual, with no accompanying questionnaires or tools for assessment. To implement it within an accounting firm, management and/or those responsible for technology should review the model systematically, asking at each point: “Are we doing this?” This allows organizations to identify practices already in place. Once the current state is mapped, the firm can refer to the descriptions of the next level to plan its progression.

Like all research, this study has some limitations that should be acknowledged. Firstly, the maturity model was based on theoretical literature, and the practical data used to develop the maturity model were sourced from Finland, where digitalization and development levels are high (Bezrukova *et al.*, 2022). In Finland, electronic payment and information transfers between firms, banks and public authorities are common and electronic methods have been allowed in accounting since 1997 without any specific permission. E-invoices are common (Jaatinen *et al.*, 2021) and form the core of the IADMM’s first levels, although accounting documents can be transferred into a structured format in other ways as well. The model contains five maturity levels. If accounting practices are not that developed, then the lowest level should accurately describe such scenarios. While some of the interviewees operated in a global environment and had an understanding beyond Finland, this geographic limitation may still affect the generalizability of the findings to other regions with different economic, regulatory and technological environments. In particular, the applicability of the IADMM may vary depending on national regulations, the availability of digital infrastructure and cultural attitudes towards automation and change. For example, in countries where electronic invoicing is not yet widely adopted or where regulatory frameworks are less supportive of digital transformation, firms may progress through the maturity levels at a different pace. Similarly, organizational hierarchies and employee roles may influence how change is managed and how technologies are implemented. These contextual factors should be considered when applying the model internationally.

Secondly, the maturity model was evaluated using only three case companies. While these cases provided valuable insights into the model’s applicability and effectiveness, and similar or more limited evaluation has been performed with previous maturity models (Pekkola *et al.*, 2015; Cuylen *et al.*, 2016), the limited sample size restricts the generalizability of the maturity model. Moreover, the small number of cases affects the robustness of the results, as broader patterns and variations in accounting practices may not be fully captured. In particular, the diversity of practices within individual firms – such as tailoring services to different client needs – suggests that maturity levels may vary even within a single organization.

Thirdly, with regard to newer technologies, blockchain is only considered at the highest maturity level of the model’s technology dimension, as none of the interviewees had practical accounting experience with it. However, as accounting documents become blockchain based, as seen in countries such as the UAE (Abdennadher *et al.*, 2022) or other disruptive technologies appear, the IADMM should be updated. These limitations do not invalidate the findings but highlight the need for further research. Future studies should aim to test the model in broader and more diverse contexts, refine its dimensions, and explore how digital maturity evolves over time in different organizational environments.

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Appendix 1

Table A1. List of the interviews

Purpose	Interviewee	Method	Duration
Iteration 2	Consultant 1 and 2	MS Teams	64 min
Iteration 2	Head of technology 1	MS Teams	55 min
Iteration 2	Head of technology 2	MS Teams	50 min
Iteration 2	Head of technology 3	MS Teams	58 min
Iteration 2	Head of technology 4	MS Teams	57 min
	Total		*4 h 44 min*
Iteration 4	Accounting consultant 1	MS Teams	37 min
Iteration 4	Accounting consultant 2	MS Teams	42 min
Iteration 4	Accounting consultant 3	MS Teams	45 min
Iteration 4	Accounting consultant 4	MS Teams	46 min
Iteration 4	Accounting consultant 5	MS Teams	66 min
Iteration 4	Accounting firm manager 1	MS Teams	60 min
Iteration 4	Accounting firm manager 2	MS Teams	41 min
Iteration 4	Software specialist 1	MS Teams	48 min
Iteration 4	Software specialist 2	MS Teams	57 min
	Total		*7 h 22 min*
Purpose	Interviewee		
Evaluation	Accounting firm 1	MS Teams	42 min
Evaluation	Accounting firm 2	MS Teams	47 min
Evaluation	Accounting firm 3	MS Teams	73 min
	Total		*2 h 42 min*

Source(s): Authors' own work

Appendix 2

Table A2. Intelligent accounting digital maturity model for small and medium-sized accounting firms

Level/ dimension	1. Non-existent	2. Initial	3. Proficient	4. Advanced	5. Continuous improvement
Technology	Primarily using on-premise software or paper-based processes	Cloud-based financial system in use with built-in AI and some system integrations	Rule-based and AI features of the cloud system actively used; initial RPA/AI experiments conducted	Established RPA and AI use; AIS gaps filled; systems well-integrated	Leveraging latest technologies; continuously monitoring and evaluating new tools
Processes	Each employee manages clients independently with personal methods	Regular tasks listed; unnecessary ones removed. Processes documented and standardized. Roles clarified with clients	Employees skilled in process management. Uniform execution monitored and improved. Tasks scheduled and tracked	Automation opportunities analysed; development plans created	Automations actively maintained and continuously improved
Vision and leadership	Automation is not part of management's plans	Automation is planned; staff engaged through communication and training. Management supports new work methods. Pricing reflects automation use	Automation is trusted and actively used. New solutions are tested. Plans are clearly communicated and tracked with metrics	Operations rely on automation. Staff involved in development. Automation development is budgeted, and staff skills are enhanced through training	Some employees act as citizen developers. Company has dedicated or outsourced IT resources and a tech development lead
Data and cybersecurity	Data mainly in paper or PDF format; its value to operations is unclear	Cybersecurity and customer data protection documented and acknowledged	Business continuity and risk plans in place. Internal monitoring active. Staff trained in data security	Data used to improve quality, processes and communication. Data security officer appointed	Data seen as a key resource. Financial data used across company boundaries for analysis and consulting
Reporting and customer communication	Statutory reports sent via email or mail	Customers access reports directly from the system. Reporting schedule agreed upon	Dashboards available. Customer and partner satisfaction monitored regularly	AI provides insights, alerts and forecasts. Automation used in communication. Customer retention plan in place	Cause-and-effect reports used. 24 / 7 service enabled by AI. Quotation, purchase and onboarding automated

(*continued*)

Table A2. Continued

Level/ dimension	1. Non-existent	2. Initial	3. Proficient	4. Advanced	5. Continuous improvement
Role of the accountant	Focus on data entry, statutory accounting and tax returns	Helps clients understand financials and enables internal reporting	Communicates insights and guides clients in process and automation development	Challenges and supports clients in identifying improvements and suggesting solutions	Accountant specializes in consulting, technology, data security or process management
Sales to cash	Billing data is unstructured; invoices sent as paper or PDFs. External sales data entered manually	Invoices created in accounting or sales systems. E-invoicing used. Partial system integration	External systems integrated. Contract billing automated. Mobile billing supported	Billing starts automatically from digital data. E-invoice approval in place	Billing initiated via new tech (e.g. voice recognition). Data used for cost accounting
Purchase to pay	Invoices are received and paid manually. Documents arrive as paper or PDFs	Invoices received in structured format. Sent for customer approval via accounting software. Receipt app in use	Approved invoices paid automatically. Default accounts and built-in automations used	ML improves invoice processing beyond built-in automation capabilities	Most invoices and receipts processed without human input. Data used for cost accounting and inventory
Payments	Paper or PDF bank statements used. Reference payments recorded manually	Machine-readable bank statements imported automatically to AIS. Default accounts used for entries	Software uses built-in machine learning to record transactions	AI allocates payments with incomplete data	AI identifies and analyses accounts receivable discrepancies
General ledger	Information received in various formats and channels. Entries made directly to the general ledger	Data received in structured form Internal audit reports used	Automations used for tasks like accruals and allocations	Tailored automations and internal audit reports support ledger entries	Recurring ledger tasks and financial statement entries automated. Management reports generated automatically

(*continued*)

Table A2. Continued

Level/ dimension	1. Non-existent	2. Initial	3. Proficient	4. Advanced	5. Continuous improvement
Payroll	Payroll info received in various formats. Customers send paper or PDF documents	Payroll data received in structured format. Payroll separated from accounting. Data transferred via integration	Customers update payroll info via portal. Monthly salaries processed automatically	Time tracking system integrated. Hourly wages calculated automatically. Payroll clerk reviews before payment	All salaries calculated automatically. Automation checks and suggests corrections. Payroll clerk approves for payment

Source(s): Authors’ own work

About the author

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