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FirmOS: Smart Intelligent Assistant for Chartered Accountant

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Abstract: ***Chartered Accountant (CA) firms deal with a huge amount of client data and supporting paperwork for tax filing, audits, compliance and similar services. Gathering, checking, sorting and storing all of this by hand takes a lot of time, and mistakes or missing details often creep into reports and everyday work. This review look at the research behind FirmOS, an smart intelligence tool built for CA firms. It covers AI in accounting and auditing, optical character recognition (OCR), automated invoice processing, document understanding, natural language processing (NLP), semantic retrieval, retrieval-augmented generation (RAG), tool-using AI systems and human–AI collaboration.***
The studies we reviewed show real progress. OCR turns scanned pages into digital text, document AI models draw on both the words and the visual layout, semantic models retrieve information by meaning rather than keywords, and RAG links language models to outside data. Accounting research add that AI makes work more efficient but professional judgment is still needed. Still, most of this work treats each technology on its own and rarely looks at what a CA firm actually needs day to day. FirmOS tries to fill that gap by bringing together client information management, document collection, OCR-based data extraction, template-based verification, document status tracking and role-based access limited to authorized staff. It is meant to help CA professionals with their daily work, not to take their place.
Keywords: Artificial Intelligence, Chartered Accountancy, OCR, Document AI, Natural Language Processing, Semantic Retrieval, RAG, Intelligent Assistant, Human-in-the-Loop.

I. INTRODUCTION

auditing research. Studies point to uses such as automation, financial analysis, audit support, anomaly detection and continuous monitoring, all of which rely heavily on data [1], [7], [20]. Adopting AI also brings practical worries, including privacy, trust, governance, professional accountability, difficulties in implementation and the need to check what the system produces [1], [14], [20]. These concerns are critical / matter even more in professional settings because accounting and auditing work involves sensitive information and calls for professional judgment.

A Chartered Accountant (CA) firm usually has many clients and handles all sorts of documents: invoices, bank statements, tax records, receipts, confirmations and other supporting papers. The usual workflow run something like this ask for documents, receive the files, confirm that everything required has arrived, pull out the information, verify certain fields, organize the records, keep track of what is pending and stay in touch with clients and the team. Done manually, the repeated data entry and chasing take up a lot of professional time. Studies on process efficiency in accounting firms report recurring problems such as little automation, unsuitable software and tight deadlines, and they suggest OCR as one way to cut down manual transcription [9].

Against this background, FirmOS is proposed as an smart intelligent assistant for Chartered Accountant firms. The project centres on client-specific workspaces, document collection and management, OCR-based data extraction, basic verification, status tracking and natural language access to authorized information. It is meant to support professional judgment rather than replace it. Software can help with routine, information-heavy work but the decisions stay with the CA professional.

This review looks at the research behind each of these components and at the gap between individual AI and document-processing techniques on one side and an integrated workflow built for CA firms on the other. It links accounting research with technical areas such as OCR, document understanding, NLP, retrieval, RAG, tool use and human–AI collaboration.

II. OBJECTIVE

A. To design a centralized system for handling the activities of a CA firm.

This objective focuses on developing a single system to manage the different activities of a Chartered Accountant (CA) firm.

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Instead of maintaining information in separate files, registers, or applications, the system stores and manages important information in one place. It helps employees and partners access client details, work progress, and other office-related information easily. This approach improves coordination, reduces data duplication, and makes daily operations more organized.

B. To create a comfortable platform for working with clients, documents and services.

The main purpose of this objective is to provide a simple and convenient platform for managing client-related activities. Employees can maintain client information, upload and access documents, and manage services such as GST filing, income tax returns, and auditing. The platform makes it easier to find the required information and track the status of client work. It also improves communication between employees and clients, reducing the time spent on manual paperwork.

C. To establish a proper system of control over tasks, deadlines and financial documentation.

This objective aims to organize and monitor the work assigned to employees. The system helps assign tasks, track their progress, and identify pending or delayed activities. It can also maintain important deadlines for tax filing, GST returns, audits, and other compliance-related work. Financial documents can be stored systematically for easy access and reference. Reminders and task-status updates help employees complete their work on time and reduce the possibility of missed deadlines.

D. To design a secure, easy-to-use system that boosts the overall productivity of CA firms.

The main Purpose of objective focuses on developing a system that is both user-friendly and secure. The platform should provide simple navigation so that employees and CA partners can use its features without difficulty. Security features such as user authentication, role-based access, and protected document storage help prevent unauthorized access to confidential client information. By reducing repetitive manual work, improving coordination, and providing quick access to information, the system can increase employee productivity and improve the overall efficiency of the firm.

III. LITERATURE REVIEW

A. Artificial Intelligence in Accounting and Auditing

Abdo-Salloum and Chehade [1] present a systematic review of AI in accounting and auditing. Their study to highlights the benefit, time saving, streamlined reporting, fraud analysis and monitoring. These benefits are the paper draws attention to critical concerns around privacy, ethics, regulatory alignment and workplace implementation offering a comprehensive basis for AI adoption in accounting.

Rikhardsson et al. [15] look at what small and medium-sized firms expect from AI in auditing and how they use it. This is relevant to FirmOS because the system is aimed at everyday practice settings, not only at large enterprise systems. Sun and Vasarhelyi [16] study deep learning for analyzing textual data in auditing, which supports treating unstructured text as another source of professional evidence.

Dong, Stratopoulos, and Wang [7] give a scoping review of ChatGPT and similar large language models in accounting and finance. They cover applications, the use of LLMs as research tools and what these models mean for professionals in the field. Zemankova [20] reviews how AI in audit and accounting has developed, along with current trends, opportunities and threats. The paper lists seven audit tasks that benefit from AI (internal control evaluation, risk assessment, analytical review procedures, classification, materiality assessment, going-concern decisions and bankruptcy prediction) and summarizes the main technologies in use, including genetic algorithms, fuzzy systems, neural networks and hybrid systems. It also discusses robotic process automation, Big Four audit tools, and threats such as regulation, data protection and algorithmic bias. Taken together these findings demonstrate that AI in accounting is moving beyond simple process automation toward systems that enhance data analysis.

So the literature makes a clear case for AI assistance in the field, but by itself it does not describe a complete CA-firm workflow. FirmOS uses this research as its professional foundation and combines it with document and information-retrieval technologies.

B. OCR and Automated Document Processing

Smith [2] describes the Tesseract OCR engine and presents OCR as a way of turning text in document images into machine-readable form. For a CA-firm system this matters, because client records often arrive as scans or images rather than as structured digital data.

OCR is only one stage of document processing, though. Krieger, Drews, and Funk [8] study machine-learning-based extraction of invoice information and highlight the long-tail supplier problem: a model trained mostly on frequently seen vendors may perform differently when it meets less common invoice formats. This is relevant in real CA practice, where documents differ in layout, supplier, language, quality and structure.

Mezzara, Saoudi, and Zahi [9] connect OCR automation to process efficiency in accounting firms and present it as a way to reduce manual transcription. Wang, Zhang and Yu [10] studied automatic invoice recognition based on deep learning, combining image preprocessing, OCR and post-processing. Together these studies trace a move from basic character recognition to structured extraction. For FirmOS, this means OCR should be seen as the intake layer of a wider document-intelligence pipeline, not as the whole intelligence component.

A. Document Understanding and Document AI

Xu et al. [3] proposed LayoutLM, which combines text and layout information for understanding document images. This matters because the meaning of a field in a document can depend not only on the words but also on where they sit on the page. Huang et al. [4] later proposed LayoutLMv3, a multimodal pre-training method that uses unified text and image masking. It targets both text-centric and image-centric Document AI tasks, such as form understanding, receipt understanding, document visual question answering, document classification and layout analysis.

These methods work well for accounting documents as like invoices, receipts and statements. The current FirmOS concept relies on OCR and document processing as its core functions, so layout-aware models are better treated as research foundations and possible future improvements, not as features the existing prototype already has.

B. Natural Language Processing and Semantic Representation

Devlin et al. [6] proposed BERT, a transformer-based approach to contextual language representation. BERT showed how much bidirectional context matters for language understanding tasks. Reimers and Gurevych [5] built Sentence-BERT (SBERT), which produces sentence embeddings that work well for semantic similarity and efficient retrieval. These approaches allow to CA professionals to search using everyday language. For example, a user might ask, “Which clients have tax documents that need to be completed?” instead of searching for a particular file name. Semantic representations can tie the meaning of a query like this to the right records. In FirmOS these techniques form the groundwork for future semantic search and natural language document discovery.

C. Retrieval-Augmented Generation and Knowledge Retrieval

Lewis et al. [12] proposed Retrieval-Augmented Generation (RAG) for knowledge-intensive tasks, pairing a retrieval module with a generative language model. REALM [17] builds retrieval into the pre-training of language models, and Dense Passage Retrieval (DPR) [18] shows that dense representations work well for finding relevant passages. Gao et al. [13] survey RAG methods and describe retrieval as a way of connecting large language models to external knowledge sources.survey of RAG methods and frame retrieval as a means of linking large language models to external sources of knowledge.

RAG is particularly relevant to FirmOS, because a practice assistant should answer organization-specific questions using authorized firm and client information. A generic language model cannot be assumed to know up-to-date internal records. A retrieval layer can first find out the relevant authorized information and then pass it to the model as context. It also gives a natural place in the architecture to add access control and source tracking.

The conceptual pipeline for FirmOS is therefore: user query → query representation → authorized retrieval → relevant client/firm information → generated response → professional review. The literature supports the retrieval concept, while the CA-specific access control and workflow integration remain part of the proposed system design.

D. Intelligent Tool Use and Agent-Based Assistance

Schick et al. [11] propose Toolformer, which explores how language models can be trained to use external tools. Yao et al. [19] introduce ReAct, which combines reasoning and acting so that language models can interact with external environments. These works suggest that future assistants may do more than answer questions and carry out controlled actions, such as searching a database, verifying records or calling a software function.

For FirmOS, this research is best seen as future scope. The project does not need to claim that its current prototype works as an autonomous agent.

E. Human–AI Collaboration in Accounting

Human–AI collaboration matters a great deal in accounting, because not every output can be accepted without review. Choi and Xie [14] study GenAI adoption using survey responses from professional accountants along with field data from an AI-enabled accounting platform.

This evidence supports a human-in-the-loop design for FirmOS. The system can assist with repetitive document processing, information retrieval and status monitoring, but professional CA judgment should stay at the centre. The same principle fits the wider accounting literature reviewed by Rikhardsson et al. [15] and Zemankova [20]. Zemankova [20] states that AI and RPA complement each other rather than replace each other, that tools such as Deloitte's GRAPA still need human creativity and judgment, and that algorithms used in accounting and audit should be explainable and checked for bias.

IV. COMPARATIVE ANALYSIS

The literature reviewed shows substantial progress across several technical and professional areas, but the contributions are spread over different problems. OCR research focuses on extracting text, invoice-processing work on extracting fields, Document AI research on layout and multimodal understanding, NLP research on language representation, retrieval and RAG research on accessing and generating knowledge, and accounting research on adoption, professional judgment and organizational impact. FirmOS sits where these research streams meet.

Research Area	Representative Papers	Main Contribution	Main Limitation / Scope	Relation to FirmOS
AI in accounting/auditing	[1], [7], [14], [15], [20]	Automation, analytics, professional support	Broad domain studies; governance and adoption remain important	Provides accounting context and human-oversight principles
OCR	[2]	Image-to-text conversion	OCR alone does not understand full workflow	Supports document ingestion
Invoice/document extraction	[8], [9], [10]	Structured information extraction	Often focused on invoices or specific document classes	Supports accounting-document automation
Document AI	[3], [4]	Text, layout, and image understanding	More advanced models may require additional implementation	Potential enhancement for complex documents
NLP / semantic representation	[5], [6]	Contextual language understanding and semantic similarity	Not specific to CA practice	Supports natural-language search
Retrieval	[17], [18]	External knowledge and dense retrieval	Generic retrieval settings	Supports authorized information retrieval
RAG	[12], [13]	Retrieval plus language generation	Requires controlled and relevant knowledge sources	Supports firm-data question answering
Tool use / agents	[11], [19]	External tool interaction and reasoning/action	Not designed specifically for CA workflows	Future extension for controlled intelligent workflows
Human–AI collaboration	[14], [15]	Professional oversight and AI augmentation	Requires careful validation and governance	Supports human-in-the-loop design

V. CONCEPTUAL FRAMEWORK

This framework is tied to the proposed FirmOS architecture. Research on accounting and auditing provides the professional context. Research on OCR and invoice processing supports document intake and extraction. Document AI is a starting point for deeper document understanding. Semantic representation and NLP make natural-language interaction possible. Retrieval and RAG give access to relevant authorized information. Human–AI collaboration forms the final control layer.and RAG enable access to relevant authorized information. Human–AI collaboration constitutes the final control layer.

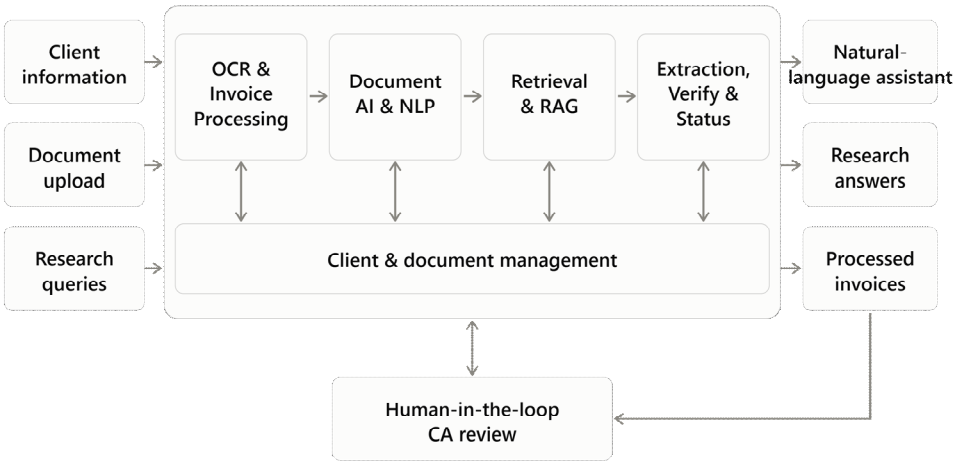


Figure 1. Conceptual framework

VI. RESEARCH GAP

A. *Lack of an Integrated CA-Firm Workflow*

Most of the studies reviewed concentrate on one technology or one professional issue. OCR research deals with extracting text, invoice research with extracting information, Document AI with understanding visuals and layout, and RAG research with retrieval-supported generation. A CA practice, in contrast, needs all of these capabilities to work together in one workflow that covers clients, document requirements, submissions, verification, status tracking and follow-up.

B. *Separation of Document Intelligence and Practice Management*

Document extraction research shows that useful information can be pulled from images and documents, but that information has to be connected to client records, document categories, requirements and status. Without that connection extraction may reduce data entry work without solving the larger practice management problem.

C. *Need for Authorized Knowledge Retrieval*

RAG and dense retrieval give us ways to connect language models to outside knowledge. A CA-firm assistant also has to restrict retrieval to what the user is allowed to see. The literature provides the technical basis for retrieval, but a CA-specific workflow that combines retrieval, client context, permissions and professional review is still an application-level need.

D. *Need for Human Professional Oversight*

Recent accounting research points to both productivity gains and risks from using AI [14]. A system built for CA firms should therefore automate routine processing and leave professional judgment with the CA.

E. *Need for a Practical Integrated Prototype*

The reviewed research provides the technical building blocks, but there is a practical opportunity to show how they can be combined in a single prototype for CA firms. FirmOS takes up this opportunity by bringing together client management, document gathering, OCR-driven processing, predefined verification, status tracking and controlled natural-language access to authorized information.

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VII. PROBLEM STATEMENT

Chartered Accountancy practices handle large volumes of client documents for taxation, auditing, compliance and other professional work. These documents have to be collected, checked, sorted and followed up by hand, often more than once.

Current research offers separate solutions for OCR, invoice extraction, document understanding, semantic retrieval and generative question answering. These technologies, however, tend to be studied in isolation, and they do not always add up to a single workflow built specifically for Chartered Accountancy practice.

What is needed, then, is an integrated practice-intelligence system: one that can organize client information, manage documents, extract information from uploaded files, run predefined verification, track document status and give controlled access to relevant firm information through natural-language interaction, all while keeping professional CA judgment in the decision-making process. FirmOS is proposed to address this problem by combining established AI and document-processing ideas into one workflow aimed at CA firms.

VIII. LITERATURE REVIEW METHODOLOGY

A. Review Approach

This paper uses a structured literature review approach to identify and compare research relevant to AI-assisted practice management in Chartered Accountant firms. The review focuses on the technical and professional foundations of FirmOS rather than presenting a new machine-learning algorithm.

B. Databases and Sources

The literature search is organized around major academic and scholarly sources including IEEE Xplore, ACM Digital Library, ScienceDirect, SpringerLink, Scopus, and Google Scholar. Publisher pages and DOI records were used to identify and confirm relevant research papers.

C. Search Keywords

The main keywords and combinations used for the review include: “AI in accounting”, “AI in auditing”, “Chartered Accountant”, “OCR accounting documents”, “invoice information extraction”, “Document AI”, “LayoutLM”, “BERT”, “Sentence-BERT”, “semantic retrieval”, “retrieval-augmented generation”, “RAG”, “LLM accounting”, “Toolformer”, “ReAct”, and “human-AI collaboration in accounting”.

D. Publication Period

The review primarily considers research published from 2019 to 2026, while a small number of earlier foundational works are retained where they are directly necessary for understanding the technologies used in FirmOS. This allows recent AI research to be considered without excluding important technical foundations.

E. Exclusion Criteria

Studies were excluded when they were unrelated to accounting or the technologies required by FirmOS, duplicated another source, lacked sufficient scholarly information, or focused on applications with no meaningful connection to document processing, information retrieval, intelligent assistance, or professional decision support.

F. Screening and Synthesis

The selected literature was grouped into seven themes: AI in accounting and auditing; OCR and automated document processing; Document AI; NLP and semantic representation; retrieval and RAG; intelligent tool use; and human-AI collaboration. After summarizing each study, its practical limitation was critically examined and then compared with the requirements of FirmOS. This thematic synthesis was used to identify the research gap and derive the proposed application-level workflow

IX. PROPOSED METHODOLOGY

The proposed approach is practical and uses proven technologies as parts of one integrated workflow. This project should be understood as an integration of existing methods, not as a new algorithm for OCR, transformers or language models.

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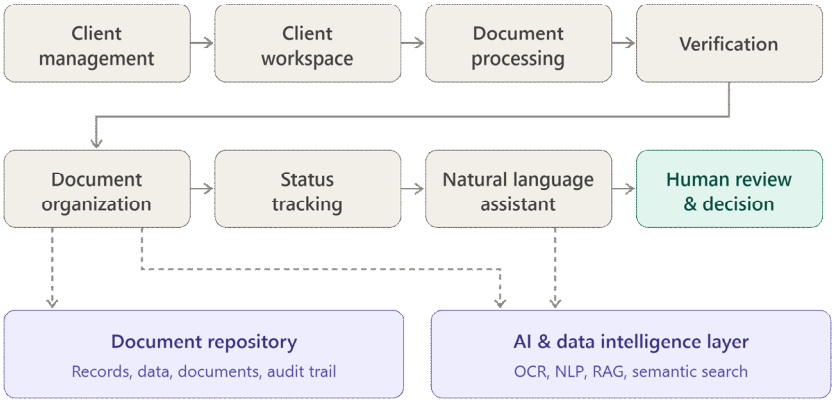


Figure 2. Proposed methodology Flow

A. Client Management

The process starts with Client Management, where basic client information is entered and kept up to date. The system also lets the firm set the document requirements for each client. This gives a structured base for handling client-related work.

B. Client Workspace

Every client gets a separate Client Workspace. It is a shared area where CA staff can review the client's requirements and upload the required documents, which keeps all of the client's information and related documents organized in one place.

C. Document Processing

Uploaded documents are then scanned using OCR (Optical Character Recognition), which extracts text and other useful data from scanned or image-based documents. This extracted information is then ready for downstream processing and verification.

D. Verification

Next, the system checks the extracted information against predefined rules. It looks for the expected or required details and flags possible problems for review. This step help to catch information that is inconsistent or incomplete.

E. Document Organization

Once extraction is done, the system files each document under the right client and document type.

The system is the compare extracted details against predefined templates to highlight missing or inconsistent information. Even though task statuses update automatically to assist with tracking, final approval rests entirely with the CA professional.

F. Status Tracking

Status Tracking lets the firm follow the progress of document-related work. The system can track deadlines and flag documents that are pending or missing, and it can notify or alert CA staff or other relevant users so they can act.

G. Natural Language Assistant

The Natural Language Assistant lets users reach authorized information by asking questions in plain language. Retrieval-based and NLP techniques can be used to search the relevant information in the available data, which saves time otherwise spent going through piles of documents by hand.

H. Human-in-the-Loop Review

The last phase is CA Review and Decision. FirmOS is a assists professional judgment , it doesn't replace it. The CA or an authorized professional examines the information, checks the key results and makes the final decision. This human-in-the-loop design matters especially in accounting and professional practice.

A later version could bring in layout-aware Document AI, semantic retrieval, RAG and controlled tool use more fully. Any such extension should be evaluated for extraction accuracy, retrieval precision, access control, privacy, explainability and how often it gives incorrect or unsupported answers. The current prototype need to draw a sharp line between features that are already built and those planned for future research.

X. CONCLUSIONS

This literature review examined research relevant to an smart intelligence assistant for Chartered Accountant firms. The literature covered AI in accounting and auditing, OCR, automated invoice processing, document understanding, NLP, semantic representation, retrieval, RAG, intelligent tool use and human–AI collaboration. Together, these studies provide a technical and professional basis for FirmOS.

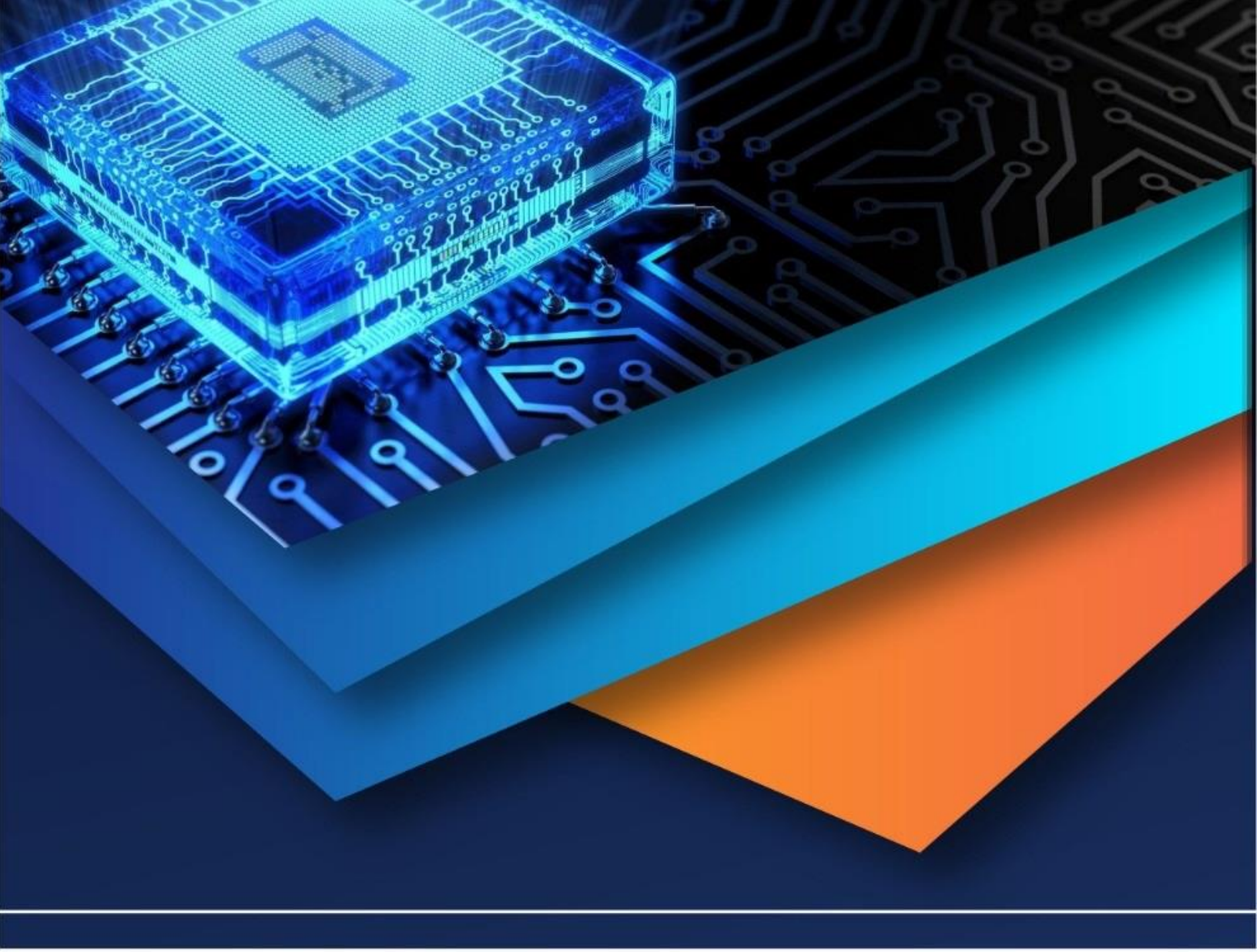
The review also reveals a significant gap at the application level. Studies to focus on particular technologies or individual accounting tasks, where as a CA practice needs connected management of clients, documents, requirements, verification, status and information retrieval. What is needed is an integrated workflow that links document intelligence with practice management and controlled access to organization-specific information.

FirmOS is put forward as an application-oriented answer to this gap. Its core workflow combines client management, document collection, OCR based extraction, predefined verification, organization, status tracking and natural-language access to authorized information. Advanced Document AI, semantic retrieval, RAG and controlled tool use can be seen as future extensions. Throughout the design, human in the loop review remains essential, so that AI handles repetitive and information processing work while professional CA judgment stays the final decision layer.

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