

Implementation of AI Based Document Systems for Automated Document Metadata Extraction to Enhance Efficiency in the Era of Digital Transformation: Case Banking Sector

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Abstract

The process of processing banking documents in Indonesia is still largely carried out manually and using conventional Optical Character Recognition (OCR), which has limitations in handling semi-structured and unstructured documents. This situation results in a high risk of human error, slow metadata extraction processes, and low operational efficiency. This study aims to analyze the integration of Artificial Intelligence (AI), Optical Character Recognition (OCR), and the UiPath Document Understanding platform system in the automation process of banking document metadata extraction in the era of digital transformation. The research results indicate that the UiPath Document Understanding system is capable of integrating AI, OCR, and Robotic Process Automation (RPA) technologies into a single automated workflow, starting from the document upload process, digitization using Intelligent OCR, document classification, AI-based metadata extraction, data validation, to metadata storage into the database. This integration is able to improve time efficiency, data accuracy, and reduce human errors in the banking document management process. In addition, the system is also capable of handling structured, semi-structured, and unstructured documents more flexibly compared to traditional OCR. Thus, the implementation of UiPath Document Understanding has the potential to be a solution in supporting digital transformation and optimizing banking business processes in Indonesia.

1. Introduction

Digital transformation today demands all sectors to achieve cost efficiency and service speed. The banking sector is undergoing massive digitization, where financial institutions are transforming from conventional business models towards more modern, fast, inclusive, and customer-oriented banking services (Ramadhan & Ahmar, 2025) [1]. Furthermore, (Abildtrup, 2024) [2] emphasizes that optimizing banking management through digital automation is the main solution in enhancing productivity as well as providing faster and more accurate services. This phenomenon encourages banks to undergo digitalization through the implementation of automation to minimize the risk of human error and significantly improve data accuracy

The very high volume of banking documents is often disproportionate to the capabilities of processing systems, which are still conventional. Conventional processes require a considerable amount of time and carry a high risk of human error. Moreover, banking documents generally have diverse formats, ranging from structured, semi-structured, to unstructured documents, making data extraction processes difficult if only conventional methods are used. (Movva, 2025) [3] explains that the greatest challenge in managing digital documents lies in the data extraction process from semi-structured and unstructured documents, which are difficult to process using traditional methods. This condition causes business processes to be less efficient and hinders the speed

Poster

Available Aug 01, 2026

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of information processing within organizations. The impact of inefficient document management can affect the quality of service to customers, slow down administrative processes, and hinder decision-making that requires data quickly and accurately.

This research offers a solution in the form of integrating Artificial Intelligence (AI), Optical Character Recognition (OCR), and Document Understanding System on the UiPath platform in the process of automating the extraction of banking document metadata. This study utilizes the Document Understanding (DU) system on UiPath, which combines OCR technology, Artificial Intelligence, and Robotic Process Automation (RPA) in a single integrated workflow to assist the automatic document processing (Movva, 2022) [4].

2. Methods

This study presents facts from various literature that have been collected through digital literature searches in academic databases such as Google Scholar, ResearchGate, and SINTA systematically, then these data are critically analyzed to identify the relationship between metadata automation and the reduction of human error. The output of this research is an architectural model that illustrates the integration between AI and OCR in the UiPath Document Understanding ecosystem for optimizing metadata extraction.

3. Results and Discussion

Literature analysis shows that dependence on traditional OCR technology, which is still static, is one of the main obstacles to banking efficiency in Indonesia. Thus, it can be concluded that conventional OCR techniques are not yet able to accurately read characters in objects that have variable real image conditions. In addition, a more responsive approach such as deep learning-based OCR is needed. Based on the research by Ramadhanti *et al.*, 2024, the application of conventional OCR with MATLAB in the character detection process on PDAM meters only achieved a precision value of 14.28% and a recall of 7.14%, thus it can be concluded that conventional OCR techniques are not yet able to accurately read characters on objects with variable conditions. Common OCR methods that still rely on pattern matching like this are highly dependent on the file structure; if there is even a slight shift in text position or a change in document format, it can cause metadata extraction to fail. This can be a problem because documents coming into banks often have free-form or non-uniform formats, such as invoices and payment receipts, as well as customer documents like proof of income.

These conditions and problems are exacerbated by findings that the level of automation in the national banking industry is not yet optimal. Although the use of OCR technology has begun to be adopted in the banking industry in Indonesia, the implementation of document digitization processes is not yet optimal. According to research by (Saraun *et al.*, 2026) [5], OCR technology in banking forms is known to have varying accuracy levels depending on the condition of the documents, which then requires bank staff to still enter data manually. This is an indication that financial institutions in Indonesia are still in a stage of partial digitization, where digitization has been implemented but

human intervention is still needed in data entry. This shows that there is still a gap between the need for service speed and the use of technology, which is still not optimal.

This research proposes the adoption of a Document Understanding (DU) system on the UiPath platform as a solution to replace traditional OCR. This model utilizes the integration between Optical Character Recognition and Artificial Intelligence working in a single workflow. Globally, this platform has been proven capable of bridging this gap because the model offers a shift in processing from merely "reading text" to "understanding documents." The model is capable of bridging the distance between character reading and context understanding through several approaches. The first approach is the transition from templates to Machine Learning models. This model utilizes semantic logic to recognize metadata so that it no longer relies on the text's coordinate positions. After OCR converts the image into text, AI functions to recognize or understand the context through the Machine Learning model. The second approach addresses the subsequent issue related to low confidence in data accuracy. UiPath provides a Validation Station feature that allows bank staff to review, correct, or complete the data extraction results performed by AI on data with low confidence scores.

4. Conclusion

The utilization of the UiPath model, which leverages AI-OCR integration, can be a solution to achieve successful digital transformation in a global era that demands institutions to always be adaptive and innovative in facing changes. By utilizing a well-established model like UiPath, banks in Indonesia do not need to build a system from scratch, but can simply adopt this model to accelerate business process automation. This adoption allows financial institutions to reach a level of global automation with a low level of risk.

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