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AI - Driven N8N Workflow for Billing and Iterative Cash-Flow Optimization

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ABSTRACT: This project develops an AI-driven automation workflow combining n8n and Ollama AI to streamline billing and iterative cash-flow optimization in construction management. It extracts detailed billing data from construction bills using AI-powered text recognition integrated in n8n, organizing this information into Excel sheets for efficient invoice generation and financial tracking. A JavaScript-implemented Newton-Raphson method is applied to calculate the Internal Rate of Return (IRR) dynamically from the project's cash flows, facilitating accurate forecasting and decision-making. This integration enables real-time monitoring of project financial health, reduces manual processing errors, and accelerates billing cycles. By combining AI-driven data extraction with workflow automation and advanced financial analytics, the project enhances cost control, improves cash-flow management, and supports proactive planning. This solution represents a practical advancement in construction project automation, delivering efficiency, accuracy, and financial insight critical for project profitability and management success.

KEYWORDS: AI, n8n, Construction bills, ollama.

I. INTRODUCTION

Effective billing and cash flow management are essential for maintaining project continuity, transparency, and profitability in the construction industry. Traditional manual methods often lead to mistakes, inefficiencies, and slow insights, causing financial delays.

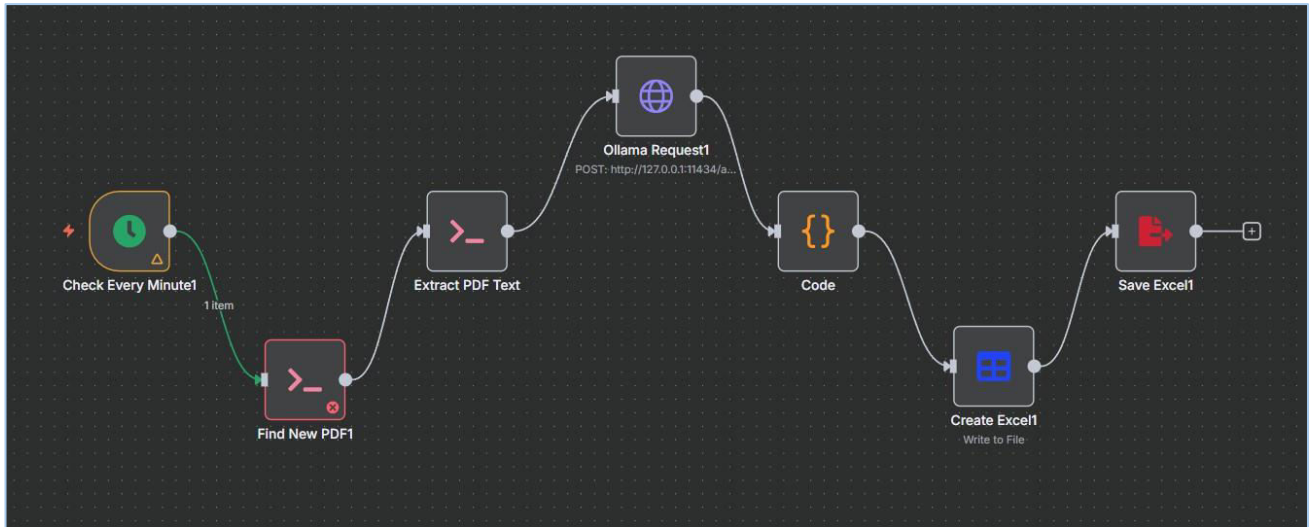
This project focuses on creating a smart web-based platform that automatically identify, sort, and pull important data from scanned construction bills, including invoices for sand, gravel, plumbing, and electrical work.

The information extracted is integrated into a cash flow management module. This ensures that cash flow projections and records are updated in real time with each scanned bill.

II. SCOPE OF PROJECT

The design and implementation of intelligent workflows for billing, payment tracking, and expense management. The system integrates AI models with the n8n automation platform to predict cash flow trends and identify financial anomalies. It aims to enhance accuracy, reduce manual workload, and minimize billing delays. The project is applicable to small and medium enterprises (SMEs), startups, and retailers for efficient financial management. Future scope includes integration with ERP systems, cloud accounting platforms, and advanced predictive analytics for real-time financial optimization.

III. WORKFLOW SIMULATION OF N8N



2. Analysis of IRR

- After the successful extraction and saving of data's in excel sheet the first problem faced has been solved, that is no need of manual data entry and tons of physical bills lying around.
 - The amount will be extracted from excel to a web-based cash flow monitoring platform where the amounts will be entered according to the source of the bill.
- The IRR of the project will be monitored
- Here Newton Raphson method is used here to get the IRR
- IRR is calculated until the NPV becomes 0.

n

$$NPV = \sum_{t=0}^n \frac{C_t}{(1+r)^t}$$

$$r_{new} = r_{old} - \frac{NPV(r_{old})}{NPV'(r_{old})}$$

$$t=0 (1+r)$$

IV. DATA EXTRACTION PROCESS

Relevant sources like invoices, payment logs, and bank statements are identified. n8n workflows automatically extract data through APIs and integrated systems. The collected data is cleaned, validated, and transformed into structured formats. Key financial features such as transaction patterns and payment cycles are extracted. Processed data is securely stored for analysis and optimization. This ensures accurate, real-time data flow for billing and cash-flow management. AI modules extract billing and payment data in real time from multiple platforms. Data cleaning ensures removal of duplicates, missing values, and inconsistencies. Validation checks are applied to maintain data integrity and accuracy. Extracted data is transformed into structured formats like CSV or JSON for analysis. Feature extraction identifies key patterns such as payment delays and cash inflow trends. Processed data is stored securely in cloud databases for easy access and monitoring. Regular updates keep the dataset current for continuous optimization. This structured extraction enables accurate AI forecasting and efficient financial automation.



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