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An Effective Open ERP System for Automation in Financial Reporting for SMEs based on Service Oriented Architecture

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Abstract— **Small-Medium Enterprises (SMEs) are currently in high demand and highly developed in many countries. However, several SMEs still do not yet have an information system to support their business processes. This causes the absence of a system that helps integrate data from each process and sector in SMEs. All data exchanges and transaction report generation are done manually and recorded using physical documents that reduce effectiveness and increase costs. This research uses the accounting module in Open ERP or Odoo Version 11.0 software and Service Oriented Architecture (SOA) methods to design ERP systems for general types of SMEs in the finance sector, specifically on the sales and purchase process. So the solution for recording financial transactions and making financial reports for SMEs is to design an ERP system based on Open Source using the Service Oriented Architecture methodology, namely Smart SMEs, by implementing the Automatic Reporting feature to create best practices on an integrated system, especially in recording transactions in the sales and purchase processes so that financial reports can be generated automatically and are real-time. The result of this research is the design of ERP systems in the finance section connected occurs especially in the financial recording of the purchase of goods, the sale of goods, and the creation of financial statements automatically. This system can help the finance sector record transactions and make automatic financial reports that can be generated in real-time.**

Keywords— **ERP; SOA; finance; accounting; Odoo; ERP; Smart SMEs.**

I. INTRODUCTION

Small and medium-sized enterprises (SMEs) play a significant role in the economy of Indonesia. According to the World Bank, SMEs account for about 99% of all business establishments in Indonesia and employ about 113 million people or about 58% of the total labor force. SMEs in Indonesia are involved in a wide range of activities, including manufacturing, trade, agriculture, and services. Many of these businesses are family-owned and operate on a small scale, with limited access to credit and other resources. However, SMEs also play a critical role in driving innovation and promoting economic development in Indonesia[1], [2].

The Indonesian government has implemented several policies and programs to support the growth and development of SMEs in the country [3]. These include tax incentives, credit guarantees, technical assistance programs, and efforts to improve the business environment and reduce regulatory barriers for SMEs. Despite these efforts, SMEs in Indonesia continue to face challenges, including limited access to finance, poor infrastructure, and a lack of skilled labor.

The rapid development of SMEs in Indonesia in the current era of technological development will affect the success rate, which is getting smaller due to remarkably high competitiveness among SMEs [4]. To prevent this, several factors can increase the level of success. One factor in an SME's success depends on the system's effectiveness 5]. Some SMEs that experience failure usually do not have a system that can be used as a standard to support the performance of daily business processes.[6].

Financial Reports is a report of the financial status in the company [7]. Financial reports have a function to see how much profit or loss is contained in a company. Companies can use information on financial reports as a reference for decision-making [8]. Management of financial reports owned by SMEs is susceptible to errors because several SMEs still use manual systems to manage their operations. Financial reports are also still done separately in several sections [9]. This causes the separation of financial reports and causes difficulties in calculating the balance sheet obtained [10].

Based on these problems, it is necessary to have a system that can integrate and manage financial reports for monitoring

costs or revenues based on sales and purchase transactions. This research designed the ERP system in the financial sector for SMEs that developed using Open ERP / Odoo Version 11.0 software and Service-Oriented Architecture (SOA) methods expected to help record sales and purchase transactions, minimize data errors and integrate every running process so that financial reports can be made more structured and can be generated automatically [11], [12].

Service-oriented architecture (SOA) is a design approach that emphasizes using services to support integrating different systems and applications. In the context of an enterprise resource planning (ERP) implementation for small and medium-sized enterprises (SMEs), SOA can be used to integrate various ERP modules and functions with other business systems and applications, such as customer relationship management (CRM), supply chain management (SCM), and financial management systems[13], [14].

Using SOA, an organization can expose various ERP functions as independent, reusable services that can be accessed and utilized by other systems and applications within the organization. This allows for greater flexibility and adaptability in integrating different systems and applications and can help streamline and improve organizational business processes [15]. SOA can be particularly useful for SMEs because it allows them to leverage existing systems and resources and to integrate new technologies and applications as their needs evolve easily. It can also help reduce the complexity and cost of maintaining and updating systems and enable SMEs to scale their operations more easily as they grow [16].

This paper is organized as follows. First, the researchers gain knowledge related to this research to summarize the literature. Second, Service Oriented Architecture (SOA) stages are described as a research methodology. Third, the researchers describe several findings and present some business process designs. Last, researchers provide the conclusions [17].

II. MATERIALS AND METHOD

A. ERP

Some experts provide several definitions of ERP (Enterprise Resource Planning). ERP is an information system software that can integrate between departments in a company, such as customer relations, human resources, and supply chain management [18]. ERP is defined as a package that integrates business functions in a company into a single system with a centralized database [19]. According to [20], ERP is defined as an information system package that integrates information and information-based processes within it and crosses functional areas within an organization. It can be concluded that ERP is an information system that integrates the business processes of each department in the company created in different software modules with a centralized storage area [21].

B. Open ERP/ Odoo

OpenERP, or Odoo, is an ERP-based enterprise management software that improves company business performance. The Odoo application was designed using the Python programming language and is supported by a database [22]. One of the key features of Odoo is its modular design, which allows users to select and configure only the modules they need rather than purchasing and implementing a large, monolithic ERP system. This can make it easier and more cost-effective for organizations to implement an ERP system and to adapt it as their needs change over time [23]. Odoo is a suite of open-source business applications that includes various enterprise resource planning (ERP) tools. Odoo is designed to be flexible and scalable and can be customized to meet the specific needs of different types of organizations [24].

C. Accounting and Finance

In the ERP software system, several basic modules can be used. An example is the Accounting and Financial module, to collects financial data from various departments and is able to make financial reports for companies [25]. One of the key benefits of an ERP system is that it can help organizations generate financial statements more efficiently and accurately, such as balance sheets, income statements, and cash flow statements. These financial statements summarize an organization's financial position and performance and are used by stakeholders, such as investors, creditors, and regulators, to assess the organization's financial health and viability [26].

An ERP system can help streamline and automate the financial reporting process by providing a centralized repository for financial data and automating the generation of financial statements based on this data. It can also help improve the accuracy and reliability of financial statements by providing real-time, up-to-date information and enforcing internal controls and compliance with financial reporting standards [27]. This module illustrates the financial status that can help the company make decisions. This module can also provide information on the company's financial condition anywhere and anytime.

Financial statements are transactions and structured financial presentations are undertaken in an organization. Financial statements provide information on financial changes, financial situation, performance, and changes that a wide range of users use in making their decisions[28].

D. Service Oriented Architecture (SOA)

Service Oriented Architecture is a collection of tools, technology, frameworks, and best practices that facilitate the rapid implementation of a service [29]. According to the site launched by MTI Binus in 2014, Service Oriented Architecture is a systematic method used in conducting a system design that refers to step-by-step SOA's research flow, and there must be input and output in the designed business process[11].
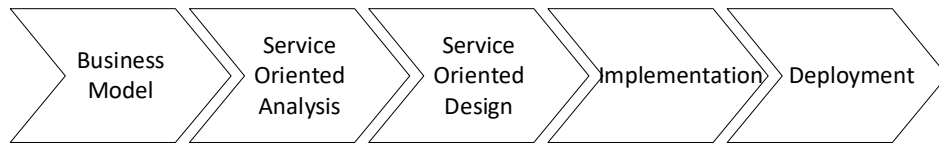
Fig. 1 SOA Method

E. SOA Stages

The basic stages of designing Small-Medium Enterprise ERP systems are examined using the Service Oriented Architecture (SOA) Method [30]. The SOA method has the advantage of producing blueprint documents that will be the best practice or standardization of the process of making financial statement reports owned by companies [31].

TABLE I
SOA STAGES

Phases	Description
Identification	In the identification stage, researchers searched for literature studies that supported research and made observations to analyze the formulation of problems and boundaries of the problem and determine the research objectives.
Business Model	In this stage, researchers conduct business process modeling using business lean canvas, followed by identifying general business processes in the accounting, purchase, and sales modules owned by SMEs.
Service Oriented Analysis	In this stage, researchers identify the system used by SMEs in general for the time being and proceed with making a service layer diagram to illustrate the integration between devices on the kites to be used in the design.
Service Oriented Design	In this stage, the researchers conducted a Smart SME system model design by making business process requirements and applications, then making a gap analysis, business process targets, and use case diagrams, and ending with making sequence diagrams.
Implementation	In the implementation phase, researchers will make application designs and descriptions of applications made. After that, identify the test method on the application, then configure and prototype the application by targeting the business process that has been created.
Deployment	At the deployment stage, researchers conduct prototypes and test application designs. Tests conducted by the team are tested based on user acceptance tests (UAT) to check the suitability of the application made with the targeting business process, then end with making conclusions and suggestions on the research conducted.

Table 1 describes the SOA stages' phases, which are used as the basis for making automatic reporting applications for SMEs.

III. RESULT AND DISCUSSION

A. Identification

The identification stage in the Service Oriented Architecture (SOA) method consists of identifying the formulation of the problem, looking for literature studies that support the research, and observing the research purpose to be conducted [32]. The following are the results of the identification stage in this paper:

TABLE II
IDENTIFICATION RESULT

Problem	Research Purpose	Basic Concept
SMEs do not have a system that supports the performance of daily business processes, especially in preparing financial reports. The Financial reports on SMEs are still made manually and not yet integrated between the running processes, which will increase inaccurate and ineffective calculation errors.	Create a system design for the automatic financial report feature using the Odoo application's accounting module with SOA method.	• Enterprise Resource Planning (ERP) • Accounting • Financial Statements • Odoo technical and functional resources • Service Oriented Architecture

Table II explains the results of the identification phase made by the researcher. SMEs do not have a standard system that is used in making financial reports. This problem can be solved by implementing the automatic reporting feature in the accounting module contained in the Odoo application. There are five basic concepts used to support this research.

B. Business Model

At this stage, the researchers have modeled the general business processes that are found in SMEs using nine building blocks of Business Lean Canvas (BLC):

1) Problems: The Smart SME design is based on a common problem that occurs in some SMEs that still do not have an information system that supports business processes, especially in preparing financial statements. Some reports and documents from business processes related to accounting processes, such as sales and purchases, are also made manually and not integrated. This reduces the efficiency, effectiveness, and flexibility of the SMEs.

2) Solution: The solution that the author designed to solve problems commonly occurring in SMEs is to create a web-based system design and ERP specifically for SMEs in making automatic financial reports using the accounting module in the Odoo application.

3) Unique value: It is a distinct advantage offered to users to enhance competitive advantage. Unique values offered in this study include web-based Open ERP, a financial system that integrates with the sales and purchase process and automatically generates financial reports.

4) Key metrics are benchmarks used to determine the progress and performance of the products offered. Key metrics that will be given are the number of SMEs that use the design system and Indicators of the success of the design system.

5) Unfair advantage: It is an advantage of the solutions provided and cannot be compared with previous studies. Unfair Advantage contained in this research is ERP Web-Based service and Smart features as well as integrated financial systems in each process that runs in an SME.

6) Channels: They are tools used to build systems. This time, channels used in the system design are Digital Ocean Cloud Server, Odoo 11, PostgreSQL, Ubuntu Server 18.04.02, and Web-Service.

7) Customer segment: It is the target of the customer or user who will use the system design that has been designed. The customer segment in this study is the Small-Medium Enterprise (SMEs) and Self-Manufactured Industry.

8) Cost structure: It is a breakdown of costs used to implement models that have been designed. In this research, researchers do not discuss the costs required to implement the design that has been made.

9) Revenue stream: It is the main source of profits from solutions that have been made. In this study, researchers do not discuss the benefits that will be generated in the business processes carried out.

C. Service Oriented Analysis

1) Identification of the accounting system currently in use: SMEs only run business processes manually and are not systematic, so business processes that run on SMEs become less efficient and less effective. The following are the problems of SMEs in the accounting system:

- Recording Financial statements are still done manually and separately.
- SMEs cannot monitor costs in real time because of income statements and unstructured and accurate cash flows.
- No system can store data integrated in the accounting process that can be accessed in real-time.

2) Service Layer Diagram: At this stage, researchers use a service layer diagram that is appropriate to the stages in the SOA method to describe the system design.
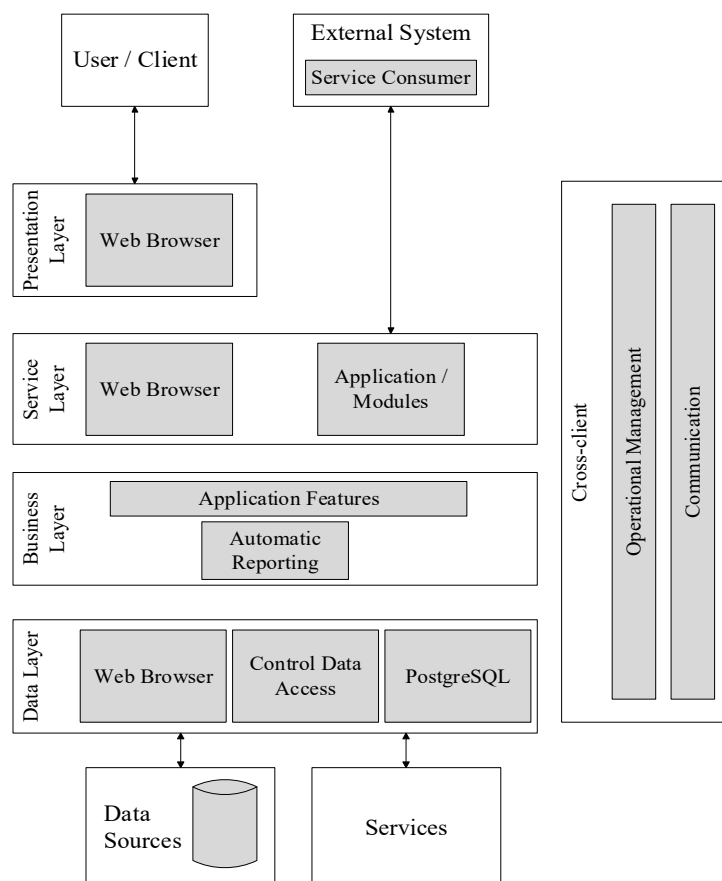

Fig 2 Service Layer Diagram

Figure 2 above shows that the Presentation Layer is an interface that can translate programming languages so that users can use the system through a web browser. The service layer describes services that the user can access. In this study, the service that is provided is an automatic reporting system contained in the accounting module in Odoo. The business Layer explains the logic of running the services provided in this study as an automatic financial report system. The data layer is used as a service that manages data transfer flow between databases and services.

D. Service Oriented Design

In the previous stage, researchers have identified the main problems that often occur in SMEs, specifically in integrating data from sales and purchases and financial reports manually and not integrated [33]. From the problems identified previously, at this stage, the researcher offers a solution design to overcome the problems experienced by SMEs in making financial reports.

TABLE III
PROCESS BUSINESS TARGET

Process	Solution
Automatic Financial Report	• Integrating the accounting module and the sales module in the sales process. So, the system can automatically input and retrieve payment data from customers into the AR and Revenue account in the general ledger so that the data can be processed in making a balance sheet. • Integrating the accounting module and the purchasing module in the purchase order process. So, the system can automatically input and retrieve billing data from vendors into the AP Account and cost account in the general ledger so that the data can be processed in making a balance sheet. • Data obtained from the sales module and the purchasing module inputted in the General Ledger will be processed when making income statement reports to determine the profit/loss owned by the company.

Researchers designed a block system to describe the relationship between each module in the process to show how the system can be integrated. Researchers also made a list of charts of accounts that would be recommended for SMEs using this system design. The following is a list of charts of accounts that have been made:

TABLE IV
RECOMMENDED CHART OF ACCOUNT FOR SMEs

Acc Number	Account Name	Account Type
1.1.1.01	Cash	Cash
1.1.1.02	Bank	Bank
1.1.2.01	Fixed Asset	Fixed Assets
1.1.2.02	Current Asset	Current Assets
1.1.3.01	Account Receivable	Receivable
2.1.1.01	Account Payable	Payable
2.1.2.01	Tax Received	Current Liabilities
2.1.2.02	Tax Paid	Current Assets
3.1.1.01	Open Balance	Equity
4.1.1.01	Sales Product	Income
4.1.1.02	Foreign Exchange Gain	Income
5.1.1.01	Cost of Goods Sold	Cost of Revenue
6.1.1.01	Expense	Expenses
6.1.1.02	Foreign Exchange Loss	Expenses

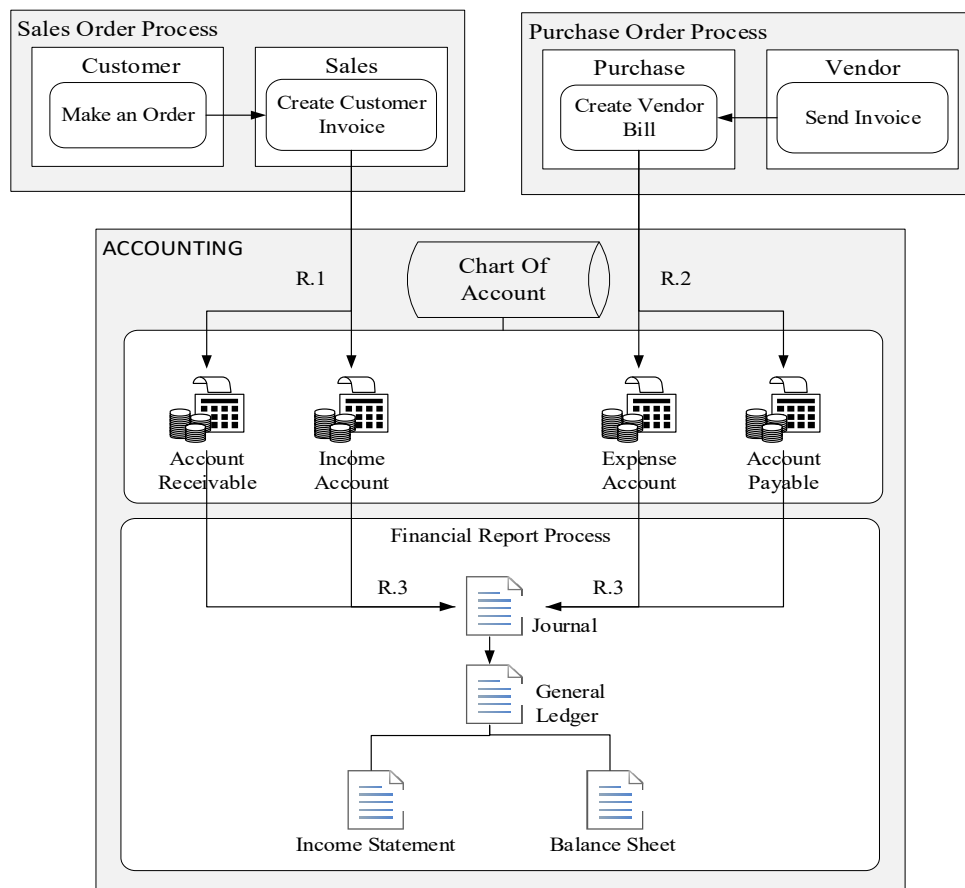Figure 3 shows the module and actor that is integrated into the Financial Report process.

Fig. 3 General Block System for Automatic Financial Report in SMEs

Three relationships we can itemize are as follows.

1) R.1 Account Receivable Process (Sales – Accounting): Figure 4 explains the integration between sales and accounting processes. When a customer purchases, the sales department will create a sales order and send it to the accounting department. The accounting department will input customer invoice data to produce a customer invoice document. The contents of this document are details of purchases made by the customer.
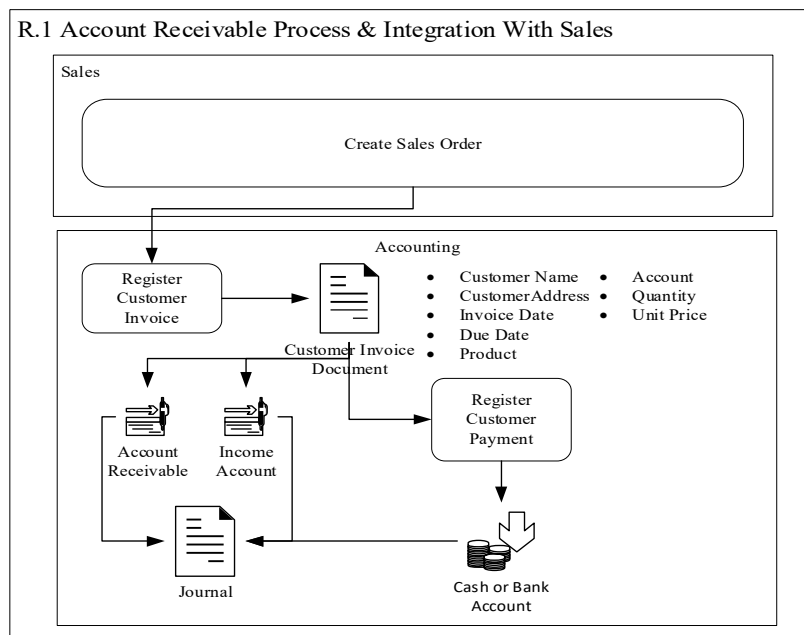

Fig. 4 R.1 Account Receivable Process (Sales – Accounting)

After the Customer invoice document is created, the amount of income will be entered automatically and recorded into two accounts, the Receivable Account and the Income Account, which will later be entered into the journal. Then, after the customer has made the payment, the accounting department will register the customer payment to update the customer payment status from the previously invoiced status to paid, which will later be entered into a bank account or cash account according to the payment method used which will later be entered into the journal.

2) R.2. Purchasing: Figure 5 explains the integration of the purchase process with accounting. When the company makes a purchase order to the vendor, the vendor will send an invoice that will be sent to the accounting department. After getting the vendor invoice, the accounting department will input the vendor bill, which will later be recorded as a vendor bill document. The vendor bill document contains details of the purchases of goods made by SMEs or companies to vendors, such as vendor name, product, quantity, etc.
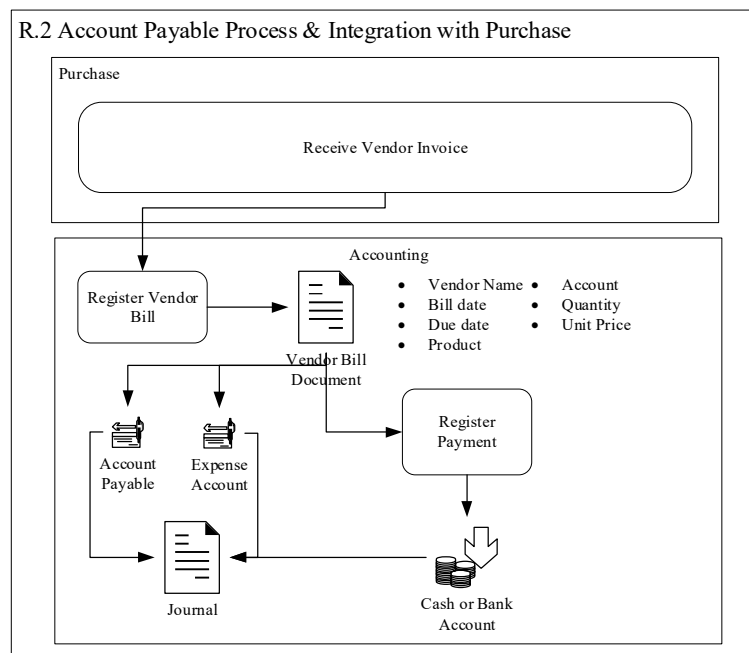

Fig. 5 R.2 (Purchasing-Accounting)

2012

When inputting vendor bills, the system will automatically send data and be recorded to two accounts, the Payable Account, and the Expense Account, which will be stored in a journal later. Furthermore, when SMEs have made payment to the vendor, the accounting section will change the status that was previously open (unpaid) to be paid, and the data will be recorded in cash or bank account according to the payment method used. Then, the data will be stored in a journal.

3) R.3 (Accounting – Financial Report): Figure 6 explains how the data is transferred so that the system can generate financial reports automatically.
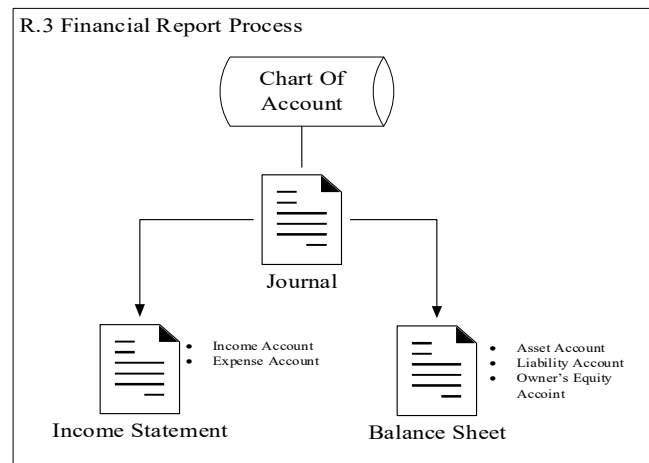

Fig. 6 R.3 (Accounting-Balance Sheet)

Transaction data such as sales and purchases will be stored in a Chart of Account which is also recorded in a journal. After that, the financial statements will be made based on data contained in the journal. For example, in the income statement, data from the Income and Expense Accounts is needed, and then on the balance sheet, data from the Asset Account, Liability Account, and Owner's Equity Account types are needed.

Figure 7 and 8 is a use case diagram that explains what each actor can do, such as administrator, manager, and staff. Admin can create and delete users and configure user authorization. Managers and staff can generate reports through balance sheets and invoice statements. Three managers can also manage and configure the general ledger and chart of accounts, while the staff can only see the general ledger.
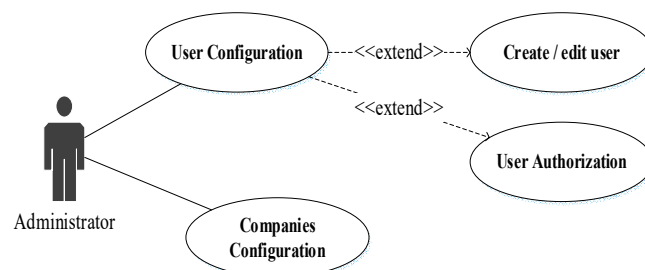

Fig. 7 Administrator Use Case Diagram

Fig. 8 User Use Case Diagram

2013

E. Evaluation and Testing

Stress testing is carried out to ensure that the system design created can be implemented properly. The results of the stress testing test will be carried out with three stages of testing; namely, if the first stress testing, 100 requests will be given to users (-n) with a total of 50 users accessing the application (-c) simultaneously, then the second stress testing 200 requests will be given to users (-n) with a total of 100 users can access the application (-c) simultaneously and the third stress testing 300 requests will be given to users (-n) with a total of 200 users can access the application (-c) simultaneously. The results explain that if there are 100 requests given by 50 users simultaneously, the application will respond in 12.06 seconds. This shows that the smart SMES application can handle 50 requests at the same time. Conversely, if there are 200 requests given by 100 users simultaneously, the application will provide a response duration of 21.88 seconds. This shows that the smart SMES application can handle 200 requests by 100 users who access it simultaneously, even though it is slow.

IV. CONCLUSION

This research concludes that the design of the automatic reporting feature is one of the solutions to overcome problems in making financial reports on SMEs, which are still done manually. Odoo is an open-source ERP software, so it fits the needs of SMEs. The system is designed using the Odoo application accounting module and refers to the Service Oriented Architecture methodology. The design of this system enables the business process owned by SMEs to be integrated, and financial statements can be made automatically, thereby reducing inaccurate calculation errors. This will improve accuracy in planning purchasing strategies, managing costs, and utilizing resources. The Service-Oriented Architecture method in this study has the advantage of producing blueprint documents that will be the best practice or standard for making financial statements.

Future research can explore the use of Odoo and other open-source ERP systems for SMEs in the feasibility and cost-effectiveness of Odoo for SMEs: Research could be conducted to assess the feasibility and cost-effectiveness of implementing Odoo and other open-source ERP systems for SMEs, compared to proprietary alternatives. This could include evaluating the total cost of ownership, as well as the return on investment and other financial benefits.

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