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# Information Needs Analysis For Inventory Management System Development Based On Existing Conditions In Msmes

**Jeremy Andrian Kurniadi [1], Yuanita Handayati [2]**
**[1,2] Master of Business Administration Institut Teknologi Bandung**
**Email: [1] jeremy_andrian@sbm-itb.ac.id ,[2] yuanita@sbm-itb.ac.id**

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**ABSTRACT**

The purpose of this research is to strengthen its competitive advantage in the digital business industry in Indonesia by utilizing digital solutions to fulfill consumer needs, considering increasing market rivalry and the progress of digital products. The interview was conducted with micro, small, and medium-sized enterprises (MSMEs) located in West Java from January to June 2024 to identify the issues and needs of MSMEs. The identified problems need to be further processed using the System Development Life Cycle method. The results are expected to be utilized in the development of an Inventory Management Information System that can support the effectiveness of inventory management by MSMEs.

## INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) have high economic resilience and flexibility in dealing with changes in the strategic environment (Coordinating, 2022; Ministry et al., 2024). The large absorption of labor by MSMEs is also supported by the productivity of MSME labor, which has an increasing trend from year to year (Anatan & Nur, 2023; Bank Indonesia, 2020) .

In terms of product characteristics, MSMEs are close to the needs of society, raw materials, and domestic resources, and have low exposure to financial markets (Alshanty & Emeagwali, 2019). In terms of business models, MSMEs in Indonesia also show flexibility (Sulastri et al., 2023) . This is supported by how MSMEs, which mostly conduct retail sales with a number reaching 60-70%, have the flexibility to adopt digital technology and how the trend of digitalization of MSMEs is increasing in Indonesia (Kurniasari et al., 2023).

Digitalization is a part of the trend of Industrial 4.0. Digitalization is a time of change in how business is conducted. A time when businesses are supported by exciting technologies such as big data, machine learning, and cognitive computing. This is one aspect of a country's sustainability in responding to challenges in the era of globalization and the rapid flow of

information. Increased access to information, knowledge, and data can trigger innovation, productivity, efficiency, and public welfare. The shift to digital technology is primarily influenced by the Internet, which is a broadly accessible information infrastructure. This is especially important for the sustainability of the digital economy (Kurniawati et al., 2021). The digitalization of micro, small, and medium enterprises (MSMEs) has the potential to have a significant impact on the global economic environment, with a special emphasis on developing economies (Fachrunnisa et al., 2020).

Telkom Indonesia has established a digital solution ecosystem specifically designed to meet the needs of Micro, Small, and Medium Enterprises (MSMEs) in the ongoing digital transformation. The aim is to provide a range of digital solutions that may be utilized by micro, small, and medium-sized firms (MSMEs) to enhance their growth and development (Telkom, 2023a). Telkom's digital product offers internet connectivity services essential for expanding micro, small, and medium-sized organizations (MSMEs) to navigate and compete effectively in an increasingly digitalized market (Telkom, 2023b) .

This study performed a preliminary search by interviewing several micro, small, and medium enterprises (MSMEs) to discover the challenges they encounter in the inefficiency of managing their inventory. Based on the first investigation, it was discovered that most of the MSMEs interviewed reported facing problems with inefficiency in managing their inventories, and these challenges are frequently encountered.

Inventory management is crucial for micro, small, and medium enterprises (MSMEs) (Azis, 2020). Based on the interviews with SMEs, approximately 80% encountered issues in inventory management, such as difficulties or problems in managing inventory (complexity, accuracy, input errors) and a lack of systematic inventory management processes due to the absence of an inventory tracking system (Ranjan et al., 2024). The difficulties or issues in the inventory management process have an impact on MSMEs (Maheshwari et al., 2021). Referring to the interview results, 78% of the respondents had a financial impact, 80% experienced a decrease in customer satisfaction, and 82% experienced an operational impact.

## LITERATURE REVIEW

Inventory management is the act of supervising and regulating the acquisition, storage, and utilization of goods or resources that the business utilizes or sells. Inventory management entails the meticulous monitoring of stock levels to avoid both shortages and surpluses of inventory (Jacobs & Chase, 2018). This is particularly crucial for small and medium-sized enterprises (SMEs), as they frequently operate with restricted cash and depend on rapid stock turnover. In addition to stock, inventory management also involves overseeing the company's assets, including equipment, furniture, and tools, to ensure their proper accounting and maintenance (Handojo et al., 2020; Meiryani et al., 2021).

Information systems are defined as integrated sets of components for collecting, storing, and processing data and for delivering information, knowledge, and digital products. Businesses use IS (Information Systems) to enhance decision-making, optimize operations, improve customer relationships, and gain a competitive advantage (Laudon & Laudon, 2012).

Information systems as mentioned above play a pivotal role in transforming business processes, enhancing decision-making, and securing competitive advantages. There are several specific benefits of using information systems according to Whitten & Bentley,2007 and Laudon & Laudon, 2012.

1. Enhanced Decision Making: IS provides managers and decision-makers with timely and accurate information, reducing uncertainties and enabling informed decisions. This reduces the need for guesswork and enables businesses to respond more quickly to market changes and customer needs.

2. Operational Excellence and Efficiency: IS contributes significantly to achieving higher levels of efficiency and productivity within an organization's operations. This, in turn, leads to higher profitability by automating and optimizing business processes that were formerly manual and time-consuming.
3. New Products, Services, and Business Models: Through the innovative use of technology, businesses can explore new market opportunities, catering to emerging customer needs and preferences.
4. Customer and Supplier Intimacy: The improvement of relationships with customers and suppliers is another critical benefit derived from IS. Businesses can enhance satisfaction and loyalty by managing detailed customer data and optimizing supply chain interactions, leading to increased sales and profitability.

## METHODS

### System Development Lyfe Cycle (SDLC)

The System Development Life Cycle (SDLC) is a systematic methodology employed to evaluate and create the most optimal system by following a prescribed sequence of analyst and user tasks (Kendall & Kendall, 2011). Meanwhile, according to (Dewanto, 2004) The System Development Life Cycle (SDLC) is a series of iterative processes used to design and create a system. Presently, the system will continually adapt to the evolving trends, advancements in technology, client demands, and other factors, so initiating a recurring cycle of system development stages.

In this research, the analysis method to be used is the System Development Life Cycle (SDLC) to design an Inventory Management Information System. Four steps in the System Development Life Cycle will be applied in this research, which is adapted from (Kendall & Kendall, 2011), which are:

1. Identifying problems, opportunities, and objectives
2. Determining human information requirements
3. Analyzing systems needs.

The initial stage entails the discernment of the problem, opportunity, and objectives of the system. To identify issues, the analyst must ascertain the events taking place within the business environment. Subsequently, the analyst works closely with the organizational member to accurately identify the problems. Opportunities are situations that the analyst sees as being able to improve through the use of computerized information systems. Subsequently, this stage entails discerning the specific goals that the company strives to accomplish. The analyst can subsequently ascertain whether any component of an information system application can aid the organization in achieving these objectives by addressing particular challenges or opportunities

The second step involves identifying the specific information requirements for the individual involved. To collect the necessary data, frequently used interactive methods include interviews, sampling, investigating hard data, surveys, and unobtrusive methods such as observing decision-maker behavior and office environment. Additionally, a comprehensive approach such as prototyping is also utilized (Kendall & Kendall, 2011). The analyst must understand the specific information requirements of users to carry out their professional responsibilities effectively.

The third step involves the analysis of the requirements of the system. This step often involves developing a flowchart of the current system's business process and a data flow diagram to visually represent the input, process, and output of the business operations. These graphical representations are based on interviews performed with the stakeholders (Kendall & Kendall, 2011).

**Data Collection Methods**

Data collection for this research is needed to support accurate analysis in developing the design and results. The data collection method of this research was gathered by conducting qualitative interviews with the owner of MSME and the user of the digital application for MSMEs. The data collected is divided into two parts, which are primary data and secondary data. The primary data was gathered by interviewing 30 owners of MSMEs who already utilize digital applications to operate their businesses. There are three categories of questions asked to respondents to collect primary data: persona validation, general features, inventory management features, and predictive inventory features.

The secondary data in this research are collected through the use of study literature, which consists of theoretical references. Literary research is undertaken to identify relevant papers, journals, and books that may be used as references in the development of an effective Inventory Management Information System.

## RESULTS

**Table 1 Identifying Problems, Opportunities, and Objectives**

| Problem | | Cause | Contributing Factor | Current Condition | Opportunity for Improvement | Objectives |
|---|---|---|---|---|---|---|
| | Grouping | | | | | |
| Higher Operational Costs and COGS | Decision-Making and Planning | Relying on feelings | Not using data | Decisions based on habits and feelings | Implement data-driven decision-making processes | Enhance accuracy and efficiency in inventory decision-making |
| | | Not considering consumer demand | Inadequate market research | Not considering consumer demand trends | Analyze consumer demand trends | Better predict and meet customer demand |
| | Inventory Management | Manual records | Inconsistent record-keeping | Inventory managed manually | Use integrated applications for inventory recording | Improve record accuracy and reduce errors |
| | | Mismatch inventory stock | Inefficient inventory management | High operational costs and COGS | Improve inventory matching and management | Reduce operational costs and COGS |
| | Data Access and Infrastructure | Difficulty accessing real-time data | Delayed data updates | Difficulty accessing real-time inventory data | Provide ease of access to real-time data | Streamline inventory management and decision-making processes |
| | | Poor connectivity | Bad signal in some locations | Lack of proper infrastructure | Establish proper infrastructure and connectivity | Support better data access and communication |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | No database for customer demand trends | Rapid changes in data | Lack of data on customer demand trends | Develop a centralized database for customer demand trends | Enhance market trend analysis and decision-making |
| | | No collaboration support | No prediction/recommendation feature | Lack of integrated management information system | Implement integrated IMIS and predictive features | Support collaboration and efficient data management |
| | | Slow application | Complex user interface | Low adoption of digital applications | Develop predictive features and user-friendly applications with comprehensive features | Improve inventory prediction, technology adoption, and user experience |

**Table 2 Determining Human Information Requirements**

| Question Type | Purpose | Objective | (Information Requirements) |
|---|---|---|---|
| **Who** | Identify key stakeholders and entities involved in the inventory management process | Identify entities involved in the process | **Entities**: MSME owners, other business owners, suppliers, peers/predecessors; **Activities**: Consulting, advising, pricing inquiries |
| **What** | Determine the main activities and processes in managing inventory | Identify key activities and processes | **Activities**: Inventory planning, procurement, stock monitoring, restocking, selling to customers |
| **Where** | Define the geographic scope and specific locations relevant to the research | Define the geographic scope of the research | **Entities**: MSMEs in West Java area |
| **How** | Understand the current procedures and methods used for inventory management | Understand current procedures and identify areas for improvement | **Activities**: Manual inventory management, personal predictions, following other businesses; **Data Needed**: Product demand, stock levels |
| **When** | Understand the timing and frequency of inventory management decisions | Understand the timing of decision-making processes | **Activities**: Restocking after sales cycles, when stock levels drop, waiting for market trends or financial resources |
| **Why** | Identify the motivations and reasons behind the current inventory management practices | Understand the motivations and rationale behind current methods | **Entities**: MSME owners, peers/predecessors; **Activities**: Traditional methods learned from predecessors or observing other businesses |

**Tabel 3 Analyzing System Needs**

| Problem | Cause | Contributing Factors | | | Systems Needed |
|---|---|---|---|---|---|
| High Operational Costs and Higher COGS | Mismatch Inventory Stock | **Difficulty in Accessing Data and Information** | No Integrated Inventory Management Information System (IMIS) | This contributes to the difficulty in accessing accurate data. | A centralized IMIS that integrates all inventory data: **Data Needed**: Centralized inventory database |
| | | | Manual data recording | Leading to inaccuracies and inefficiencies | Digital data entry systems (e.g., mobile apps or desktop applications): **Data Needed**: Digital inventory records |
| | | | Rapid changes in data | Makes it hard to keep up-to-date records manually | Real-time data processing and updates: **Data Needed**: Real-time inventory updates |
| | | **Difficulty in Using Digital Applications** | Too many applications | This leads to confusion and inefficiency | Consolidation of functionalities into a single, integrated application: **Data Needed**: Unified application usage data |
| | | | Slow Application Performance | Hinders timely data access and management | Optimization of application performance: **Data Needed**: Application performance metrics |

| | | | | | |
|---|---|---|---|---|---|
| | | | Complex User Interface | Makes it difficult for users to navigate and use the applications effectively. | Simplified, intuitive user interface design: **Data Needed**: User interaction data |
| | | **Lack of Predictive Inventory Features** | No prediction/ recommendation feature | Inability to forecast inventory needs accurately. | Integration of machine learning algorithms to predict inventory needs: **Data Needed**: Historical sales and inventory data |
| | | | No database for customer demand trends | Poor decision-making due to lack of trend data. | Development of a database to collect and store customer demand data: **Data Needed**: Customer demand trend data |

## DISCUSSION

**Problems, Opportunities, And Objectives**

The analysis is broken down into three main areas: Decision-Making and Planning, Inventory Management, and Data Access and Infrastructure. Each area is examined through several lenses, including the problem grouping, cause, contributing factors, current conditions, opportunities for improvement, and objectives. Here's a comprehensive explanation:

1. Decision-Making and Planning

a. Problems:

- Relying on Feelings: Decisions are often made based on habits and feelings rather than data, leading to potential inaccuracies.
- Not Considering Consumer Demand: Inadequate market research results in a lack of consideration for consumer demand trends.

b. Contributing Factors:

- The lack of data usage leads to decisions based on habits.
- Inadequate market research contributes to not considering consumer demand.

c. Current Condition:
- Decisions are being made based on habits and feelings without sufficient data.
- Consumer demand trends are not considered in planning.

d. Opportunities for Improvement:
- Implement data-driven decision-making processes to enhance accuracy and efficiency.
- Analyzing consumer demand trends can help predict and meet customer demands better.

e. Objectives:
- Accuracy and Efficiency: Enhance accuracy and efficiency in inventory decision-making.
- Customer Demand: Better predict and meet customer demand through improved analysis.

2. Inventory Management

a. Problems:
- Manual Records: Inventory management is done manually, leading to inconsistencies and errors.
- Mismatch Inventory Stock: Inefficient inventory management results in mismatches between stock and demand.

b. Contributing Factors:
- Inconsistent record-keeping exacerbates manual record issues.
- Inefficient inventory management systems contribute to stock mismatches.

c. Current Condition:
- Inventory is managed manually, leading to high operational costs and potential errors.
- The mismatch between inventory and demand leads to increased COGS.

d. Opportunities for Improvement:
- Integrated applications for inventory recording can improve accuracy and reduce errors.
- Improving inventory matching and management can reduce operational costs and COGS.

e. Objectives:
- Record Accuracy: Improve record accuracy and reduce errors.
- Cost Reduction: Reduce operational costs and COGS by enhancing inventory management.

3. Data Access and Infrastructure

a. Problems:
- Difficulty Accessing Real-Time Data: Delayed data updates lead to challenges in accessing real-time inventory data.
- Poor Connectivity: Bad signal in some locations hinders effective data access.
- No Database for Customer Demand Trends: Rapid changes in data are not managed effectively due to the absence of a centralized database.
- No Collaboration Support: Lack of integrated management systems and predictive features hampers collaboration.
- Slow Application: Complex user interfaces in digital applications result in slow adoption.

b. Contributing Factors:
- Delayed data updates make real-time data access difficult.
- Poor signal and inadequate infrastructure limit connectivity.
- The rapid changes in data are not supported by a centralized system.
- No integration of management systems leads to a lack of collaboration support.

- Complex interfaces discourage users from adopting digital applications.

c. Current Condition:
- Real-time data access is challenging due to delayed updates.
- Lack of proper infrastructure affects data connectivity.
- Lack of centralized data for customer trends hinders market analysis.
- No prediction or recommendation features are available.
- Low adoption of digital applications due to a complex interface.

d. Opportunities for Improvement:
- Providing easy access to real-time data can streamline inventory management and decision-making.
- Establishing proper infrastructure and connectivity will support better data access and communication.
- Developing a centralized database for customer trends will enhance market trend analysis.
- Implementing integrated management systems and predictive features will support collaboration.
- Developing predictive features and user-friendly applications will improve technology adoption and user experience.

e. Objectives:
- Streamlined Processes: Streamline inventory management and decision-making processes through real-time data access.
- Enhanced Connectivity: Support better data access and communication with proper infrastructure.
- Market Trend Analysis: Enhance market trend analysis with a centralized database.
- Collaboration and Data Management: Support collaboration and efficient data management with integrated systems.
- User Experience: Improve user experience and technology adoption through better application interfaces.

**Human Information Requirements**

The framework is structured around six key questions: Who, What, Where, How, When, and Why. Each question is associated with a specific purpose, objective, and the types of information required to achieve those objectives. Here's a detailed explanation:

1. Who

a. Purpose: Identify key stakeholders and entities involved in the inventory management process.
b. Objective: Identify the entities involved in the process.
c. Information Requirements:
   - Entities: MSME owners, other business owners, suppliers, peers, or predecessors who are involved in the process.
   - Activities: Activities such as consulting, advising, and pricing inquiries are relevant to understanding the roles of these entities.

2. What

a. Purpose: Determine the main activities and processes in managing inventory.
b. Objective: Identify key activities and processes.
c. Information Requirements:
   - Activities: Inventory-related activities such as planning, procurement, stock monitoring, restocking, and selling to customers are identified as critical processes.

3. Where
a. Purpose: Define the geographic scope and specific locations relevant to the research.
b. Objective: Define the geographic scope of the research.
c. Information Requirements:
   - Entities: The research focuses on MSMEs in specific geographic areas, such as the West Java area.

4. How
a. Purpose: Understand the current procedures and methods used for inventory management.
b. Objective: Understand current procedures and identify areas for improvement.
c. Information Requirements:
   - Activities: Includes manual inventory management, personal predictions, and following methods used by other businesses.
   - Data Needed: Product demand data and stock levels are crucial for assessing current practices and identifying areas where improvements can be made.

5. When
a. Purpose: Understand the timing and frequency of inventory management decisions.
b. Objective: Understand the timing of decision-making processes.
c. Information Requirements:
   - Activities: Activities such as restocking after sales cycles, restocking when stock levels drop, and waiting for market trends or financial resources are important to understanding when decisions are made.

6. Why
a. Purpose: Identify the motivations and reasons behind the current inventory management practices.
b. Objective: Understand the motivations and rationale behind current methods.
c. Information Requirements:
   - Entities: MSME owners, peers, or predecessors are relevant in understanding why certain practices are adopted.
   - Activities: Understanding traditional methods learned from predecessors or by observing other businesses provides insights into the reasoning behind current inventory management practices.

**System Needs**

This table presents an analysis of problems related to high operational costs and higher Cost of Goods Sold (COGS) in MSMEs, focusing on issues like mismatched inventory stock and the challenges of using digital applications. It details the causes, contributing factors, and the systems needed to address these problems, along with the specific data required to implement these solutions.

1. Difficulty in Accessing Data and Information
a. Cause: No Integrated Inventory Management Information System.
b. Contributing Factors:
   - No Integrated System: The absence of a centralized inventory management system makes it difficult to access accurate data.
   - Manual Data Recording: This leads to inaccuracies and inefficiencies.
   - Rapid Changes in Data: The fast pace of data changes makes it hard to maintain up-to-date records manually.

c. Systems Needed:
   - Centralized IMIS: A centralized inventory management information system that integrates all inventory data.

d. Data Needed: Centralized inventory database.
   - Digital Data Entry Systems: Systems like mobile apps or desktop applications to digitize data entry.

e. Data Needed: Digital inventory records.
   - Real-Time Data Processing and Updates: Systems that allow real-time updates to keep records accurate.

f. Data Needed: Real-time inventory updates.

2. Difficulty in Using Digital Applications

a. Cause: Too many applications and poor user interface design.
b. Contributing Factors:
   - Too Many Applications: The use of multiple applications leads to confusion and inefficiency.
   - Slow Application Performance: Slow performance hinders timely data access and management.
   - Complex User Interface: Complex interfaces make it difficult for users to navigate and use applications effectively.

c. Systems Needed:
   - Unified Application: Consolidation of functionalities into a single, integrated application to reduce confusion.

d. Data Needed: Unified application usage data.
   - Optimized Application Performance: Improved performance of applications for better data management.

e. Data Needed: Application performance metrics.
   - Simplified User Interface: A more intuitive user interface design to make applications easier to use.

f. Data Needed: User interaction data.

3. Lack of Predictive Inventory Features

a. Cause: No prediction/recommendation feature and no database for customer demand trends.
b. Contributing Factors:
   - No Prediction/Recommendation Feature: The inability to forecast inventory needs accurately.
   - No Database for Customer Demand Trends: Lack of trend data leads to poor decision-making.

c. Systems Needed:
   - Machine Learning Integration: Use of machine learning algorithms to predict inventory needs accurately.

d. Data Needed: Historical sales and inventory data.
   - Customer Demand Database: A database that collects and stores customer demand trends to improve decision-making.

e. Data Needed: Customer demand trend data.

## CONCLUSION

This research provides a comprehensive understanding of the challenges faced by MSMEs in managing inventory and digital applications, which contribute to high operational costs and COGS. The conclusions drawn can be summarized as follows:

1. Need for Data-Driven Decision-Making: MSMEs often rely on intuition and manual processes, leading to inefficiencies and inaccuracies in inventory management. There is a clear need for implementing data-driven decision-making processes supported by real-time data access. Centralized and integrated systems are essential to improve inventory accuracy and reduce operational costs.
2. Challenges in Inventory Management: The existing methods of managing inventory, particularly those relying on manual records, are prone to errors and inefficiencies. Implementing digital solutions that provide real-time inventory updates and predictive features can significantly improve inventory management. This will not only reduce operational costs but also enhance the ability of MSMEs to meet customer demand more effectively.
3. Barriers to Effective Use of Digital Applications: MSMEs face difficulties in adopting and using digital applications due to issues such as the complexity of user interfaces, slow application performance, and the use of multiple unintegrated applications. Simplified and unified digital solutions, along with optimized performance, are necessary to support better data management and decision-making processes.
4. Lack of Predictive and Analytical Tools: The absence of predictive inventory features and databases for customer demand trends hinders effective forecasting and decision-making. Integrating machine learning algorithms and developing databases for trend analysis are crucial steps toward enhancing inventory management and reducing costs.

The key to addressing the high operational costs and COGS in MSMEs lies in adopting integrated, data-driven inventory management systems and user-friendly digital applications. By focusing on real-time data access, predictive analytics, and improved user experience, MSMEs can achieve greater efficiency, reduce costs, and better meet customer demands, thereby positioning themselves for sustainable growth and competitiveness in the market.

## SUGGESTION

Designing the Recommended Systems, it is essential to focus on creating a high-level design that outlines the system architecture, data flow, and database structure. For the Data Flow Diagram (DFD), the goal is to map out the main processes, such as inventory monitoring, order processing, and supplier management, along with how data flows between these processes and external entities like customers and suppliers.

This helps in visualizing the system's functionality and identifying potential areas for improvement. Similarly, the Entity-Relationship Diagram (ERD) should be designed to define the key entities involved, such as Inventory, Orders, Customers, and Suppliers, along with their attributes and relationships. This ensures that the database structure supports the system's data requirements, facilitating efficient data management and retrieval. Together, these designs will provide a clear blueprint for developing a robust and scalable inventory management system tailored to the needs of MSMEs.

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