Jurnal Sistem Informasi Bisnis 04(2025)
Copyright ©2025, JSINBIS, p-ISSN: 2502-2377, e-ISSN: 2088-3587
On-line: http://ejournal.undip.ac.id/index.php/jsinbis/article/view/76467

Implementation of a Raw Material Inventory Control Information System Using the Continuous Review System Method at Naf'a Bakery

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Submitted: March 16th, 2025; Revised: October 29th, 2025; Accepted: November 15th, 2025; Available Online: December14th, 2025

DOI: 10.21456/vol15iss4pp473-479

Abstract

Effective inventory management is crucial in manufacturing industries to ensure smooth production and minimize operational costs. This study aims to design and implement an inventory control system based on the Continuous Review System (CRS) method at Naf'a Bakery, a small business located in Desa Canggu, Kediri. The implementation of CRS is expected to optimize raw material inventory, reduce storage costs, and avoid the risks of stockouts or overstocks. The methods used include observation, interviews, and demand data analysis to calculate the reorder point (ROP), optimal order quantity (EOQ), and safety stock. The results show that the implementation of CRS can reduce storage costs by approximately 30% and ordering costs by about 25%, while improving operational efficiency compared to the previous manual system. The CRS-based information system allows Naf'a Bakery to monitor inventory in real-time, ensuring that raw materials are always available at optimal levels and providing flexibility to adapt to demand fluctuations. Thus, this system not only enhances inventory management accuracy but also reduces waste and improves profitability. This study provides significant contributions to the development of more efficient inventory control systems for small and medium enterprises.

Keywords: Inventory Control, Continuous Review System, Naf'a Bakery, Operational Efficiency, Storage Costs.

1. Introduction

Manufacturing is the process of transforming raw materials into goods with higher added value, which in turn can increase a company's profits. Success in the production process depends heavily on the management of raw material and other supporting material stocks. Inadequate stock management can increase a company's operating costs and have a direct impact on profit margins. Therefore, an efficient and effective stock control system is vital to ensure smooth production and minimise operating costs (Akram *et al.,* 2023; Madamidola *et al.,* 2024; Novrianti & Harahap, 2026; Nurjanah *et al.,* 2023; Pradinain *et al.,* 2025; Sabiq, 2025; Sridarta & Kristantiningtyas, 2025; Sukosyah *et al.,* 2023; Yoes & Harahap, 2025; Zhang & Liu, 2021).

Inventory is one of the most significant assets in the manufacturing industry. Poor management can lead to a range of serious problems, such as excessive stockpiling (overstock) or shortages of raw materials (out of stock), which can disrupt the smooth running of the production process(Borja-Gonzales & Perez-Soto, 2024; Hansen *et al.,* 2023; Kim & others, 2023; Panigrahi *et al.,* 2024; Sharma *et al.,* 2023). Unexpected fluctuations in demand, which are a major challenge for many small and medium-sized enterprises (SMEs), make accurate inventory planning increasingly difficult (Jankovic & Tucu, 2025; Okokpujie & Tartibu, 2025; Rathore *et al.,* 2023). It is therefore essential for every business to have an inventory control system that is appropriate and adaptable to changes in market demand (Gonzalez *et al.,* 2023; Shubaili *et al.,* 2026).

Naf'a Bakery, a home-based business located in Canggu Village, Badas Sub-district, Kediri Regency, processes raw materials such as flour, oil, margarine and other ingredients to produce bread and cakes, with moist pastries as its flagship product. As a small and medium-sized enterprise, Naf'a Bakery faces significant challenges in managing its stock of raw materials to meet frequently fluctuating customer demand. Unpredictable fluctuations in demand make it difficult to determine the optimal stock levels (Kurniawan *et al.,* 2022; Rahayu & Zain, 2021).

To address the issue of lost sales due to raw material shortages, Naf'a Bakery increased the order quantities of raw materials from suppliers and adjusted stock levels based on historical sales data. Although this policy may reduce lost sales in the short term, it also leads to excessive overstocking in the warehouse, which increases storage costs (Ramsi & Amin, 2022).

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Conversely, inaccuracies in planning can also lead to stock shortages (out of stock), resulting in an inability to fully meet customer demand (Rudyanto & Hidayat, 2023). Therefore, there is an urgent need for a more efficient and responsive inventory control system.

One approach that can be implemented to address these issues is the use of the Continuous Review System. Research by (Kurniawan *et al.,* 2022; Rahayu & Zain, 2021) shows that the implementation of this system in various companies can help optimise inventory policies, reduce storage costs, and improve operational efficiency. Their findings indicate that the implementation of the Continuous Review System can reduce expenditure by 36% for key product categories and by 59% for other product categories.

The aim of this study is to design and implement a raw material inventory control information system using the Continuous Review System method at Naf'a Bakery. With this system, it is hoped that raw material stock levels can be maintained at an optimal level, enabling production to run smoothly whilst minimising inventory costs. Furthermore, the use of this computerised system will facilitate more accurate and efficient inventory data management (Madamidola *et al.,* 2024; Rahayu & Zain, 2021; Zhang & Liu, 2021).

2. Theory

2.1. Inventory Control

Inventory control is a key component of supply chain management, aimed at ensuring that a company can meet customer demand without experiencing stock shortages or surpluses. Well-managed inventory can reduce storage costs, improve production efficiency, and minimise the risk of lost sales due to a shortage of raw materials (Heizer & Render, 2021).

According to (Wang & others, 2023), there are two main approaches to inventory control, namely

a. *Systematic Inventory Control, which relies on the analysis of historical data to determine the optimal order quantity.*
b. *Automated Inventory Control, which uses software and automated systems to monitor and manage stock levels in real time.*

2.2. Continuous Review System (CRS) Method

The Continuous Review System (CRS) is one of the most popular and effective inventory control techniques for companies with fluctuating or unpredictable demand levels. Under this system, stock levels are continuously monitored and, whenever stock reaches a certain point—the reorder point—the company places a new order for raw materials or goods in a specific quantity (order quantity). CRS is more effective for products with irregular demand that require more active control over inventory levels to avoid stockouts or overstocks (Nahmias, 2021).

According to (Nahmias, 2021), there are three key elements in the implementation of the Continuous Review System:

a. Reorder Point: This is the stock level at which a company decides to reorder raw materials or goods. The reorder point is calculated based on the lead time (the time taken to receive a delivery after placing an order) and the daily demand rate.
   The formula for the reorder point is:
   $$ROP = dxL$$
   Where :
   $\mathrm{d} = \text{average daily demand}$
   $\mathrm{L} = \text{lead time in days}$
b. Order Quantity: Once the reorder point is reached, the company will order the specified quantity of raw materials or goods. The purpose of the order quantity is to restore stock levels to an optimal level, taking into account factors such as ordering costs and storage costs. One commonly used method for determining the order quantity is the Economic Order Quantity (EOQ).
   The EOQ formula is:
   $$EOQ = \sqrt{(2DS/H)}$$
   Where :
   $D = Annual\ Demand$
   $S = Ordering\ cost\ per\ unit$
   $H = Storage\ cost\ per\ unit\ per\ year$
c. Safety Stock: In the Continuous Review System, safety stock is the amount of reserve stock maintained to account for uncertainty in demand or lead times. Safety stock aims to protect the company from unexpected fluctuations, such as higher-than-expected demand or delivery delays from suppliers. Safety stock is calculated by taking into account the standard deviation of demand and lead times.
   The formula for safety stock is:
   $$SS = Z \times \sigma\_dL$$
   Where:
   $$Z = Desired\ safety\ factors$$
   $\sigma_{dL} = Standard\ deviation\ of\ demand$

The implementation of the Continuous Review System at Naf'a Bakery will involve the ongoing monitoring of stock levels of key raw materials, such as flour, margarine and other ingredients used in the production of bread and cakes. Under this system, Naf'a Bakery will order raw materials as soon as stock levels reach the reorder point, which has been calculated based on historical demand and supplier lead times.

The main benefit of using a CRS at Naf'a Bakery is to avoid overstocking issues, which can lead to wasted storage space and higher storage costs. On the other hand, this system will also help reduce the risk of stockouts, which often become a problem when

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customer demand rises faster than anticipated. By using an integrated computer-based information system, Naf'a Bakery can manage and control its stock more accurately and efficiently, enabling them to remain flexible in the face of changes in demand and market conditions.

2.3. Information Systems Theory and System Design

A well-designed information system (IS) must take into account a number of technical and functional aspects in order to meet the requirements for efficient data management, particularly in the context of inventory control. Information systems used in inventory control serve not only to monitor and manage inventory data, but also to provide relevant and timely information to decision-makers(Permadi, Vitadiar, Kistofer, *et al.,* 2019; Prawira *et al.,* 2025).

According to (O'Brien & Marakas, 2022), when designing information systems for inventory control, there are several key components that must be taken into account:

a. Data Input: Data entered into the system, such as customer order data, supplier data and stock level data.
b. Data Processing: The processing of data to generate relevant information, such as reports on raw material procurement or low-stock alerts.
c. Data Output: The information produced, such as a decision to reorder raw materials or an inventory cost analysis report.

A well-designed information system not only improves operational efficiency but can also minimise human error and speed up the decision-making process, which is crucial for inventory management within a company (Jafari & Abbasian, 2021).

2.4. Data Analysis and System Implementation

Data analysis in inventory control involves the use of statistical tools and forecasting techniques to predict future inventory requirements. Techniques such as forecasting models, regression analysis and probabilistic models are used to estimate future demand, which forms the basis for planning optimal order quantities and inventory levels (Permadi, Vitadiar, & Kistofer, 2019).

The use of computer-based information systems also enables companies to analyse and manage inventory data more efficiently. According to (Kurniawan *et al.,* 2022), the implementation of an information system integrated with inventory control methods such as CRS will yield greater benefits in terms of cost and time savings, as well as improving the accuracy of inventory management.

2.5. Relevance to the Research

In this study, the Continuous Review System method will be implemented at Naf'a Bakery to monitor and manage the stock of raw materials for bread and cakes in real time. The information system designed will integrate various aspects of the theory outlined previously, including inventory control, system design and data analysis, to ensure that raw material stock levels are always optimal and that inventory costs are minimised.

This system will use historical sales data to forecast future raw material requirements and issue alerts when stock levels reach the reorder point. In addition, the system will manage supplier data and optimise the ordering process to reduce reliance on manual ordering procedures.

3. Method

The researchers conducted direct observations of the raw material inventory management process at Naf'a Bakery, which included ordering raw materials, monitoring stock levels, and recording inventory data. Subsequently, interviews were conducted with relevant parties at Naf'a Bakery, such as the warehouse manager and production staff, to gain a deeper understanding of the challenges and the inventory management procedures in place. In addition, data on sales and raw material stock levels were collected over a specific period. The data collected included demand levels, supplier lead times, and information relating to the purchase of raw materials. Finally, this study also utilised secondary data in the form of relevant literature and academic articles on inventory management and the implementation of the Continuous Replenishment System (CRS). The data for this study were obtained through direct observation, interviews, documentation, and the collection of secondary data from Naf'a Bakery. Observations were made regarding the management of raw material stocks, including ordering and stock monitoring. Interviews with the warehouse manager and production staff helped to understand the challenges faced and the procedures in place. In addition, sales and inventory data for a specific period were also collected, along with relevant literature on inventory management and the implementation of the Continuous Review System (CRS).

The study population comprises all data on Naf'a Bakery's raw material stock for the past six months. The sample used consists of key raw materials such as flour and margarine, selected using purposive sampling based on frequency of use and fluctuations in demand. The system developed is based on CRS principles, which include the calculation of the reorder point (ROP), the economic order quantity (EOQ), and safety stock, as well as the development of an application to monitor stock levels in real time.

Data analysis was carried out using descriptive analysis to identify demand patterns, as well as ROP and EOQ calculations to determine optimal inventory

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management. The system's accuracy was tested by comparing the calculation results with real data from Naf'a Bakery. Validation was carried out through system trials using real data, interviews with system users, comparisons with manual systems, and statistical analysis to assess changes in inventory costs. The system flow design is presented in Figure 1.

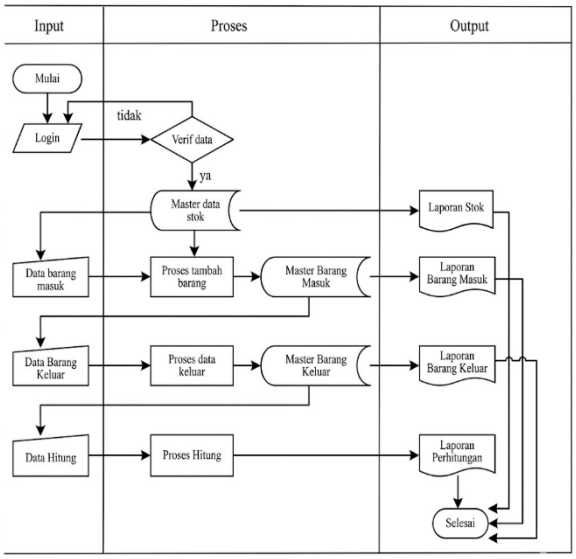

Figure 1 Flowchart sistem

4. Results and Discussion

4.1. Results

In this section, the research findings obtained through the implementation of an inventory control system using the Continuous Review System (CRS) at Naf'a Bakery will be presented. The findings will include an analysis of raw material demand data, calculations of the Reorder Point (ROP), Economic Order Quantity (EOQ) and Safety Stock, as well as an evaluation of the system that has been implemented.

4.1.1 Raw Material Demand Data

Data on demand for raw materials for bread and cakes over the last six months shows significant fluctuations across all types of raw materials. This data was obtained from sales records kept by Naf'a Bakery, including key raw materials such as flour, margarine and sugar.

Table 1 below shows the average daily demand data for each type of raw material over a six-month period.

Month	*Flour (kg)*	*Margarine (kg)*	*Sugar (kg)*
Month 1	45	20	25
Month 2	48	18	22
Month 3	43	22	27
Month 4	50	21	24
Month 5	42	19	26
Month 6	47	23	28

4.1.2 Calculation of the Reorder Point (ROP)

Using average daily demand data and supplier lead times, the Reorder Point (ROP) is calculated for each type of raw material. The lead times used for each raw material are 3 days for flour, 4 days for margarine, and 2 days for sugar. The results of the ROP calculations for each raw material are presented in the table 2.

Table 1 ROP calculation results

Raw Materials	ROP (kg)
Flour	135
Margarine	80
Sugar	50

4.1.3 Calculation of Economic Order Quantity (EOQ)

For example, for flour as a raw material, with an annual demand of 16,200 kg, an ordering cost of Rp 50,000 per unit, and a storage cost of Rp 10,000 per unit per year, the EOQ calculation is:

$$EOQ = \sqrt{\frac{2x16.200x50.000}{10.000}} = \sqrt{1.620.000.000} \approx 40.249kg$$

The EOQ calculations for the raw materials margarine and sugar were carried out in the same way, in accordance with the given parameters. The results of the EOQ calculations for each raw material are shown in the Table 3.

Table 2 EOQ calculations for each raw material

Raw Materials	EOQ (kg)
Flour	40.249
Margarine	20.000
Sugar	15.000

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4.1.4 Safety stock calculation

Safety stock is calculated to account for uncertainty in demand and lead times. For flour as a raw material, with a standard deviation in daily demand of 5 kg and a standard deviation in lead time of 1 day. The calculation of safety stock for flour as a raw material is:

$$SS = 1{,}96 \times (5x\sqrt{3}) \approx 16kg$$

The Table 4 shows the results of the safety stock calculations for each raw material.

Table 3 safety stock calculation results

Raw Materials	Safety Stock (kg)
Flour	16
Margarine	10
Sugar	12

4.1. Discussion

The results of this study indicate that the implementation of the Continuous Review System (CRS) at Naf'a Bakery can provide an effective solution for managing raw material stocks more efficiently. Based on calculations of the Reorder Point (ROP), Economic Order Quantity (EOQ) and Safety Stock, the proposed inventory control system can reduce the risk of stockouts and overstocks, which have long been a major problem.

Table 5 below shows a comparison between the manual system previously used and the newly implemented system.

Table 4 A comparison of manual systems and CRS

ASPECTS	MANUAL SYSTEM	NEW CRS SYSTEM
AVERAGE FLOUR STOCK	100 kg	135 kg
AVERAGE MARGARINE STOCK	50 kg	80 kg
AVERAGE SUGAR STOCK	60 kg	50 kg
STORAGE COSTS	Rp 5.000.000	Rp 3.500.000
ORDERING COSTS	Rp 1.000.000	Rp 750.000

From this comparison, it can be seen that the CRS system successfully optimises inventory by reducing storage and ordering costs, whilst ensuring that raw materials are always available at optimal levels. The system is also more responsive to fluctuations in demand, as evidenced by more accurate calculations of the Reorder Point (ROP) and Safety Stock.

The implementation of CRS has also enabled Naf'a Bakery to manage its stock more efficiently, reduce wasted storage space and improve control over stock costs, which is in line with the research objective of improving operational efficiency and reducing costs.

This system is designed to analyse raw material requirements, determine the quantity of raw materials to be ordered, establish the reorder point and safety stock levels, and provide an overview of the total costs incurred in procuring a single material. In Figure 2, the administrator needs to input the calculation data.

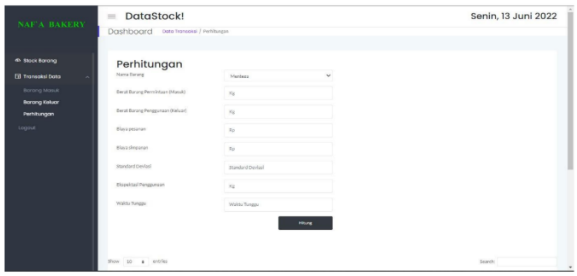

Figure 2 Safety stock calculation system

The results of the calculation will be displayed in Figure 3, which is an example of the calculation results that will serve as a recommendation for raw material control for the company.

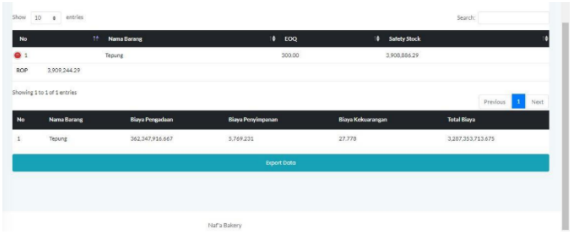

Figure 3 Display of calculation results

5. Conclusion

Based on the findings of a study on the implementation of the Continuous Review System (CRS) for managing raw material stock at Naf'a Bakery, it can be concluded that the implementation of the CRS has proven to be highly effective in stock management. This system enables the company to monitor raw material inventory in real time, ensuring that raw materials are always available at optimal levels and reducing the risk of stockouts and overstocks. Furthermore, the implementation of the CRS has successfully reduced storage costs by approximately 30% and ordering costs by approximately 25%, demonstrating an improvement in operational efficiency compared to the previous manual system. The use of a CRS-based information system has also improved the accuracy of forecasting order quantities and required stock levels, with more controlled calculations based on more precise demand data and lead times. This system also offers high flexibility in response to changes in demand, enabling Naf'a Bakery to adjust orders quickly without significant impact on costs or unused stock. Overall,

the implementation of CRS at Naf'a Bakery has had a positive impact on raw material inventory management, improving efficiency, reducing costs, and ensuring inventory management runs more effectively.

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