Journal of Economics and Social Sciences (JESS)
Vol. 4, 1 (January-June, 2025), pp. 155-170
EISSN: 2808-5094, DOI: 10.59525/jess.v4i1.698

Dynamic System Simulation Modeling to Increase Profits in Bakery MSMEs (Case Study: Ciracas Bread House)

Wahyudi Adiprasetyo[1], Irayanti Adriant[2], Yoseph Sunardhi[3], Hilmi Alhafidz[4]

[1] Universitas Logistik dan Bisnis Internasional (ULBI), Indonesia; wahyudi@ulbi.ac.id
[2] Universitas Logistik dan Bisnis Internasional (ULBI), Indonesia; irayanti@ulbi.ac.id
[3] Universitas Logistik dan Bisnis Internasional (ULBI), Indonesia; yoseph@ulbi.ac.id
[4] Universitas Logistik dan Bisnis Internasional (ULBI), Indonesia; hilmi@ulbi.ac.id

ARTICLE INFO

Keywords:

UMKM Rumah Roti;
System Dynamics Simulation;
E-commerce;
Promotion Strategy;
Production Capacity

Article history:

Received 2025-03-10
Revised 2025-04-22
Accepted 2025-05-29

ABSTRACT

This research addresses the challenges faced by UMKM Rumah Roti, a small bakery in Ciracas, Indonesia, regarding declining profits due to suboptimal use of e-commerce, promotional strategies, and production capacity. By employing system dynamics simulation, the study analyzes the impact of various business strategies on profitability. Seven business scenarios were modeled to identify the most effective combination of strategies. Simulation results indicate that integrating e-commerce, effective promotions, and investments in production capacity (such as additional ovens) significantly increase income and profits. The study recommends implementing a comprehensive, data-driven strategy based on simulation outcomes to optimize business performance, highlighting the importance of systematic planning and data-driven decision-making in navigating a competitive market environment.

Corresponding Author:
Yoseph Sunardhi
Universitas Logistik dan Bisnis Internasional (ULBI), Indonesia; yoseph@ulbi.ac.id

1. INTRODUCTION

MSMEs (Micro, Small, and Medium Enterprises) are the backbone of Indonesia's economy, making a significant contribution to the Gross Domestic Product (GDP) and labor absorption. The latest data shows that MSMEs absorb around 97% of the total workforce in Indonesia and contribute up to 61% to the national GDP, making it a crucial sector in supporting the country's economic growth (Minister of Finance Sri Mulyani, 2024). With the number of MSME actors reaching around 65 million, this sector is not only a provider of employment but also plays an important role in national economic stability (Junaidi, 2022).

The food sector, including bread and pastry MSMEs, is one of the sectors with the largest number of business actors. In recent years, the food and beverage industry in Indonesia has experienced rapid growth, driven by changes in people's lifestyles that increasingly prioritize convenience and food quality. This creates a great opportunity for MSMEs in the bread and pastry sector to develop and meet the increasing market demand (Tambunan, 2020). The bread and pastry industry in Indonesia has high

growth potential. This growth is driven by factors such as increased health awareness, organic food trends, as well as consumer preferences shifting to quality local products.

However, despite having great potential, MSMEs in the food sector, especially bread and pastry, face various challenges in increasing profits. Key challenges include fluctuations in raw material prices that can significantly affect production costs (Arifin & Rahman, 2021), fierce competition from both fellow MSMEs and from larger, more established companies, as well as rapid changes in market trends. Fluctuations in raw material prices are a serious problem for MSMEs because they can reduce profit margins and affect operational stability. In addition, fierce competition in the bread and pastry market requires business actors to continue to innovate and improve product quality to remain relevant to consumer needs. Rapid changes in market trends also require MSMEs to be adaptive and responsive to changing consumer preferences.

To overcome these challenges and increase profits, a proper and measurable business strategy is needed. Dynamic systems simulation modeling can be applied as a tool to analyze various business scenarios and their impact on profits. By using this approach, business actors can evaluate production strategies, manage raw material costs, and market more effectively to maximize their profit potential.

Although many studies have discussed increasing MSME profits, studies that focus on the application of dynamic system simulations on bread MSMEs are still limited. Most previous studies have used more simple qualitative or quantitative approaches, which are often unable to capture the complexity of the interactions between factors that affect profits in dynamic contexts (Setio, 2021). Therefore, this study will use a dynamic system simulation approach to analyze the factors that affect the profits of bread MSMEs, providing a more holistic and integrated view. Factors that will be considered in this study include the use of e-commerce, promotional strategies, and additional production capacity. The use of e-commerce, for example, has proven to be one of the effective ways to increase market reach and sales for MSMEs in the food sector (Mait et al., 2022). By utilizing digital platforms, bakery MSMEs can reach a wider range of consumers and increase the visibility of their products. In addition, the right promotional strategy can increase brand awareness and attract more customers, while the addition of production capacity allows MSMEs to meet the increasing demand without sacrificing product quality (Putri & Nefri, 2021).

The research gap that this study aims to fill is the lack of studies that specifically apply dynamic system simulation methods to understand and increase the profits of bread MSMEs. This study aims to identify the best scenario to increase the profits of bread MSMEs by considering the impact of each factor on other variables in the system. This scenario will be analyzed using a simulation model that can illustrate the dynamic interactions between different elements in a business process. Thus, this study will not only provide insight into how these factors interact with each other but will also provide practical recommendations for bread MSMEs in optimizing their business strategies. The results of this research are expected to make a real contribution to the development of business strategies in the bakery MSME sector, as well as help business actors in facing challenges and taking advantage of opportunities in an increasingly competitive market. With a dynamic systems simulation-based approach, it is hoped that business actors can make better and data-driven decisions to increase their profitability in a sustainable manner.

This research is important because it can make a significant contribution to the development of theory and practice in the field of MSME management, especially in the context of complex system modeling (Nugroho & Supriyadi, 2023). The results of this study are expected to help bakery MSMEs in understanding the complexity of their business systems and how various factors interact with each other to affect performance and profitability. The simulation model that will be developed in this study will facilitate the testing of various scenarios to identify the optimal strategy. Using simulations, business actors can evaluate the impact of various business decisions, such as price changes, marketing strategies, or production capacity additions, before applying them in real practice (Hussain et al., 2022). This approach allows for more informational and data-driven decision-making, thereby reducing the risk of failure in strategy implementation.

This research is specifically designed to answer several main problem formulations, namely: how the characteristics and behavior of the existing model of Rumah Roti Ciracas MSMEs in dynamic system simulations; how the impact of the use of e-commerce, promotion strategies, and additional production capacity on the profits of these MSMEs; as well as what kind of business scenario is most optimal in increasing profits based on the results of dynamic system simulations. In line with the formulation of the problem, the purpose of this study is to analyze the characteristics and behavior of the existing model of Rumah Roti Ciracas MSMEs in the context of dynamic system simulation, evaluate the influence of e-commerce, promotion strategies, and production capacity increase on profits, and identify the most optimal business scenario to improve the performance and profitability of Rumah Roti Ciracas MSMEs in a sustainable manner.

To build this dynamic system simulation model, the study will use AnyLogic software, widely known for its ability to model complex and dynamic systems. AnyLogic allows users to create interactive and realistic simulation models, so that they can accurately describe the behavior of the bread MSME business system (Borshchev & Filippov, 2020). With its advanced features, this software will help researchers in designing simulations that are able to better capture market dynamics and interactions between factors. The data used in this study will be collected through interviews, direct observations, and documentation studies on Rumah Roti Ciracas MSMEs. This method of data collection is chosen to ensure that the information obtained is accurate and relevant to the local context. Interviews with owners and employees will provide in-depth insights into daily business practices as well as the challenges faced, while hands-on observation will help researchers understand operational processes in real life (Suharto & Rahman, 2021). The dynamic system simulation method was chosen because of its ability to model complex and dynamic systems. This approach not only allows for an in-depth analysis of the interactions between various factors but also provides a platform for virtual experiments that can speed up the decision-making process (Sterman, 2021). Thus, this research is expected to make a positive contribution to the development of bread MSMEs in Indonesia and enrich the academic literature in the field of MSME management.

2. METHODS

Research Location and Time

This research will be carried out at Rumah Roti Ciracas MSMEs, located in East Jakarta. This research is planned to take place during the period of 2023, with a set implementation time of 5 months, starting from November 2023 to March 2024.

Rumah Roti Ciracas MSMEs were chosen as a case study because they have characteristics that represent bread MSMEs in general in Indonesia. These characteristics include:

1. **Micro business scale:** These MSMEs are managed by owners with the help of several employees, have limited capital, and still focus on the local market.
2. **Common production process:** Using standard equipment and bread-making techniques commonly found in other bakery MSMEs.
3. **Facing similar challenges:** Such as fluctuations in raw material prices, competition with MSMEs and large bakeries, and changes in market trends.
4. **Potential to grow:** These MSMEs have the desire to increase profits and business scale but are constrained by limited resources and business strategies.

By choosing representative MSMEs, it is hoped that the results of this research can be applied to other bread MSMEs with certain adjustments.

Research Object

The object of the research includes the business process of bread production and sales, as well as the factors that affect the profits of these MSMEs. Some of the factors to be analyzed include:

1. **Utilization of e-commerce:** Which is becoming increasingly important in today's digital era.
2. **Promotion strategy:** Which plays a role in increasing the visibility and attractiveness of the product.

3. **Addition of oven:** Which can increase production capacity and operational efficiency.

Data Type

The data to be collected in this study consists of two main categories: primary data and secondary data.

1. Data Primer:
   a. Interview: In-depth interviews with the owners and employees of Rumah Roti Ciracas MSMEs to get first-hand information about business practices, challenges faced, and strategies implemented.
   b. Direct Observation: Direct observation of the production and sales processes to understand operational dynamics and interactions with customers.
2. Data Seconds:
   a. Documentation: Collection of data from financial statements, operational records, and other relevant documents to provide additional context to the primary data.
   b. Related Literature: Using previous studies and scientific articles discussing bread MSMEs and dynamic system simulations as references to strengthen the argument.

The importance of mentioning this type of data is to ensure that the reader can understand the source of the information used, as well as to allow other researchers to replicate the research using the same data collection methods.

Data Collection

To collect data, this study will use several data collection methods, namely:

1. **Interview:** In-depth interviews will be conducted with MSME owners to get first-hand information about business strategies, challenges, and opportunities faced.
2. **Observation:** Field observations will be conducted to directly understand the production and sales process of bread, as well as interaction with customers.
3. **Documentation Study:** Documentation studies will also be conducted to collect relevant secondary data, such as financial statements and operational records of **the MSMEs.**

Detailed Analysis

A detailed analysis of the data collected must be in-depth enough to support the study's findings. Here are some analysis steps that need to be done:

1. Qualitative Data Processing:
   Using thematic analysis methods to identify patterns in interviews and observations. This will help in understanding the specific challenges faced by MSMEs and the strategies they implement.
2. Quantitative Data Processing:
   a. Using AnyLogic software to simulate dynamic systems. The simulation model should include key variables such as production costs, revenue, and profits, as well as the interactions between those variables.
   b. Conduct a sensitivity analysis to evaluate the impact of changes in a specific variable (e.g., raw material prices or promotion amounts) on profits.
3. Model Validation:
   Once the simulation model is built, validate it by comparing the simulation results with historical data or interview results to ensure the model's accuracy.
4. Interpretation of Results:
   Present the results of the simulation in the form of a clear graph or table, as well as provide an interpretation of how certain factors affect the profits of MSMEs.

Data Analysis and Simulation Modeling

The data analysis method that will be used in this study is dynamic system simulation modeling using AnyLogic software. The modeling process will go through several stages as follows:

Rich Picture Diagram Arrangement

To visually describe the existing business system, including the actors, processes, and relationships between elements in the system.

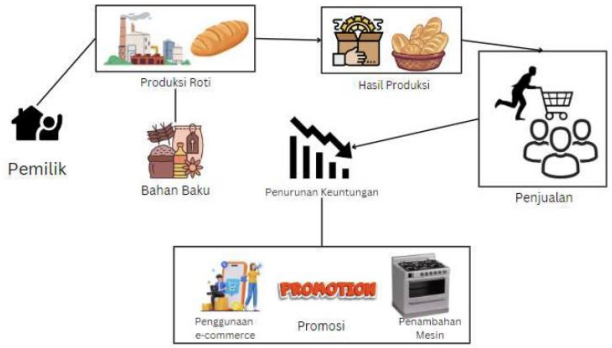


Figure 1. Rich Picture Porses Diagram Bakery House Business

Rumah Roti MSMEs run a production process that requires raw materials. After the production process is completed, the resulting product will be sold to consumers. In the current conditions, Rumah Roti MSMEs face challenges in the form of a decrease in the level of profits obtained. Some of the factors that affect this decline include the lack of optimal use of e-commerce, the number of promotions carried out, and the use of available ovens.

Causal Loop Diagram Construction:

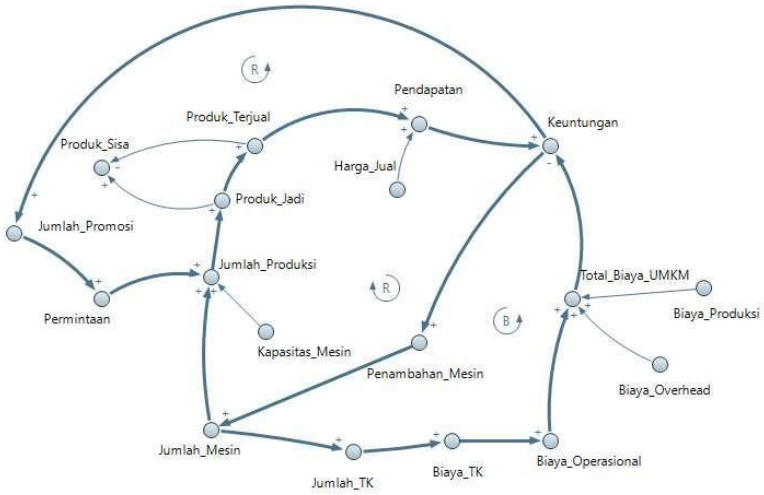


Figure 2. Causal Loog Diagram (CLD) Bread House Business Process

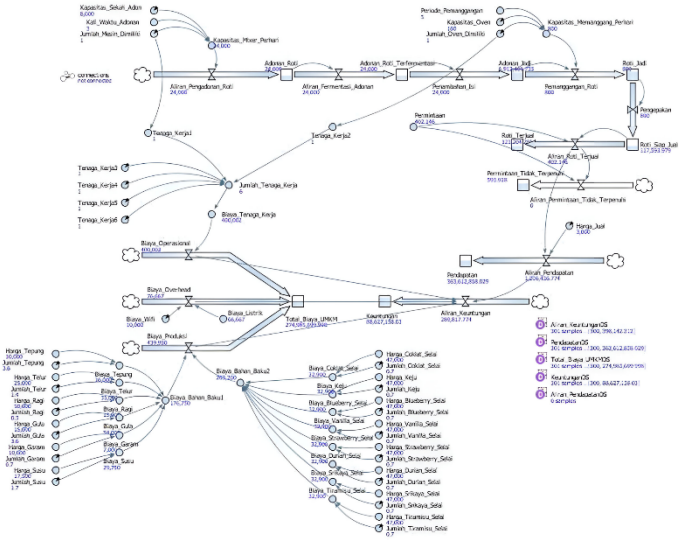
The CLD model for bakery MSMEs shows three main variables that affect the total cost of MSMEs, namely operational costs, overhead costs, and production costs. These three variables have a positive influence on the total cost, meaning that the greater the costs, the greater the total cost of MSMEs.

Operating costs are positively affected by labor costs, which are further affected by the number of workers. On the production side, the addition of machines will increase the number of machines owned, which in turn increases the number of production. The production quantity is also affected by the demand and capacity of the machine. Increasing the number of production will increase the number of finished products, which will further increase the number of products sold and residual products.

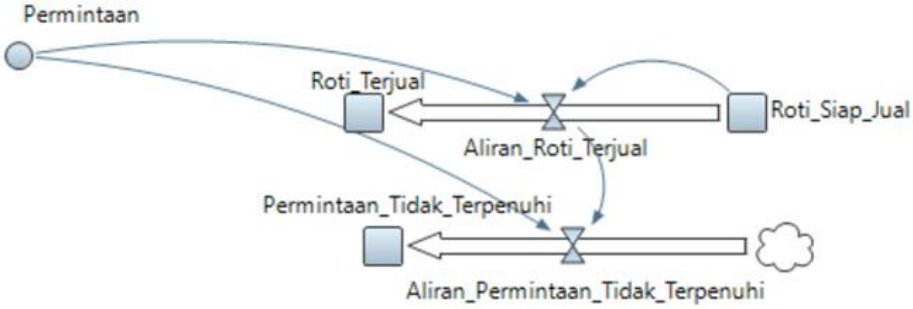
Products sold have a positive effect on revenue, which is also influenced by the selling price of the product. Profits are positively influenced by revenue and negatively by the total cost of MSMEs. High profits will encourage an increase in the number of promotions and the addition of machines.

The CLD shows the existence of several interconnected loops. The first loop involves profit variables, the addition of machines, the number of machines, the number of workers, labor costs, operational costs, and the total cost of MSMEs. This loop illustrates how profits can be reinvested to increase production capacity and ultimately affect the total cost of MSMEs.

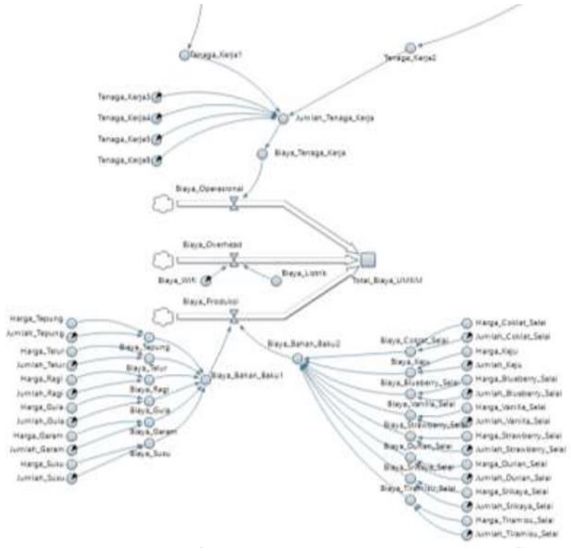
Preparation of Stock Flow Diagram:



In the bread production process, the bread dough flow is influenced by the dynamic variable of the mixer capacity per day, which depends on the capacity of one dough, the number of machines owned, and the time of the dough. At the end of the dough flow there is a stock of bread dough. Furthermore, the dough fermentation flow is affected by the bread dough stock, with the fermented bread dough stock at the end. The flow of filling addition is affected by the stock of fermented bread dough, resulting in a stock of finished dough. The bread baking flow is affected by the finished dough stock and the dynamic variable of baking capacity per day, which depends on the oven capacity, the number of ovens, and the baking period, resulting in the finished bread stock. Lastly, the packing flow is affected by the finished bread stock, resulting in ready-to-sell bread stock.

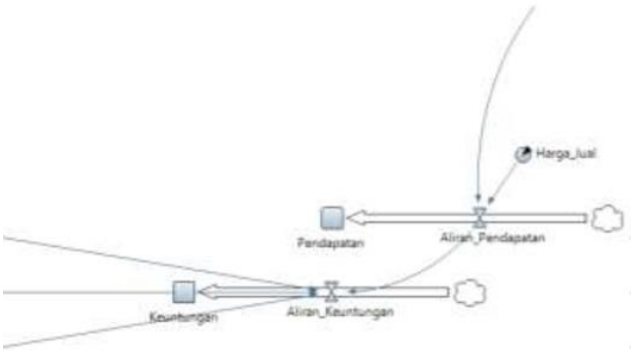


In the sales section, there is a symbol (flow) of the flow of bread sold which is influenced by the stock of ready-to-sell bread and the dynamic variable of demand. At the end of the bread sold stream there is a symbol of the bread stock sold. After that, there is a symbol (flow) of unmet demand flow which is influenced by the dynamic variables of demand and the flow of bread sold. At the end of the unmet demand stream there is a stock unmet demand symbol. The image below will show the SFD sub model for the total cost share.



In the total cost section, there is a symbol (flow) of operational costs that are influenced by the dynamic variable of labor costs, which is also influenced by other dynamic variables, namely the number of workers. The number of workers is influenced by the dynamic variables of labor 1 and 2 and labor parameters 3 to 6, where labor 1 is influenced by the number of machines owned, while labor 2 is influenced by the number of ovens owned. After that, there is a symbol (flow) of overhead costs which is influenced by wifi cost parameters and dynamic variables of electricity costs.

Furthermore, there is a production cost flow symbol which is influenced by the dynamic variables of raw material cost 1 and raw material cost 2. The cost of raw materials 1 is influenced by several dynamic variables, namely the cost of flour, eggs, yeast, sugar, salt, and milk. The cost of raw materials 2 is influenced by several dynamic variables, namely the cost of chocolate jam, cheese, blueberry jam, vanilla jam, strawberry jam, durian jam, srikaya jam, and tiramisu jam. At the end of the flow of operational costs, overhead costs, and production costs, there is a symbol of the total stock of MSME costs. The image below will show the SFD sub model for the revenue and profit section.



In the revenue section, there is a symbol (flow) of revenue flow which is influenced by the parameters of the selling price and (flow) of bread sold. At the end of the revenue stream is the revenue stock symbol. Furthermore, there is a profit flow symbol that is influenced by revenue flow, operating costs, overhead costs, and production costs. At the end of the profit stream is the profit stock symbol. The table below is a parameterization table of the overall SFD model of Rumah Roti MSMEs and how the output is produced after the run simulation process is carried out.

Model Parameterization:

Key parameters in the model will be determined based on data collected through interviews, observations, and documentation studies. Examples of parameters include:

1. Production capacity
2. Raw material cost
3. Product selling price
4. Promotion fees
5. The effectiveness of e-commerce in increasing sales

Model Verification:

The purpose of verification is to ensure that the model that has been created with the AnyLogic system does not have any errors or errors in the running process. If there is an error such as an example of an unverified model, then it can be concluded that the model created has not been verified so that improvements are needed to create the model. However, in this study there were no such errors, so it can be concluded that the model that has been created has been verified. After passing the verification process, there is a validation process that aims to find out whether the model created is in accordance with the real system. Validation was carried out by asking directly to the object of the research, namely the Cariracas Bread House MSMEs. In addition, validation is also carried out by comparing the original data with the output results of the model created using AnyLogic. Here are some comparisons between the original data and the output results of the AnyLogic model. The first validation is to compare the historical data revenue with the model's output.

Model Validation

Validation was carried out by asking directly to Rumah Roti Ciracas MSMEs and comparing the original data with the output of the AnyLogic model. Here are some comparisons between the original data and the output of the AnyLogic model. The first validation is to compare the historical data revenue with the model's output.

Table 4.7 Comparison of Historical Data Revenue and Output

Data Historis	Output Model
33.030.000,00	33.652.955,00
32.040.000,00	33.342.859,00
38.610.000,00	38.101.020,00
42.120.000,00	39.195.951,00
36.360.000,00	34.677.357,00
36.270.000,00	34.656.522,00
34.380.000,00	34.820.634,00
36.720.000,00	33.716.272,00
33.210.000,00	33.292.909,00

Source: Author's Processing, 2024

Based on the income comparison table from January to October 2023, the income of Rumah Roti MSMEs has decreased. The average revenue from historical data and model output was IDR 35,451,000 and IDR 34,949,587, respectively. This difference is not significant. The second validation is to compare the advantages of historical data and model output.

Table 4. 8 Comparison of Historical Data and Output Gains

Data Historis	Output Model
6.270.000,00	6.154.386,00
5.280.000,00	5.844.289,00
11.850.000,00	10.602.450,00
15.360.000,00	11.637.380,00
9.600.000,00	7.178.787,00
8.510.000,00	7.157.952,00
7.620.000,00	6.540.818,00
9.960.000,00	7.322.064,00
6.450.000,00	6.217.702,00
5.010.000,00	5.794.339,00

Based on the profit comparison table from January to October 2023, the profits of Rumah Roti MSMEs have decreased. The largest profit based on historical data was IDR 15,360,000 in April, while the model's output showed IDR 11,637,380 in the same month. The average profit from historical data and model output was IDR 8,691,000 and IDR 7,445,017, respectively. This difference is not significant.

The comparison data was revalidated with the t-test: Two-sample Assuming Equal Variances. This test assumes that both samples have the same variance. The test criteria are:

1. Hipotesis:
   a. H0: μ1 ≤ μ2 (no difference between the two data)
   b. H1: μ1 > μ2 (there is a difference between the two data)
2. Level significance: α = 5% or 0.05.
3. Interpretation:
   a. Accept H0 if t computes ≤ t table or p-value > α
   b. Minus H0 if t counts > t table or p-value ≤ α

The following are the results of the t-test on the income and profit data of Rumah Roti's MSMEs.

a. Revenue Data

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	8691000	7445017
Variance	1,05E+13	4,11E+12
Observations	10	10
Pooled Variance	7,32E+12	
Hypothesized Mean Difference	0	
df	18	
t Stat	1,029744	
P(T<=t) one-tail	0,158385	
t Critical one-tail	1,734064	
P(T<=t) two-tail	0,31677	
t Critical two-tail	2,100922	

Figure 4.16 Revenue Data T-Test Test

The t-Stat value is 1.029744 and the t-Critical two-tail is 2.100922. Hypothesis zero (H0) is accepted and hypothesis one (H1) is rejected, meaning that there is no significant difference between the historical data and the model's output.

b. Profit Data

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	35451000	34949587
Variance	1,05E+13	4,17E+12
Observations	10	10
Pooled Variance	7,35E+12	
Hypothesized Mean Difference	0	
df	18	
t Stat	0,413599	
P(T<=t) one-tail	0,342027	
t Critical one-tail	1,734064	
P(T<=t) two-tail	0,684053	
t Critical two-tail	2,100922	

Figure 4.17 T-Test Advantage Data

The t-Stat value is 0.413599 and the t-Critical two-tail is 2.100922. Hypothesis zero (H0) is accepted and hypothesis one (H1) is rejected, meaning that there is no significant difference between the historical data and the model's output.

Scenario Development and Testing

Various business scenarios will be tested to see their impact on MSME profits. These scenarios are: There are seven types of scenarios that are built to be tested on the business process simulation model of Rumah Roti Ciracas MSMEs to increase profits.

1. **Scenario 1 (E-commerce Utilization):** The implementation of e-commerce usage will have an effect on product sales. The Stock Flow Diagram (SFD) of this first scenario shows the implementation of e-commerce, based on research by Jaya & Raya (2022) which states that there is a positive influence of e-commerce variables on sales of 18.3%. The parameterization used for improvisation as well as SFD for the first scenario can be seen in the image below.
2. **Scenario 2 (Promotion):** Promotions carried out by MSMEs will affect demand, so that they can increase sales and profits. The second scenario SFD shows the use of promotions, based on research by Togodly, Tarore, & Tumbel (2018) which stated that there is a positive influence of promotional variables on sales by 37%. The parameterization used for improvisation in this second scenario can be seen in the image below.
3. **Scenario 3 (Addition of Ovens and Labor):** The addition of ovens and labor will affect the costs that need to be incurred as well as the production capacity and stock of products that can be sold. The third scenario SFD shows the addition of machine tools in the form of ovens, which are obtained from investment by Rumah Roti MSMEs and have a direct impact on other variables or parameters.
4. **Scenario 4 (Oven Addition):** The addition of an oven will affect the costs that need to be incurred as well as the production capacity and stock of products that can be sold. This scenario is almost the same as the third scenario, but the addition of machines has no effect on the number of workers but on the cost of direct labor. The fourth scenario SFD shows the addition of ovens obtained from investment by Rumah Roti MSMEs and has a direct impact on other variables or parameters.
5. **Scenario 5 (Combination of Promotion and E-commerce Utilization):** A merger between the first scenario and the second scenario. The fifth scenario is carried out by combining the use of e-commerce and promotion. The parameterization used for improvisation in this fifth scenario is the

same as the previous two scenarios, from sisi penjualan pada e-commerce dengan harga dan mekanisme yang berbeda. SFD skenario kelima dapat dilihat pada gambar di bawah.

6. **Scenario 6 (E-commerce Utilization, Promotion, and Addition of Ovens and Labor):** Merger between the first, second, and third scenarios. The sixth scenario is carried out by combining the addition of oven machines and labor, the use of e-commerce, and promotion. The parameterization used for improvisation in this sixth scenario is the same as the previous three scenarios, in terms of production and sales in e-commerce. The sixth scenario SFD can be seen in the image below.
7. **Scenario 7 (Combination of E-commerce Utilization, Promotion, Addition of Oven Machines):** Combination of first, second, and fourth scenarios. The seventh scenario is carried out by combining the addition of oven machines, the use of e-commerce, and promotion. The parameterization used for improvisation in this seventh scenario is the same as the three previous scenarios, in terms of production and sales in e-commerce. The seventh scenario SFD can be seen in the image below.

The business scenario will be run on a simulation model and evaluated based on several criteria, including:

1. **Total cost:** Considering production costs, promotional costs, and other operational costs.
2. **Revenue:** Analyze the revenue earned from the sale of bread in each scenario.
3. **Profit:** Calculates the difference between revenue and total costs in each scenario.
4. **Unmet demand:** Evaluate the ability of each scenario to meet market demand.

Sensitivity Test

A sensitivity test will be carried out to find out how much the parameter changes affect the simulation results. The parameters that will be tested for sensitivity include:

1. Percentage increase in e-commerce
2. Promotion increase percentage
3. Percentage increase in production capacity

The results of the sensitivity test will show which parameters have the most influence on MSME profits.

With this approach, this study not only aims to provide practical recommendations for Rumah Roti Ciracas MSMEs but also contributes to the development of theories in MSME management through the application of dynamic system simulation methods.

3. FINDINGS AND DISCUSSION

Existing Models

The existing model is built on historical data of Rumah Roti Ciracas MSMEs to provide an accurate picture of their business performance. Here is a more complete and easy-to-understand description of the results of this existing model:

1. Bread Stock: The bread stock chart shows a steady trend with a total of 117,560 pcs of bread on the 300th day. This shows that bread production is running consistently and is able to meet stock needs without experiencing significant shortages.
2. Bread Sold: The bread sold chart shows fluctuations with a total of 121,200 pcs of bread sold on the 300th day. These fluctuations reflect variations in market demand and the effectiveness of sales strategies implemented by Rumah Roti Ciracas MSMEs.
3. Total Cost: The total cost chart shows a stable trend at IDR 916,000 per day, with total cost reaching IDR 274,985,700 on the 300th day. This stability indicates that operational and production costs can be managed well, although there is some variability in daily costs.
4. Income: The income chart shows fluctuations with total revenue reaching IDR 363,705,863 on the 300th day. These revenue fluctuations reflect changes in sales volume and product selling prices, which can be influenced by external factors such as market trends and promotions.
5. Profit: The profit chart also shows fluctuations with the total profit reaching IDR 88,720,163 on the 300th day. There was a decline in the first six days of the simulation due to the assumption of no

initial capital, but after that the gains showed a more stable trend. These fluctuations reflect the dynamics between revenue and costs, as well as the effectiveness of the business strategy implemented.

By understanding the results of this existing model, Rumah Roti Ciracas MSMEs can identify areas that need improvement and develop more effective strategies to improve their business performance.

Model Scenario

There are seven types of scenarios that are built to be tested on the business process simulation model of Rumah Roti Ciracas MSMEs to increase profits.

The first scenario involves the implementation of the use of e-commerce, which is expected to increase product sales. Based on research by Jaya & Raya (2022), the use of e-commerce has a positive influence on sales by 18.3%. The Stock Flow Diagram (SFD) for this scenario shows how e-commerce is integrated into business processes.

The second scenario is the promotion carried out by MSMEs. This promotion is expected to increase demand, thus having a positive impact on sales and profits. Research by Togodly, Tarore, & Tumbel (2018) shows that promotions can increase sales by 37%. The SFD for this scenario illustrates the influence of promotion on business processes.

The third scenario involves the addition of an oven and labor. This addition will affect operational costs as well as production capacity and stock of products that can be sold. The third scenario SFD shows how the addition of ovens and labor impacts other variables and parameters in the production process.

The fourth scenario also involves the addition of ovens, but in contrast to the third scenario, this addition does not affect the number of workers but rather the cost of direct labor. The SFD for this scenario shows how the addition of an oven affects the production process and cost.

The fifth scenario is a combination of e-commerce utilization and promotion. This scenario combines elements from the first and second scenarios, with the goal of increasing sales through the two approaches. The SFD for this scenario shows how the combination of e-commerce and promotion is integrated into business processes.

The sixth scenario combines the use of e-commerce, promotion, and the addition of ovens and labor. This scenario integrates elements from the first, second, and third scenarios, to maximize sales and production increases. The SFD for this scenario shows how the three elements work together in the business process.

The seventh scenario is a combination of e-commerce utilization, promotion, and the addition of ovens. This scenario combines elements from the first, second, and fourth scenarios, to increase sales and production. The SFD for this scenario shows how the three elements are integrated into the business process.

By testing these seven scenarios, it is hoped that the most effective strategy can be found to increase the profits of Rumah Roti Ciracas MSMEs.

Validate the simulation results. The validation process is carried out through several systematic steps. First, the simulation results are compared with relevant historical data from Rumah Roti Ciracas MSMEs. This aims to evaluate the extent to which the simulation model can reproduce the results that have occurred in the field. Next, sensitivity analysis was applied to test the impact of changes in key variables on the simulation results. In this way, researchers can identify which variables have the most influence on profits and verify that the model used reflects the real dynamics of the business system. In addition, feedback from MSME owners and employees was also collected to gain additional perspectives on the accuracy and relevance of the model. Through these measures, the validation of the results not only increases confidence in the findings but also provides a solid basis for the recommendations resulting from the study.

Comparison with Previous Research Results. In the context of comparison with previous research, the results of this study show alignment with some recent studies that have been conducted in the last

five years. For example, research by Mait et al. (2022) highlights the importance of utilizing e-commerce in increasing market reach for MSMEs in the food sector, which is in line with the study's findings that e-commerce contributes significantly to increased sales. In addition, Putri and Nefri (2021) found that effective promotional strategies can increase brand awareness and attract more customers, supporting the results of this study which shows that promotion has a positive effect on the profits of bakery MSMEs. Research by Hussain et al. (2022) also noted that adding production capacity can help MSMEs meet increasing demand without sacrificing product quality, this is in line with the recommendations of this study to increase production capacity as a profit-increasing strategy. By comparing the results of this study with those studies, the unique contribution of the dynamic systems simulation approach in understanding the complex interactions between business factors becomes clearer.

4. CONCLUSION

This study analyzes the impact of e-commerce utilization, promotion strategies, and the addition of ovens on the profits of Rumah Roti Ciracas MSMEs using dynamic system simulation modeling. The results show that the best scenario to increase profits is a combination of promotion, e-commerce utilization, and the addition of ovens. This scenario is able to increase revenue by 59% and profit by 208.5% compared to the existing model.

This study provides empirical evidence on the effectiveness of integrated business strategies in increasing the profitability of MSMEs. The results of this study are expected to provide practical recommendations for MSME actors in the bread and pastry industry, as well as contribute to the development of theories in the field of MSME management.

REFERENCES

Arifin, Z., & Rahman, A. (2021). Fluktuasi harga bahan baku dalam odellin makanan: Dampaknya terhadap UMKM. *Jurnal Ekonomi Mikro*, 5(2), 123-135.

Hussain, M., Khan, R., & Ali, S. (2022). The impact of raw material price fluctuations on small and medium enterprises: Evidence from the food sector. *International Journal of Business and Management*, 10(3), 45-58.

Junaidi. (2022). Peran UMKM dalam perekonomian Indonesia: Tinjauan terkini. *Jurnal Ekonomi Pembangunan*, 8(1), 78-90.

Kementerian Keuangan Republik Indonesia. (2024). Laporan tahunan tentang kontribusi UMKM terhadap PDB.

Mait, A., Nefri, Y., & Putri, R. (2022). E-commerce as a growth strategy for micro and small enterprises in the food sector: A case study in Indonesia. *Journal of Digital Business*, 15(4), 201-215.

Nugroho, S., & Supriyadi, A. (2023). Complex systems in small business management: A dynamic odelling approach. *International Journal of Small Business Management*, 11(1), 33-50.

Setio, R. (2021). Dynamic simulation odelling for improving profitability in SMEs: A case study in the bakery industry. *Journal of Simulation Modeling*, 12(2), 67-80.

Suharto, W., & Rahman, F. (2021). Trends in food consumption in Indonesia: Implications for small businesses. *Indonesian Journal of Food Science*, 9(3), 112-126.

Tambunan, T. (2020). The growth of the food and beverage industry in Indonesia: Opportunities and challenges for SMEs. *Journal of Indonesian Economic Studies*, 14(2), 145-160.

Abdullah, T., & Tantri, F. (2019). Manajemen Pemasaran. PT RajaGrafindo Persada.

Astriana, S., & Adriant, I. (2023). Model Simulasi Dinamika Sistem Untuk Meningkatkan Profit (Studi Kasus: UKM Kerupuk Mulyasari). ULBI.

Chopra, S., & Meindl, P. (2016). Supply Chain Management: Strategy, Planning, and Operation. Pearson Education Inc.

Duwila, U. (2015). Pengaruh Produksi Padi Terhadap Tingkat Kesejahteraan Masyarakat Kecamatan Waeapo Kabupaten Buru. Cita Ekonomika Jurnal Ekonomi, IX(2), 149–158.

Ekoanindiyo, F. A. (2011). Pemodelan Sistem Antrian Dengan Menggunakan Simulasi. Dinamika Teknik, V(1), 72–85.

Fadylla, A. R., Azizah, F. N., & Ledya, I. (2022). Optimalisasi Hasil Penjualan Menggunakan Metode Simpleks Dan Pom-Qm Pada Umkm Pembuatan Tempe. Jurnal Peradaban Sains, Rekayasa Dan Teknologi, 10(2), 359–373. https://doi.org/10.37971/radial.v10i2.305

Fakhrurrazi. (2021). Konsep Berpikir Sistemik Dalam Penyusunan Rencana Strategis. ISEMA, 13–24.

Haekal, F., Adriant, I., & Adiprasetyo, W. (2022). Model Simulasi Discrete Event Untuk Usulan Rancangan Tata Letak Gedung (Studi Kasus: Gudang CFS III,PT Multi Bina Pura Internasional Kota Jakarta Utara,Daerah Khusus Ibu Kota,Jakarta). STIMLOG Indonesia.

Hanafi, M. M. (2010). Manajemen Keuangan. BPFE.

Hartono, J. (2005). Dasar Ilmu Komputer Pemrograman Sistem Informasi dan Integrasi Buatan (5th ed.). CV Andi Offset.

Hendra, K. (2009). Manajemen Produksi: Perencanaan dan Pengendalian Produksi. Penerbit Andi.

Jaya, U. A., & Raya, A. N. (2022). Pengaruh E-Commerce dan Media Sosial Terhadap Penjualan UMKM Di Era Pandemi (Studi Kasus Desa Cibolang). Jurnal Ilmiah Ilmu Manajemen Dan Kewirausahaan, 2(1), 378–387.

Jeylani, U., Isbah, F., Yaqin, A., & Veri, P. (2019). Business Process Simulation in Public Schools Using the Business Process Improvement Method (Bpi) and Anylogic Software. Explore IT : Jurnal Keilmuan Dan Aplikasi Teknik Informatika, 11(2), 30–37. https://doi.org/10.35891/explorit.v11i2.1803

Kotler, P., & Armstrong, G. (2004). Prinsip Dasar Pemasaran. Erlangga. Kotler, P., & Lane, K. (2009). Manajemen Pemasaran. Indeks.

Lipsey, R. G. (1995). Pengantar makroekonomi jilid 1. Binarupa Aksara. Masdaini, E., & Dewi, H. A. (2022). Analisis Keputusan Pembelian pada

Konsumen Warung Kopi Nilang. Jurnal Terapan Ilmu Ekonomi, 2(1), 20–28. Nurhayati, L., Lasminingrat, A., Lusiana Yulianti, M., & Komar Priatna, D. (2023). Pengaruh Promosi terhadap Penjualan UMKM S3Shop di Kecamatan Conggeang Jawa Barat. Jurnal Manajemen Dan Pemasaran Digital, 1(1), 40–

50. https://doi.org/10.38035/jmpd.v1i1.20

Pattiapon, M. L. (2015). Peningkatan Kinerja Perusahaan dengan Menggunakan Metode Supply Chain. Arika, 9(1), 1–10.

Shofa, M. J., & Widyarto, W. O. (2018). Model Sumber Daya Air Untuk Kawasan Industri dan Perumahan dengan Pendekatan Sistem Dinamis. Jurnal REKAVASI, 6(2), 117–123.

Sterman, J. (2002). Business Dynamics. Irwin/McGraw-Hill.

Sumertiasih, N. P. L., & Yasa, G. W. (2022). Pengaruh Pertumbuhan Laba, Profitabilitas dan Ukuran Perusahaan PadaKualitas Laba. E-Jurnal Akuntansi, 32(5), 1301. https://doi.org/10.24843/eja.2022.v32.i05.p14

Suparman, D. (2018). Pengaruh Harga Dan Kualitas Pelayanan Terhadap Penjualan Spare Part Motor Di Pt. Slm (Selamat Lestari Mandiri). Jurnal Ekonomedia, Vol. 07 No(2), 2.

Suryati, I. (2021). Pengaruh Ukuran Usaha dan Sumber Modal Terhadap Penerapan Standar Akuntansi Pada Usaha Mikro Kecil dan Menengah Bidang Jasa Atau Pelayanan Laundry di Kecamatan Makasar Tahun 2019. Jurnal Mahasiswa Akuntansi Unsurya, Vol. 1, 18–30.

Suryatna, B. S. (2015). Peningkatan Kelembutan Tekstur Roti Melalui Fortifikasi Rumput Laut Euchema Cottoni. Teknobuga, 2(2), 18–25.

Tarigan, R. E. (2013). Peranan Sistem Informasi dengan Online Trading terhadap Pertumbuhan Pasar Modal di Indonesia. ComTech: Computer, Mathematics and Engineering Applications, 4(2), 803.

Togodly, E. (2020). Pengaruh Promosi Terhadap Peningkatan Penjualan Pada Koperasi Serba Usaha Baliem Arabica Di Kabupaten Jayawijaya. Jurnal Administrasi Bisnis, 1(July), 1–23.

Utari, T., & Dewi, P. M. (2014). Pengaruh Modal, Tingkat Pendidikan Dan Teknologi Terhadap Pendapatan UsahaMikro Kecil dan Menengah (UMKM). E-Jurnal Ekonomi Pembangunan Universitas Udayana, 3(12), 576–585. https://ojs.unud.ac.id/index.php/eep/article/view/9916

Yanti, I., & Idayanti, D. (2022). Analisis Strategi Pemasaran Untuk Meningkatkan Penjualan Pada Usaha Ibu Bagas di Kecamatan Mamuju. Forecasting: Jurnal Ilmiah Ilmu Manajemen, 1(1), 1–13.