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The Application Of Business Process Management (BPM) In Quality Control Of The Production Process At The Krukut Tofu Factory

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Abstract

This study aims to analyze and evaluate the application of Business Process Management (BPM) in production process quality control at the Krukut Tofu Factory. The main problem faced is the high rate of defective products, such as broken tofu and irregular shapes, which have the potential to disrupt the continuity of cooperation with the partner Tahu Go. This study employs a qualitative method using data collection techniques such as observation, interviews, and documentation. Analysis was conducted through mapping of the current business processes (As-Is) and designing proposed processes (To-Be). The research results indicate that the primary causes of defective products are the absence of standardized standard operating procedures (SOPs) and insufficient training for workers during the production stage. Therefore, process improvements were implemented through the standardization of work procedures and enhanced employee training. The implementation of these proposed improvements is expected to reduce the rate of defective products, enhance product quality consistency, and improve production process efficiency at the Krukut Tofu Factory.

Keywords : Business Process Management, product quality, production, tofu industry.

INTRODUCTION

The processed food industry, particularly the tofu industry, plays a significant role in Indonesia's economy. Tofu, a processed product made from soybeans, has long been

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a staple in daily consumption due to its affordability and high nutritional value. As business competition intensifies, tofu producers are required to maintain product quality, improve production process efficiency, and consider environmental sustainability aspects. However, in practice, there are still tofu industries that use traditional production methods that have not been standardized, potentially leading to process inefficiencies and increasing the risk of defective products, particularly during the packaging stage.



Figure 1.1 Conditions of the Production Area at the Krukut Tofu Factory

Source: Researcher's Documentation (2026)

Figure 1.1 shows the production area conditions at the Krukut Tofu Factory, which still uses simple equipment with a production system largely carried out manually. The soybean boiling process uses a wood-fired stove, and the relatively simple layout of production equipment reflects the characteristics of a small-scale tofu industry. Although the production process is directly supervised by the owner to maintain quality consistency, this manual work system has the potential to cause inefficiencies and increase the risk of defective products, particularly during the packaging stage.

The Krukut Tofu Factory is a small-scale tofu business established in 2020 by Mr. Alex Mulyoto. The factory produces tofu in accordance with standards set by its business partner, Tahu Go, making product quality consistency a critical aspect. In addition to producing tofu, the factory also produces a special seasoning mixture in the form of a thin, yellow paste that is not sold commercially. The establishment of this business was driven by the relatively low capital requirements and the presence of a business partner that supports the smooth distribution of products.

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In its day-to-day operations, the Krukut Tofu Factory conducts its production process manually, from soybean processing through to packaging, under the direct supervision of the owner. The factory employs seven staff members, consisting of five production workers and two delivery personnel. With a production capacity of approximately 300 kg of soybeans per day, the factory is capable of producing around 22,000–25,000 pieces of tofu. The production process uses firewood as an energy source and does not use preservatives , while soybean pulp waste is utilized as animal feed as part of the implementation of environmentally friendly principles.

As the primary partner, Tahu Go is a franchise-based food business specializing in the sale of crispy fried tofu and has established a partnership with the Krukut Tofu Factory as its raw material supplier. All tofu products produced must meet established quality standards, making product quality a critical factor in maintaining the sustainability of the partnership. Product quality issues can lead to a loss of partner trust and potentially disrupt business stability.

Based on initial observations, tofu products are still found to be damaged during the packaging stage, such as cracked, broken, or irregularly shaped tofu. This issue occurs repeatedly and indicates weaknesses in a work system that has not been optimally standardized. If not addressed promptly, this situation could lead to production losses and a decline in the quality of the products produced. Therefore, the packaging stage was selected as the focus of this study because it is the final stage in the production process that critically determines product quality before distribution to partners.

To address these issues, an approach is needed that can manage work processes systematically and structurally. *Business Process Management* (BPM) is an approach that can be used to analyze current processes (*As-Is*), identify critical points causing defective products, and design improvement processes (*To-Be*) as an optimization effort. Through this approach, it is hoped that the packaging process can become more effective, efficient, and standardized.

Although various studies have discussed quality control in the food industry, research specifically analyzing small-scale tofu industries using a BPM approach—particularly focusing on the packaging stage—remains limited. Therefore, a more in-depth analysis is needed to identify issues and systematically design process improvements. This study offers a novel contribution in the application of BPM to analyze and design improvements to the packaging process as a critical quality point in the small-scale tofu industry.

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RESEARCH METHOD

This study employs a field research design with a qualitative descriptive approach. This approach was chosen because the study aims to deeply understand the conditions of the production process, particularly the tofu packaging stage at the Krukut Tofu Factory, based on actual conditions observed in the field. The research is not directed toward statistical testing but rather toward describing workflows, identifying critical points ( ) causing defective products, and developing process improvement designs. The analytical framework used is Business Process Management (BPM), an approach that maps actual processes (As-Is), analyzes process weaknesses, and designs proposed processes (To-Be) as the basis for quality control.

The research subject is the tofu packaging process at the Krukut Tofu Factory, starting from when the tofu is finished being molded, moved to the packaging area, arranged, visually inspected, packaged, and temporarily stored before being distributed to business partners. The packaging stage was selected because defective products are still found at this stage, such as cracked, crushed, or irregularly shaped tofu, as well as poorly arranged packaging. Thus, the packaging process is identified as a critical point influencing the final product quality before it reaches Tahu Go's business partners.

The research subjects are the parties directly involved in production and packaging activities. The primary informant is the owner of the Krukut Tofu Factory, while supporting informants consist of production workers and distribution staff. Subject selection was conducted using a purposive approach, based on the consideration that these informants possess experience, knowledge, and direct involvement in the processes under study. This study does not employ the concepts of population and sample as in quantitative research, as its focus is a case study emphasizing in-depth information from all relevant parties.

Research data sources consist of primary and secondary data. Primary data was obtained through direct observation, interviews, and documentation of tofu production and packaging activities. Secondary data was obtained from books, scientific journals, previous studies, and references related to BPM, quality control, and the DMAIC approach. Data collection techniques were carried out in three ways. First, observation was used to examine the packaging process flow, employee work methods, tool usage, work environment conditions, and potential activities leading to defective products. Second, semi-structured interviews were conducted with the owner and employees to gather information regarding production constraints, causes of defects, quality control practices, and opportunities for process improvement. Third, documentation was used to

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supplement the data through photographs of production activities, field notes, production records, and other visual evidence supporting the results of observations and interviews.

Data analysis was conducted using qualitative descriptive methods through data reduction, data presentation, drawing conclusions, and process analysis based on BPM and DMAIC. During the data reduction phase, the researcher selected key information related to the packaging workflow, types of defective products, causes of defects, and challenges in the work process. Irrelevant data was excluded to ensure the analysis remained aligned with the research objectives. Next, the data was presented in the form of narrative descriptions, tables, and process mapping to illustrate the actual state of the packaging process. This data presentation helped the researcher understand the relationships between work stages, potential issues, and the need for process improvements.

The conclusion-drawing stage involves comparing field findings with the research objectives and the BPM framework. The As-Is condition is used to describe the current process, while the To-Be design is formulated as a proposed improvement to make the packaging process more structured, effective, and capable of reducing defective products. The DMAIC approach is used as a qualitative analysis tool, encompassing Define to identify the main problem, Measure to describe process conditions, Analyze to identify defect causes, Improve to develop improvements, and Control to design sustainable controls.

Data validity is ensured through source triangulation, method triangulation, temporal triangulation, thorough observation, and sufficient references. Source triangulation is conducted by comparing information from owners, production workers, and the distribution department. Method triangulation is conducted by comparing results from observations, interviews, and documentation. Temporal triangulation is conducted by collecting data at different times to ensure the information is not merely situational. Through these procedures, the research results are expected to objectively, thoroughly, and scientifically account for the packaging process conditions.

In the context of this research, the Krukut Tofu Factory is understood as a small-scale tofu industry where production processes are still largely manual. This situation makes field observations crucial, as product quality variations are influenced not only by raw materials but also by work habits, tofu handling methods, pressure during arrangement, visual inspection, and temporary storage before shipment. Therefore, this research method is aimed at producing a practical description of the process tailored to the factory's needs, rather than merely a theoretical exposition. The analysis results are

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then used to formulate recommendations for standardizing work procedures, improving packaging workflows, and enhancing workforce training to ensure more consistent tofu quality and to sustainably minimize the risk of defective products.

RESULT AND DISCUSSION

This section presents the research findings based on field observations, interviews, and documentation that have been collected. The data is presented systematically in accordance with the research questions, covering production process conditions, defect rates, the implementation of *Business Process* Management (BPM), and quality control during the packaging stage at the Krukut Tofu Factory.

a. Production Process Conditions and Quality Control

Based on the results of field observations, interviews, and documentation, the tofu production process at the Krukut Tofu Factory is carried out through several main stages as shown in Figure 4.1. These stages include raw material reception, soybean sorting and cleaning, soybean soaking for 3 hours, grinding, boiling, filtering, starter culture preparation, molding, cooling, cutting, packaging, and distribution.



Figure 2: Tofu Production Process at the Krukut Tofu Factory

Source: Researcher's Documentation (2026)

The tofu packaging process is performed manually by arranging the tofu pieces into boxes, each containing 100 pieces. Based on observations, this packaging process is not yet supported by standardized operating procedures, leading to variations in work methods among workers. These variations in work methods result in inconsistent

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pressure applied when moving the tofu, as the entire process is performed directly by hand without the use of tools.

These conditions increase the risk of handling errors and cause the tofu pieces to easily deform or become damaged. Therefore, the process of arranging tofu into boxes requires a high level of skill and concentration to prevent the product from breaking easily. Additionally, the cut tofu pieces need to be tidied up before the packaging process to maintain uniformity in size and product quality. This situation is shown in the field documentation in Figure 3.



Figure 3: Tofu Transfer and Packaging Process

Source: Researcher's Documentation (2026)

Based on the field documentation in Figure 3, the transfer and packaging process is carried out by workers manually lifting the tofu with both hands and then arranging it in layers inside the box. During this process, variations in pressure were observed among workers when pressing the layers of tofu to fit the packaging capacity, which has the potential to cause physical damage to the product.

b. Application of BPM in the Production Process

The implementation of *Business Process Management* (BPM) in the production process at the Krukut Tofu Factory was carried out to analyze and improve the production workflow, particularly during the packaging stage. BPM was used to map the current

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production process (*As-Is*), identify activities that could potentially cause defective products, and design process improvements (*To-Be*).

The results of the *As-Is* process mapping showed that the packaging process was performed manually without clear quality checks or work standards. The cut tofu was packaged immediately while its texture was still soft, making it prone to damage such as crushing or denting. Additionally, differences in work methods among workers led to inconsistencies in packaging results.

As a corrective measure, using a BPM approach, a *To-Be* process was designed by adding a quality inspection step before packaging and extending the cooling time to ensure the tofu's texture is more stable and less prone to damage during handling.

c. Defect Rate

The defect rate in this study was used as a descriptive indicator to characterize the quality of tofu during the packaging stage at the Krukut Tofu Factory. Data were collected through field observations, and interview results were used as supporting data to identify patterns of product defects.

This study focuses on analyzing the causes of product defects, rather than on statistical measurements of defect rates. This approach aligns with the nature of qualitative research, which emphasizes a deep understanding of operational phenomena in the field.

Based on the observation results, the most frequently found defects during the packaging stage include broken tofu, irregular shapes, and untidy packaging arrangements. These conditions indicate that the packaging stage is a critical point in the overall production process.

The frequency categories in the table are determined based on the intensity of defect occurrence during field observations, where the "high" category indicates findings that appear dominantly in nearly every packaging cycle, while the "moderate" category indicates findings that appear periodically but are not dominant.

To provide an overview of the dominant defect characteristics during the packaging stage, the observation results are summarized in Table 4.1 below.

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Table1 s of Defects in the Tofu Packaging Process

No	Defect Type	Description	Dominant Frequency
1	Cracked Tofu	Broken pieces when moved	Height
2	Irregular Shape	Varying sizes	Medium
3	Unneat Packaging	Unstable arrangement	Moderate – High

Source: Compiled by the researcher (2026)

Interview results support this data. One informant, W1, stated:

"If we're in a hurry, we usually handle them a bit roughly, so they tend to break. But if we go slowly, we don't have enough time."

Meanwhile, another worker (W2) added:

"This tofu has a soft texture, so even a slight mistake during handling can cause it to lose its shape, especially when hands are slippery."

These findings indicate that time constraints, manual handling techniques, and the texture characteristics of the tofu are the primary factors contributing to the occurrence of defective products during the packaging stage. This reinforces the observation that the packaging process is the most critical point in the entire production flow.

d. Root Cause Analysis (*DMAIC – Analyze*)

Root cause analysis was conducted by integrating field observations, in-depth interviews, and production process documentation. This approach was used to identify the dominant factors causing defective products during the packaging stage.

Table 2 of Root Causes of Defective Products

No	Factor	Findings	Impact
1	Material	Soft texture of tofu	Product is fragile
2	Method	Manual transfer	Unstable pressure

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3	Labor	Variation in skill level	Quality inconsistencies
4	Tools	No tools available	Risk of deformation
5	Time	Tight packaging deadlines	Workers are rushing

Source: Compiled by the researcher (2026)

e. Evaluation of BPM Implementation

Based on the results of observations, interviews, and document analysis, it was found that *Business Process Management* (BPM) has not yet been formally implemented at the Krukut Tofu Factory. This situation is evident from the absence of the basic elements of BPM that should form the foundation of business process management. This finding indicates that production activities still rely on the experience and habits of workers, rather than on a standardized work system.

1) No SOP (*Standard Operating Procedure*)

During the research process, no written SOP documents were found that regulate the steps of work execution, particularly during the packaging stage. Without SOPs, workers:

a) Do not have a standard reference for performing their tasks.
b) Tend to use different methods.
c) Do not have standards regarding hand pressure, the number of layers, how to move, or how to arrange the tofu.

Informant O1 stated in an interview:

"No specific SOP has ever been created. So far, workers have just followed their usual practices."

2) Lack of a Production Process *Flowchart*

In the concept of *Business Process Management* (BPM), the existence of *a flowchart* is crucial as it serves as a tool to visualize the entire process. However, at the Krukut Tofu Factory, no production or packaging process *flowchart* was found. This situation leads to several consequences, namely:

a) Workers only understand the tasks in their respective sections without knowing the overall process flow.
b) Coordination between departments is suboptimal.
c) Potential process errors are difficult to identify systematically.
d) Process improvement evaluations lack a clear visual reference.

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f. Designing the Improved Process (*To-Be Process*)

Improvement solutions developed during the *Improve* phase *of* the DMAIC approach include:

1) Development of New Packaging SOP

The SOPs were developed to establish uniform work standards for all workers by systematically defining packaging steps.

2) Use of Tofu Handling Tools

The use of handling aids is proposed to reduce the risk of product damage caused by direct pressure during tofu transfer.

3) Worker Training

Training focuses on the implementation of SOPs, the use of handling aids, and proper tofu handling techniques to reduce the risk of defective products.

4) New Process Mapping

A new process mapping is conducted to visualize the workflow after improvements, from tofu transfer to quality inspection before final packaging.

1. Discussion and Interpretation of Research Findings

a. Alignment of Findings with BPM Theory

According to Dumas et al. (2018), *Business Process Management* (BPM) emphasizes the importance of process mapping, standardization, and documentation as the primary foundations for creating structured, measurable, and sustainable business processes. This principle served as a reference in evaluating the operational conditions at the Krukut Tofu Factory. The field findings align with this theory, particularly because the production conditions at Krukut Tofu indicate:

1) Undocumented Processes

Production and packaging processes at the Krukut Tofu Factory are carried out entirely based on the workers' habits and tacit knowledge. There are no formal documents such as SOPs, work instructions, operational guidelines, or process step records that can serve as a common reference.

Informant O1 stated: *"We've never had any written procedures. Everything is based on experience alone."*

Informant W1 stated: *"When we work, we just get right to it. We've known the process by heart for a long time; there are no books or written instructions."*

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2) High Work Variation

Work variation also contradicts the BPM principle of *process repeatability*, which states that a process should produce the same output even when performed by different people.

Informant W2: *"Everyone has their own way. Some are fast, some are slow. Sometimes, when we're chasing a deadline, the pressure is stronger."*

Informant W3: *"I usually lift two layers at once, but others do it one by one. It depends on personal habits."*

3) No Standardization

The absence of standards also indicates that the factory has not yet implemented the BPM cycle *analyze–redesign–implement–monitor*.

Informant W4: *"We've never been given any guidelines on how to hold or arrange the tofu. As far as we're concerned, the main thing is that it looks neat."*

Informant O1: *"There are no standards yet. We're still figuring out the best way, which is why this research is important."*

Meanwhile, the *To-Be* design proposes SOPs and *flowcharts* in line with BPM concepts regarding *process design* and *continuous improvement*.

b. Interpretation of Defects from a *Quality Control* Perspective

According to Garvin (1987), process stability is one of the key indicators in quality control because it determines a production system's ability to produce consistent output in accordance with established standards. When process stability is low, the likelihood of variation and defective products increases.

1) Manual techniques cannot produce uniform output

According to Garvin (1987), quality is heavily influenced by a process's ability to produce consistent output. In manual processes, each worker uses different hand strength, speed, and techniques, making it difficult for the final results to be uniform. Reliance on individual skills leads to variations in shape, thickness, and the physical condition of the tofu because there is no control mechanism ensuring uniformity in every work cycle.

2) Pressure and handling methods vary significantly

Garvin (1987) explains that *process variation* is directly related to the defect rate. At the Krukut Tofu Factory, differences in how workers lift, press, and place the tofu result in variations in pressure on the product. These variations pose the risk of the tofu

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breaking, deforming, or becoming unstable when stacked. The greater the variation in actions during the handling process, the lower the quality stability that can be achieved.

3) No quality standards

According to Garvin (1987), quality standards are necessary to ensure that products fall within acceptable quality limits. The absence of quality standards at the Krukut Tofu Factory means that workers lack guidelines regarding ideal size, permissible shape, damage limits, or proper packaging methods. Without documented standards, the process becomes unmeasurable and uncontrollable, making it difficult to prevent defective products.

c. Discussion Based on DMAIC

1) *Define* (Main Problem): The main problem identified at this stage is the high rate of defective products during the packaging stage. Defects such as broken tofu, irregular shapes, and untidy packaging were consistently found in the daily output.
2) *Measure* (Initial Conditions): Initial measurements indicate that high production volume (±3 quintals of soybeans per day), short processing times, and same-day delivery targets force workers to work quickly, thereby increasing the risk of defects.
3) *Analyze* (Root Cause): The analysis identified that the manual process of moving and arranging tofu—performed without tools or standard operating procedures (SOPs)—is the primary root cause of defects. Variations in work techniques further compromise process consistency and stability.
4) *Improve* (Solution): The improvement phase includes the use of tofu-handling tools, the development of packaging SOPs, worker training, and the reorganization of the work area to support ergonomics and process consistency.
5) Control: This phase is implemented through monthly monitoring, the use of daily packaging *checklists*, evaluation of compliance with SOPs, recording of defective product counts, and periodic internal evaluation meetings. These control measures aim to ensure that process improvements are implemented consistently and in a measurable manner.

d. Alternative Solutions and Long-Term Implementation

Based on the research findings, there are several long-term alternative solutions that can be implemented to maintain quality stability and minimize the risk of defective products at the Krukut Tofu Factory, including the following:

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1) Appointing a supervisor in the packaging department

The appointment of a supervisor in the packaging department aims to oversee the implementation of work processes, ensure the consistent application of standard operating procedures (SOPs), and conduct product quality inspections prior to distribution ( ). With a supervisor in place, the potential for errors in the packaging process can be minimized.

2) Development and implementation of packaging SOPs

The development of packaging SOPs is necessary as a work guideline for employees so that the packaging process is carried out uniformly and in accordance with established quality standards. The implementation of these SOPs is expected to reduce variations in work methods that could potentially cause damage or defects to the tofu products.

3) Providing regular training and evaluating worker performance

Regular training is necessary to improve workers' understanding and skills in performing the packaging process correctly. Additionally, routine performance evaluations can serve as a basis for continuous improvement and enhanced work quality.

4) Implementation of quality checks prior to distribution

Quality checks before products are distributed aim to ensure that the tofu products sent to partners meet established quality standards. This step can help reduce the number of defective products reaching consumers.

5) Implementation of continuous process improvement

The Krukut Tofu Factory is advised to conduct regular monitoring and evaluation of the packaging process to identify potential issues that may arise. This continuous process improvement aligns with the principles *of Business Process Management* (BPM) and the DMAIC approach in the pursuit of continuous quality improvement.

6) Integrating daily *checklists* into work processes

The integration of daily *checklists* into work processes aims to ensure that every stage of packaging is carried out consistently in accordance with established standards. *Checklists* serve as a tool for workers to minimize oversights and enhance precision in work processes. According to Gawande (2010), *checklists* are simple yet effective tools for minimizing procedural errors in manual work because they help improve the consistency of task execution, operator precision, and adherence to established procedures.

Research findings indicate that product quality consistency is a critical factor in maintaining sustainable partnerships with business partners. Therefore, the

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implementation of packaging process improvements must be carried out continuously to ensure product quality remains consistent with the standards expected by partners.

CONCLUSION

1. Production Process Conditions and Quality Control

The production process at the Krukut Tofu Factory remains conventional and relies on work experience. Production stages begin with soaking soybeans for approximately 3 hours, followed by boiling, adding starter culture, molding, and packaging. In a single day, the factory can produce approximately 3 quintals of tofu, distributed directly to regular partners.

However, the quality control system has not been formally documented. Quality checks are only conducted visually at the final stage, particularly during packaging. This situation results in the continued presence of defective products such as cracked, crumbled, and irregularly shaped tofu. Consequently, quality control remains reactive and is not yet based on Standard Operating Procedures (SOPs).

2. Packaging Process Analysis Based on BPM (*As-Is*)

Based on an analysis using the *Business Process Management* (BPM) approach through *As-Is* process mapping, it was found that the packaging process does not yet have a structured and systematically documented workflow. Some of the main issues identified include:

a. Lack of standards for handling tofu before packaging
b. No sorting process prior to packing
c. Lack of quality control at each stage
d. Potential *bottlenecks* in the final production stage

The packaging stage is *a* critical *point* because it is the final process before distribution. Irregular workflows and the absence of proper procedures are the main factors causing a high rate of defective products.

3. BPM-Based Packaging Process Improvement (To-Be)

Based on the analysis results, a packaging process improvement was designed through a BPM-based *To-Be* mapping. The proposed improvements include:

a. Adding a sorting stage before packaging
b. Development and implementation of packaging SOPs
c. Establishment of quality control at every stage of the process

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d. Clearer division of tasks among workers

These improvements result in a more systematic, structured, and controlled workflow. With quality evaluation prior to packaging, the rate of defective products can be minimized and production process efficiency improved.

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