

## **MANAGING WASTED GOODS OF PERISHABLE ITEMS USING SIX SIGMA FRAMEWORK: CASE OF FOOD & BEVERAGE DIVISION OF HORISON HOTEL**

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*Abstract – Horison Hotel is a commercial business whose runs in hospitality business sector. Nowadays, the hospitality industry not only play a key role in toursim and hotel culture only, but also driving up for food and beverage revenues. It makes the food and beverage division becomes important, especially for breakfast service. Food and beverage division of Horison Hotel face waste problem where the number of waste stream exceed the number of waste allowance. Thus, this research is conducted to aim breakfast preparation amount more specifically which can resulting in waste reduction by implementing six sigma framework.*

*Keywords – Six Sigma, Waste Management, Food and Beverage, Hotel*

### **Intorduction**

The hospitality industry is one of the fastest growing business sector globally. It has always played a key role in the tourism and hotel culture. Nowadays, the booming business and toursim trades are driving up for food and beverage revenues. Higher food and beverage revenue also comes at a higher cost, unlike in rooms where the cost of maintaining a room are much lowers [1]. Horison group had been operating more than 25 hotels in Indonesia with different segment classes. As an entrepreneurial firm which seeks for maximum profit, Horison group tries to emphasize their operational management by reducing food waste. It is one of the most difficult tasks encountered, because perishable goods like food and beverage have limited life, therefore there is always a risk of their deterioration. Spoilage of perishable items not only contributes to production cost, but also waste cost [2].

Because of the importance of managing the waste food, this research will be focusing on identifying on what cause the food waste, with the goals to find the most efficient solution to Horison Hotel. Based on the background above, the objective of this study is:

1. To map the business process of operational system in food and beverage division of Horison Hotel.
2. To analyze the waste level and waste cost in food and beverage division of Horison Hotel.

3. To purpose the most appropriate food management model that could achieve number of waste allowance.

## **Theoretical Framework**

### **A. Six Sigma**

Six sigma is considered as a methodology of implementing the total quality management (TQM). Six sigma is an innovative approach to continuous process improvement and a TQM methodology [3]. There are two methodologies for six sigma, which are DMAIC process and DMADV process [4]. But, this research will only use the DMAIC process.

1. Define: Define problem improvement activity, opportunity for improvement, project goals, and customer requirements.
2. Measure: Measure process performance.
3. Analyze: Analyze the process to determine root cause of variation, poor performance (defects).
4. Improve: Improve process performance by addressing and eliminating the root cause.
5. Control: Improved process and future process performance

### **B. Waste Management**

Waste is useless consumption or expenditure and use without adequate return. According to Ohno (1988), there are seven categories of waste in waste management [5]. These seven waste are categories of unproductive manufacturing practices, which are:

1. Transportation: Waste occurs any time goods or materials are moved.
2. Inventory: Waste occurs because of producers of any type of goods and services some inventory is needed.
3. Motion: Any movement of people that does not add value to the product or services.
4. Waiting: Occures anytime people are queued up.
5. Overproduction: Occurs when a company produces more than its customer needs.
6. Overprocessing: Waste occurs when it is doing work more than is necessary.
7. Defects: Any work that is less than the level the customer requested.

## **Methodology**

### **A. Research Method**

To solve the problem in this research, the research will be constucted by implementing six sigma framework's DMAIC (define, measure, analyze, improve, control).

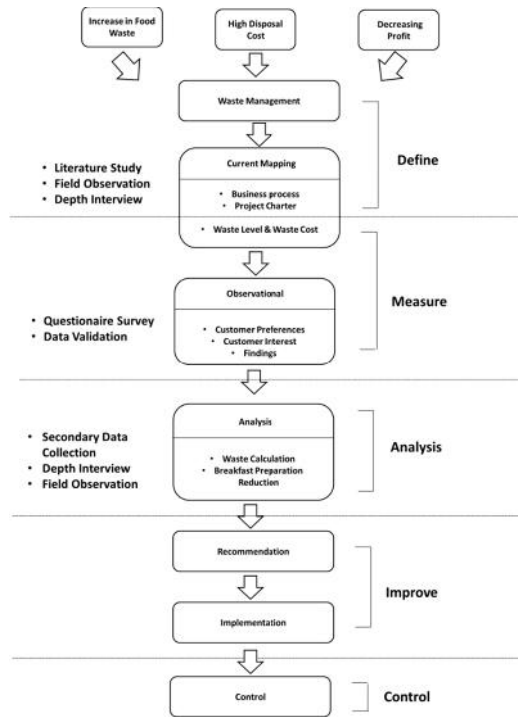


Figure 1 Research Framework

In define, this research define problem activity through business process mapping and project charter. Defining business process will be divided into 4 major steps, planning, purchasing & receiving, storage, and cooking. While project charter provide project outline and can be used for measure basis.

Table 1 Project Charter

Project Charter	
Project Context	Encounter waste problem
Project Objective	Reduce waste to below 5%
Project Scope	Breakfast service
Methodology	Qualitative method by implementing six sigma framework
Key Output	Proposed recommendation to reduce breakfast preparation amount
Risk	Reduce preparation will increase risk of stockout

In measure, this research measuring the waste and customer’s interest. Then in analyze, this research calculate the waste level and analyze the breakfast preparation reduction using classification analysis. In improve, this research constructed proposed method to reduce the waste. And in control, this research tries to improve operational system through proposed recommendation to be implemented in the future.

### B. Data Collection

To collect the data, this research will be using historical data, such as breakfast cost data & waste observational data and depth interview with stakeholders of Hersion Hotel.

## Data Analysis

### A. Cause and Effect Analysis

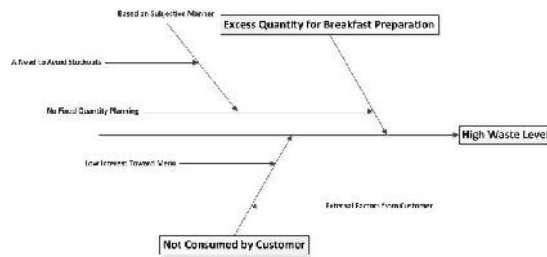


Figure 2 Cause and Effect Diagram

Based in cause and effect diagram above, we found that food and beverage division of Horison Hotel needs to improve their planning activity to determine the right amount of breakfast preparation to reduce the waste.

### B. Breakfast Component

In this research, there are 12 components of breakfast service that will be analyzed, which are: cereal, porridge, hot dishes, soup, pastry, salad, japeese corner, fruit station, coffee & tea station, egg & waffle station, milk, and juice. By using voice of customer data, this research constructed breakfast component ranking toward customer's interest. The ranking defines the chance of consumption that will affect determination for reduction amount.

### C. Waste Level

Waste level can be calculated with following equation:

$$Waste\ Level = \frac{Total\ Waste\ Cost\ (Rp)}{Expected\ Revenue\ (Rp)}$$

In existng condition, the waste level shows that it exceeds the number of waste allowance (below 5%) which shows 7,82% of waste level.

### D. Food Allocation

Food Allocation is one of Horison Hotel strategy to reduce waste. Food Allocation strategy tries to re-use waste food from breakfast service and allocating it as ingredient material for another service. So, it can reduce waste food while saving preparation cost for another service. But, Food Allocation strategy can only be used for certain foods and beverages, dependes on its menu type and characteristic. The importance to consider food allocation possibility is because this strategy is use to consider breakfast prioritization.

### E. Waste Type

This research also need to consider which type of waste that occured in food and beverage division of Horison Hotel. The determination of waste type is important because it will affecting the prioritization of components and determination of reduction amount. Among 7 types of waste, the waste that occured in food and beverage division of Horison Hotel is overproduction. So, to encounter waste in overproduction, this research proposing to reduce the amount of preparation.

F. Breakfast Prioritization

To construct proposed recommendation, this research will sort prioritization for each component. To sort prioritization for each component, this research will be using classification analysis. The classification analysis used to sort the components by considering several variables, which are the food allocation possibility, waste level, and customer’s interest level. The classification analysis will be performed twice. First classification analysis will be perform to define degree of importance for each breakfast component and the second classification analysis will be use to determine the number of reduction for each component. First classification analysis will sort all components into 4 quadrants. Each quadrant has its own requirements regarding its waste level and allocation possibility. The waste level will be defined as high or low level. The waste level defined as high if the component has waste level above 50% and low waste level is the opposite. While, the allocation possibility will be defined as yes / no option.

Table 2 Prioritization Quadrant Requirements

Quadrant	Waste Level	Allocation Possibility
1	High	No
2	Low	No
3	High	Yes
4	High	Yes

Based on the requirements above, having no at allocation possibility will increase the urgency. So, quadrant 1 will be consider as high importance, quadrant 2 will be consider as low importance, and quadrant 3 and quadrant 4 will be consider as safe. Then, second classification analysis will determine the amount of reduction for each component. Second classificaton analysis will divide each component into 5 segments. These segments constructed by considering quadrant position which define importance degree and voice of customer data which define chance of consumption through customer’s interest data. High ranking in voice of customer data define that the component is customers’ favorite which indicate high chance of consumption, while low ranking position is the opposite.

Table 3 Segment Requirements

Segment	Requirements	
	Quadrant Position	Ranking Position
1	High Importance	Low
2	High Importance	High
3	Low Importance	Low
4	Low Importance	High
5	Safe	High / Low

G. Waste Reduction

The segmentation position from classification analysis will be use to determine the amount of reduction. This research tries to reduce the waste stream at least below the number of waste allowance, where the number of waste allowance is 5%. By using calculation, this research will set subjective reccomendation to use 5% as basis range for reduction number. Moreover, based on the segmentation above, it can be consider that segment 5 as the

safest segmentation will get smallest amount of reduction, which is 5% and the other segments will follow suit number range.

Table 4 Breakfast Component Reduction Amount Based on Segmentation

Segment	Breakfast Component	Reduction
1	Porridge	25%
2	No Component	20%
3	Soup	15%
	Milk	15%
4	Hot Dishes	10%
	Japanese Corner	10%
	Egg & Waffle Station	10%
5	Fruit Station	5%
	Coffee & Tea Station	5%
	Juice	5%
	Pastry	5%
	Cereal	5%
	Salad	5%

#### H. Proposed Recommendation

Refer to the table 4 above, this research will purpose new preparation number as stated below:

Table 5 Proposed Preparation Number Based on Segmentation

Segment	Breakfast Component	Proposed Recommendation
1	Porridge	75%
2	No Component	80%
3	Soup	85%
	Milk	85%
4	Hot Dishes	90%
	Japanese Corner	90%
	Egg & Waffle Station	90%
5	Fruit Station	95%
	Coffee & Tea Station	95%
	Juice	95%
	Pastry	95%
	Cereal	95%
	Salad	95%

In existing condition, the waste level shows that it exceed the number of waste allowance, which shows 7,82% of waste level. By applying proposed recommendation to reduce the amount of breakfast preparation, it can reduce the number of waste below its allowance number. The proposed method shows it can reduce the waste level from 7,82% to 4,68%, which below the number of waste allowance.

Table 6 Comparison Existing and Proposed Recommendation

Comparison	Cost Level	Waste Level	Actual Consumed
Existing	27,79%	7,82%	21,97%
Proposed	27,11%	4,68%	21,97%

Also, by using proposed recommendation, the hotel management can reduce the number of waste level while avoiding stockout, because each component has its own consideration that prevent stockout. Not only that, by using proposed recommendation, the hotel management can also reduce breakfast cost level which can save hotel management from purchasing expenditure and increase company profit.

## Conclusion

Food and beverage division of Horison Hotel faces waste problem where the total amount of waste exceed the number of waste allowance beside that they must avoid stockout. Thus, the waste problem occurred because of the executive chef conducted the amount of breakfast preparation in subjective manner. The executive chef prefer to have high level of preparation to avoid stockout that lead to high level of waste. By implementing six sigma framework's DMAIC (define, measure, analyze, improve, and control), proposed solution is provide to food and beverage division. Proposed solution is to reduce the amount of preparation by considering customer behavior toward breakfast component. Based in the comparison result, the proposed method can reduce the waste level below the number of waste allowance. It can also reduce breakfast cost level which can save hotel management from purchasing expenditure.

In conclusion, proposed recommendation that conducted in this research has proven that it is better than existing system. For further research, the scale of this research can be expanded for another service, such as lunch service and banquet service. The topic can also be expanded into inventory management. The result of this research only aim to manage and reduce waste only, therefore there is a need to expand the topic into inventory management which can affect material management for preparation needs. By using inventory management, it can improve the accuracy of measuring the amount of preparation.

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