The Antecedents of Defective Products And it's Effect on Company Profit

A Study of Indonesian Small and Medium Size Enterprises

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Abstract

Defective products sometimes are delivered from production process. This product must be repaired or sold with lower price. But the worst thing will happen if the customers receive the defective products; it will cause customer's dissatisfaction. Spoilage goods is an internal failure cost, which is cost incurred when a nonconforming product is detected before it is shipped to customer. For small and medium size enterprises in Indonesia, which the profit is also relatively small; spoilage or defective products could cause a lot of financial loss and have a significant effect on their profitability. Defective products can be caused by many things and should be corrected to avoid any further spoilage. This paper evaluates the antecedent of defective products, for example mans, materials, machines and methods, and also examines its impact on the profit of small and medium size enterprises.

Keywords: defective product/spoilage, profit, small and medium size enterprise

Introduction

In a very competitive business world, many companies compete each other by providing the best customer value. It is caused by the guidance concept that to attract customer's attention is by delivered value. Value is customer's estimation about product's capacity to satisfy several purposes. Customers are able to rank the most wanted until the less wanted or unwanted product. A product will be placed as a most wanted product because it has the highest value for its customer.

One of the most avoided things is customer's dissatisfaction which is caused by receiving the product which is not appropriate with expected value, but sometimes defective products are delivered from production process. This product must be repaired or sold with lower price, and the worst thing will happen if the customers receive the defective products; it will cause customer's dissatisfaction. For small and medium size enterprises, which the profit is also relatively small; defective products could cause a lot of financial loss and have a significant effect on their profitability.

Defective products can be caused by many things and should be corrected to avoid any further spoilage.

The purpose of this research is to identify the factors which caused defective products and to analyze how significant those factors give an effect on the loss of spoilage goods in small and medium business. This research is also want to know how significant the effect of the defective products on small and medium enterprises' profit.

The next section of this paper draws on previous literature to develop the theoretical framework for this study. Conceptual model and the hypotheses are summarized in this section. The subsequent sections address the research method, results and conclusion.

Literature Review and Hypotheses Development

In his famous book Competitive Advantage: Creating and Sustaining Superior Performance, Michael E. Porter (1985) described Generic Strategies, which divided into 2 main strategies:

- Differentiation
- Cost Leadership

Differentiation is not just to be different, but we also have to have a product or service which is unique and has a high value according customer's demand, cost leadership means that we can rule a company with lower cost if it is compared to competitor.. In to day situation, we can translate both strategy further, it means that to have a competitive advantage to win the competition, we must produce the high quality of products or services and being produced that products by efficient cost.

According to Philip Kotler (2000), a product is anything that can be offered to a market to satisfy a want or need. Products are everything that can be offered to the market with various forms, not only in physical form, which can fulfill the customer's need or want.

In the other hand, Quality is totality of the features and characteristics of a product or service that bear on its ability to satisfy implied or stated need (Besterfield,1994).

Quality is the total composite product and service characteristics of marketing, engineering, manufacture, and maintenance through which the product and service in use will meet the expectations of the customer (Feigenbaum, 1991).

The important thing from quality is to understand the demand from customer and how the company can fulfill that demand.

Quality itself can be divided into 2 categories:

1. Quality of design is the product quality which is formulated into several level according to market survey, cost efficiency research and management demand to always fulfill the customer's satisfaction.
2. Quality of conformance is a formulated quality which is based on the appropriateness from the product and design quality. There are two things that are able to defect quality of conformance, which are the disobeyed working standard or a bad working standard.

There is a cost needed to be able to satisfy the customer by delivering quality product or have values as the customer want. This cost is known as cost of quality.

According to Horngren, Foster, dan Datar (2003), quality cost can be defined as follows:

"The cost of quality (COQ) refers to the costs incurred to prevent, of costs arising as a result of, producing a low-quality product. These costs focus on conformance quality and are incurred on all business functions of the value chain."

Hansen and Mowen (2003) stated that cost of quality is:

".....those activities performed because poor quality may or does exist. The costs of performing these activities are referred to as costs of quality. Thus, costs of quality are the costs that exist because poor quality may or does exist."

Kaplan and Atkinson (1998) define the cost of quality as follows:

"The cost of quality (COQ) approach collects all costs currently being spent on preventing defects and fixing them after they have occurred. The cost of quality, also called the cost of nonconformance, attempts to compute a single aggregate measure of all explicit costs attributable to producing a product that is not within specifications."

Besterfield (1994) also described the definition of cost of quality as follows:

"Quality costs are defined as those costs associated with the non-achievement of product or service quality as defined by the requirements established by company and its contracts with customer and society. Simply stated, it is the list of poor product or service."

Based on the definitions above, we can conclude that cost of quality is not only the cost which occurs because of bad quality which do not meet the standard/specification. But also include the costs to prevent the cost which caused by the bad quality. There for a proper action need to be taken to decrease those costs.

According to American Society for Quality Control (2000), the cost of quality can be categorized into:

1. Prevention costs – costs incurred for planning, implementing, and maintaining a quality system that will assure conformance to quality requirements at economic levels.
2. Appraisal costs – costs incurred to determine the degree of conformance to quality requirements.
3. Internal failure costs – costs arising when products, components, and materials fail to meet quality requirements before transfer of ownership to customer.
4. External failure costs – costs incurred when products fail to meet quality requirements after transfer of ownership to customer.

Prevention costs are costs which occur because of preventing products which are not in accordance with specification. These costs include:

a. Market research cost. This cost occurs in a continuous gathering and evaluation about customer's needs & quality perception which effect satisfaction in using company's product or services.
b. Quality planning cost, e.g.: quality targeting cost, controlling planning cost to set a reliable quality target.
c. Product designing cost and production process. This cost occurs to translate the customer and user's need to be reliable standards and conditions.
d. Training program cost
e. Cooperation cost with supplier to increase the quality of material and supplier selection cost. Sub element from this cost are supplier review, supplier rating, technical data review for purchase order, supplier quality planning
f. Maintenance cost for equipment and machinery to do the production process

Appraisal cost is the costs to detect product units which do not meet the specification. According to Dale H. Besterfield (1994) these costs are:

a. Purchasing Appraisal Costs

   These costs are inspection and test for material, equipment or services to decide whether those are accepted to be used or not.
b. Operations (Manufacturing or Service)

   These are costs needed to inspect, test or audit to decide and make sure whether a product or service can be accepted and forwarded into the next step from operation planning from production until the delivery to customer.

c. External Appraisal Costs

   Generally this cost will occur whenever needed for every setup or field installation and to check before the products are delivered to customer and also needed for field check for new product or service.

d. Review of Test and Inspection Data

   This is the cost to inspection review and data test frequently before the product are sent, such as to decide whether the product qualification has been fulfilled or not.

e. Miscellaneous Quality Evaluations

   These costs include all of the quality evaluation from the supporting parts to assure its ability in giving its support to production process.

Internal failure costs are the result from producing product which do not meet the quality standard and are found before it is sent to customer. These costs include:

a. Rework, spoilage, and scrap cost

   Usually this cost represents the important portion from the whole quality cost and generally can be seen as a defective products related which are found during the production process.

b. Production process delay cost or production facility repair cost which are caused by damaged product (spoilage).

c. Product or Service Design Failure Costs (Internal)

   Generally this cost is seen as incidental cost which is caused by nonconforming design documentation which is issued for the production process.

d. Sales discount for product which do not meet the quality standard

External failure costs are costs which are occurred due to product which not fulfill the customer's quality standard. This cost includes:

a. Customer's complaint and claim response cost.

   This cost include the investigation total cost, problem solving and response cost for individual customer or complaint or user's questions, including several needed services.

b. The returned goods guarantee. This cost includes the total evaluation, repair or replace goods which are not received by the customers because of the quality problem.

c. Repairing cost or delivery cost from returned goods. This cost include the total cost from customer's claim, also the repair cost, e.g. : broken hardware moving from a system

d. Further claim cost from customer because they receive a product which is not fulfill the quality standard. The cost which has to be paid by company because of responsibility claim, including the product or service's insurance cost.
e. Penalty cost is the cost caused by product or service which did not reach the standard which was stated in the contract with customer or government regulation.
f. Lost sales is contribution value to the lost profit because of decrease sales which is caused by quality problem

Small businesses are common in many countries, depending on the economic system in operation. A small business may be defined as a business with a small number of employees. These businesses are normally privately owned corporations. Small businesses often face a variety of problems related to their size,and one of them is defective products. Defective products, one of internal failure cost, also known as spoilage. According to Horngren, Datar, and Foster (2003) spoilage is "Unacceptable units of product that are discarded or are sold for reduces price. Partially completed or fully completed units of output may be spoiled." For small and medium size enterprises, which the profit is also relatively small; spoilage goods could cause a lot of financial loss and have a significant effect on their profitability.

In the manufacturing industry, defective goods like spoilage or rework usually cause by several categories. Kaoru Ishikawa, who pioneered quality management processes, with his famous fishbone diagram or cause and effect diagram, divided the caused of problem in manufacturing industry into five categories; Manpower, Machinery, Materials, Methods and Others like environment.

Based on previous discussion above, the following hypotheses were formulated for investigation in present study:

H1: Number of defective products caused by human error has a positive effect on total financial loss of defective products.

H2: Number of defective products caused by machinery has a positive effect on total financial loss of defective products.

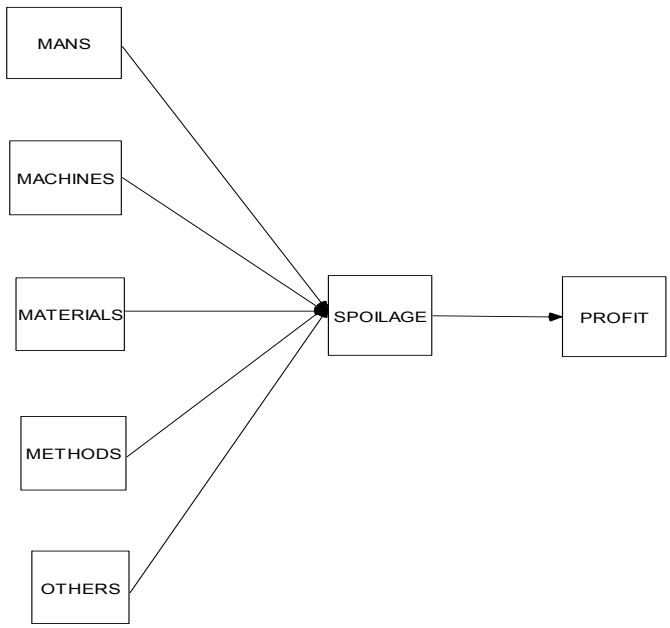
H3: Number of defective product caused by materials has a positive effect on total financial loss of defective products.

H4: Number of defective products caused by production methods has a positive effect on total financial loss of defective products.

H5: Number of defective products caused by others than human error, machinery, materials and production methods has a positive effect on total financial loss of defective products.

H6: Financial loss of defective products has a negative effect on small and medium size enterprises' profit.

The conceptual model of these relationships is presented below:



Mans = defective products caused by human error
Machines = defective products caused by machinery
Materials = defective products caused by materials
Methods = defective products caused by production methods
Others = defective products caused by others than human error, machinery, materials and production methods
Spoilage = Total Financial loss of defective products
Profit = Small and Medium Size enterprises' profit.

Research Method

There many small and medium business enterprises located in West Java-Indonesia, but so very difficult to collect the data about defective products from them. The data was collected only from 31 small and medium business enterprises, located in West Java-Indonesia, which they business are in the garment industry. The criteria

of small and medium size enterprises is if the number of workers employed is about 20-150 persons. The data was collected by interviewing the owners and or the production manager, and also from their writing documents. The data was collected by interviewing the owners and or the production manager, and from their writing documents. The relationship of the variables is examined using path analysis with LISREL. Path analysis is a statistical method which can used to test causal relationship within one or more variable. Path analysis involves the analysis of sets of relations between variables, so that one dependent variable may be an independent variable in other dependence relationship. With this method, we can study direct and indirect effects of independent variables on dependent variables.

Measurement of the variable was presented below:

- Mans = defective products caused by human error as percentage of total defective products.
- Machines = defective products caused by machinery as percentage of total defective products
- Materials = defective products caused by materials as percentage of total defective products
- Methods = defective products caused by production methods as percentage of total defective products
- Others = defective products caused by others than human error, machinery, materials and production methods as percentage of total defective products
- Spoilage = financial loss of defective products as percentage of revenue
- Profit = profit as percentage of revenue

Results

Descriptive Statistic is presented in the table below:

Variable	Mean	Median	Minimum	Maximum	Std. Deviation
Mans	15.4	15	7	24	0.758
Machines	33.90	33	24	65	1.45
Materials	33.22	34	13	46	1.15
Methods	10.64	10	3	18	0.8
Others	6.80	7	30	14	0.7
Spoilage	4.6	5	1	8	0.4
Profit	18.38	18	8	40	1.16

Fit for the model is presented in the table below.

	ActualResult	Recommended
GFI	0.93	≥ 0, 80 Cheng (2001); Gregson, Wendell and Aono (1994).
IFI	0.99	≥ 0,90 (Ghozali,2004)
CFI	0.99	≥ 0,90 Donnelly, Quirin and Bryan (2003); Browne and Cuddeck,1993
NFI	0,98	≥ 0,90 Donnelly, Quirin & Bryan (2003)

A path analyses were carried out to investigate the influence of the selected independent variables on dependent variables in this study. These are shown in the tables in the next page.

Regression Weights:

			Estimate	CR	P
Spoilage	<---	Mans	0.083	74.59	0.0011
Spoilage	<---	Machines	0.072	58.20	0.0012
Spoilage	<---	Materials	0.450	37.63	0.0120
Spoilage	<---	Methods	0.095	42.34	0.0023
Spoilage	<---	Others	0.005	35.94	0.0001
Profit	<---	Spoilage	-0.050	0.02	-0.25

Here it can be seen that, at confidence level 95%, p< 0.05:

- Defective products caused by human error have statistically significant influences on financial loss of defective products (betas=0.083, p=0.0011).
- Defective products caused by machinery have statistically significant influences on financial loss of defective products (betas=0.072, p=0.0012).
- Defective products caused by materials have statistically significant influences on financial loss of defective products (betas=0.450, p=0.0120).
- Defective products caused by production methods have statistically significant influences on financial loss of defective products (betas=0.095, p=0.0023).
- Defective products caused by others than human error, machinery, materials, and production methods have statistically significant influences on financial loss of defective products (betas=0.005, p=0.0001).
- Financial loss of defective products has **not statistically significant** influences on Profit (p=-0.25).

Based on that statistic analysis:

H1: defective products caused by human error has a positive effect on total financial loss of defective products.

is supported, this result means that in small and medium size enterprises in West Java-Indonesia, defective products caused by human error has a positive effect on total financial loss of defective products.

H2: defective products caused by machinery has a positive effect on total financial loss of defective products.

is also supported, and this result means that in small and medium size enterprises in West Java-Indonesia, defective products caused by machinery has a positive effect on total financial loss of defective products.

H3: defective products caused by materials has a positive effect on total financial loss of defective products.

is also supported, and this result means that in small and medium size enterprises in West Java-Indonesia, defective products caused by materials has a positive effect on total financial loss of defective products.

H4: defective products caused by production methods has a positive effect on total financial loss of defective products.

is also supported, and this result means that in small and medium size enterprises in West Java-Indonesia, defective products caused by production methods has a positive effect on total financial loss of defective products.

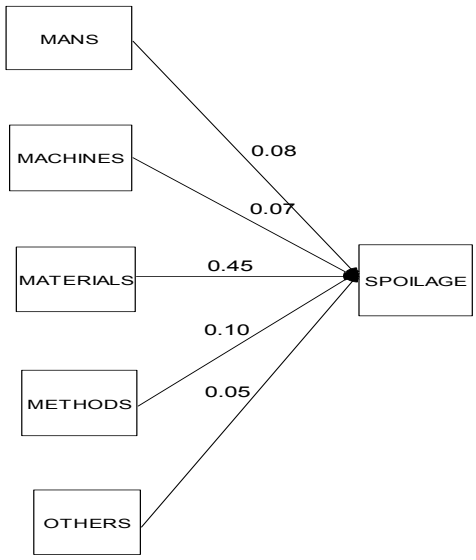
H5: defective products caused by others than human error, machinery, materials and production methods has a positive effect on total financial loss of defective products.

is also supported, and this result means that in small and medium size enterprises in West Java-Indonesia, defective products caused by others than human error, machinery, materials and production methods has a positive effect on total financial loss of defective products.

H6: Financial loss of spoilage goods has a negative effect on small and medium size enterprises' profit.

, **is not supported.** This result means, that in small and medium size enterprises in West Java-Indonesia, statistically, financial loss of defective products has no significant negative effect on profit.

The final result of the model is presented below :



Conclusion

From the statistical analysis and discussion above we can take a conclusion that human error, machines , materials, production methods and others are the caused of defective products or spoilage in 31 small business enterprises in West Java – Indonesia. The impact of mans, machines, materials, methods and others, are shown in the final model. Materials, statistically, is the biggest factor which influence financial loss of defective products , maybe because the raw material they used for productions is not number one quality. On the other hand, the loss of defective products has no impact on small business profit, and maybe this result is an indication that in small business enterprises in West Java-Indonesia the defective

products were also sold at the same price with the good products. The other possibility of that result is small business enterprises has a big percentage profit. The limitation of this study is the fact that there is to little sample, only 31 small business enterprises.

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