

Determinants of spoilage goods and its impact on small-size enterprises' profit.

Hamfri Djajadikerta

Parahyangan Catholic University, Bandung, Indonesia
talenta@home.unpar.ac.id and djajadikerta@yahoo.com

One of the cost of quality is defective unit which known as spoilage goods. Spoilage goods is an internal failure cost, which is cost incurred when a nonconforming product is detected before it is shipped to customer. Abnormal spoilage is spoilage that is not expected to arise under efficient operating conditions. For small-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. This paper evaluates the determinants of the abnormal spoilage, for example mans, materials, machines and methods, and also examines its impact on the profit of small-size enterprises.

Keywords: spoilage, profit, small-size enterprise

Introduction

Currently, business environment characteristic is full of turbulence, the environment change quickly and hardly to predict. In current business condition, upper level manager in various company always try to find a way to compete, to stand in current market position, or even try to survive. Therefore, management focus their effort to increase the results with a minimum resources by always evaluate the operation procedures so it can be done effectively and efficiently.

Companies which cannot adapt the environment changes will have difficulties to survive. In a very competitive business world, a lot of companies will compete each other to fight for the customer by providing the best customer value.

It is caused by the guidance concept that to attract customer's attention in choosing satisfactory product is by delivered value. Value is customer's estimation about product's capacity to satisfy several purposes. Customer will form estimation about the value of each product to satisfy their 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. But it is not enough; a successful company should able to choose the right customer, providing the unique and liked by customer, and also able to operate efficiently. In another words, do the right things and do the things right.

One of the most avoided things is customer's dissatisfaction which is caused by receiving the product which is not appropriate with expected value. If the company has done a survey about customer's expected value, and also has an appropriate product design quality, then company must look after the appropriateness from the product and the design quality. But sometimes defective products are delivered from production process, this is called spoilage product. This product must be repaired or sold with lower price. But the worst thing will happen if the customers receive the spoilage product, and it will cause customer's dissatisfaction. For small-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. Spoilage goods can be caused by many things and should be corrected to avoid any further spoilage.

According to above description, research questions that will be questioned are:

1. What are the causing factors of defective products in small business?
2. What is the impact of those factors on the financial loss of spoilage goods?
3. What is the effect of financial loss of spoilage goods on the small business profit?

The purpose of this research is to identify the factors which caused defective product and to analyze how significant those factors give an effect on the loss of spoilage goods in small business. This research is also want to know how significant the effect of the spoilage goods on small business 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. If both can be done, then our company will have a competitive advantage compared to our competitor and this means that we have a big possibility in winning the competition.

In the mean time, we probably can not choose one of the strategy but if we can translate both strategy further, it means that to have a competitive advantage to be able to win the competition, we have to have a high quality or product or service or to have value which is appropriate to customer demand and being produced by efficient cost or with high productivity level, and this can be achieved by doing a continuous improvement.

According to Philip Kotler (2000), A product is anything that can be offered to a market to satisfy a want or need. From the definition, 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.

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), or 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).

From both definitions, we can conclude that 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. It is not a guarantee that a higher quality product is a better product, for example a high technology product will be able to loose the competition with a lower technology product. This can be caused by the price from high technology product is too expensive or customer's needs for those technology are still rare.
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. If the first condition happened, then an investigation should be taken to know why do the working standard were not be obeyed and several precaution actions should be taken to make sure that the working standard will be obeyed. If the second condition happened, then the current working procedures should be re-evaluated and do the correction actions.

Things that should be noted related to the quality are:

1. Quality is the quality from a product or service
2. Cost is the quality from cost, e.g. : the lower cost of production, the lower price of product can be set-
3. Delivery is the quality of the distribution of products or services, in another word is the on time delivery of products or services according to the customer's request.
4. Safety is the secure quality from a product/service when it is used.
5. Morality means the quality from the spirit to serving the customer

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, and 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 costs which occur 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 costs are the costs to detect product units which do not meet the specification. In another word, the cost which are caused by the effort to make sure the appropriateness between material, products and the quality standard. According to Dale H. Besterfield (1994) these costs are:

- a. Purchasing Appraisal Costs
Including 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 these costs represent 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 these costs are 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. These costs include 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

Information received from the measurement of quality cost can attract attention from top level management of the existence of quality cost and take the corrective actions.

In the manufacturing industry, defective goods like spoilage or rework usually cause by several categories. Kaoru Ishikawa, who pioneered quality management processes in the Kawasaki shipyards, and in the process became one of the founding fathers of modern management., with his famous diagram, 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.

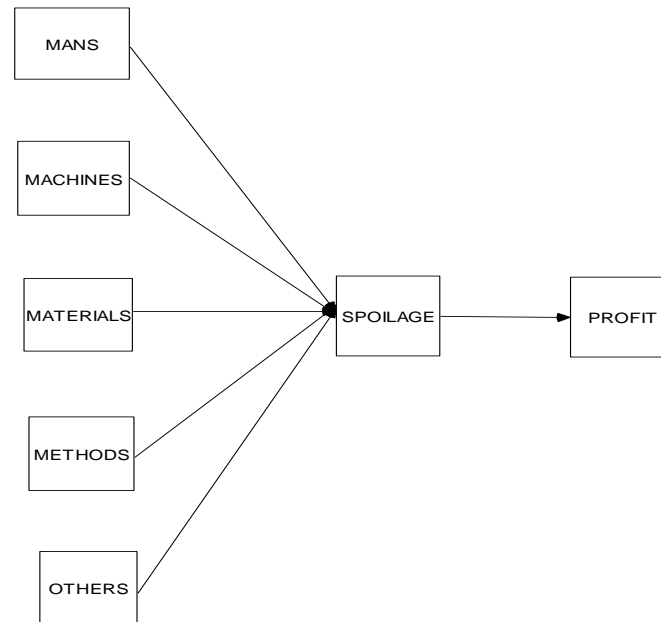
Small businesses are common in many countries, depending on the economic system in operation. A small business may be defined as a business with a small number of employees. These businesses are normally privately owned corporations. Small businesses often face a variety of problems related to their size. One of internal failure cost was 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-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.

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

- H1: Number of production mistake caused by human error has a positive effect on the financial loss of spoilage goods.
- H2: Number of production mistake caused by machinery has a positive effect on the financial loss of spoilage goods.
- H3: Number of production mistake caused by materials has a positive effect on the financial loss of spoilage goods.
- H4: Number of production mistake caused by production methods has a positive effect on the financial loss of spoilage goods.

- H5: Number of production mistake caused by others than human error, machinery, materials and production methods has a positive effect on the financial loss of spoilage goods.
- H6: Financial loss of spoilage goods has a negative effect on small business profit.

The conceptual model of these relationships is presented below:



| | |
|-----------|---|
| Mans | = Number of production mistake caused by human error |
| Machines | = Number of production mistake caused by machinery |
| Materials | = Number of production mistake caused by materials |
| Methods | = Number of production mistake caused by production methods |
| Others | = Number of production mistake caused by others than human error, machinery, materials and production methods |
| Spoilage | = Financial loss of spoilage goods |
| Profit | = small business profit. |

Research Method

There many small business enterprises located in West Java-Indonesia, but so very difficult to collect the data about spoilage goods from them. The data was collected only from 31 small business enterprises, located in West Java-Indonesia, which they business are in the garment industry, like clothes and shoes. The criteria of small business is based on World Bank which state that that the enterprise was categorized in SME if the number of workers employed is about 20-150 persons, and have Asset \leq US\$. 500. 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. The measurement of the variables was presented below:

- Mans = Number of production mistake caused by human error as percentage of total production mistake/error
- Machines = Number of production mistake caused by machinery as percentage of total production mistake/error
- Materials = Number of production mistake caused by materials as percentage of total production mistake/error
- Methods = Number of production mistake caused by production methods as percentage of total production mistake/error
- Others = Number of production mistake caused by others than human error, machinery, materials and production methods as percentage of total production mistake/error
- Spoilage = financial loss of spoilage goods as percentage of revenue
- Profit = small business 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 | $\geq 0,80$ Cheng (2001) ; Gregson, Wendell and Aono (1994). |
| IFI | 0.99 | $\geq 0,90$ (Ghozali,2004) |
| CFI | 0.99 | $\geq 0,90$ Donnelly, Quirin and Bryan (2003); Browne and Cuddeck,1993 |
| NFI | 0,98 | $\geq 0,90$ 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%, $p < 0.05$:

- Number of production mistake caused by human error (Mans) have statistically significant influences on financial loss of spoilage goods (betas=0.083 , $p=0.0011$).
- Number of production mistake caused by machinery (Machines) have statistically significant influences on financial loss of spoilage goods (betas=0.072 , $p=0.0012$).
- Number of production mistake caused by materials (Materials) have statistically significant influences on financial loss of spoilage goods (betas=0.450 , $p=0.0120$).
- Number of production mistake caused by production methods (Methods) have statistically significant influences on financial loss of spoilage goods (betas=0.095 , $p=0.0023$).
- Number of production mistake caused by others than human error, machinery, materials, and production methods (Others) have statistically significant influences on financial loss of spoilage goods (betas=0.005 , $p=0.0001$).
- Financial loss of spoilage goods **has not statistically significant** influences on Small Business Profit ($p=-0.25$).

Based on that statistic analysis:

H1 : Number of production mistake caused by human error has a positive effect on the financial loss of spoilage goods.

is there supported that in small business, number of production mistake caused by human error has a positive effect on the financial loss of spoilage goods

H2: Number of production mistake caused by machinery has a positive effect on the financial loss of spoilage goods.

is also supported that in small business, number of production mistake caused by machinery has a positive effect on the financial loss of spoilage goods.

H3: Number of production mistake caused by materials has a positive effect on the financial loss of spoilage goods.

is also supported that in small business, number of production mistake caused by materials has a positive effect on the financial loss of spoilage goods.

H4: Number of production mistake caused by production methods has a positive effect on the financial loss of spoilage goods.

is also supported that in small business, number of production mistake caused by production methods has a positive effect on the financial loss of spoilage goods.

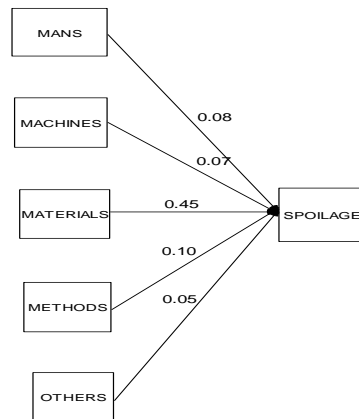
H5 : Number of production mistake caused by others than human error, machinery, materials and production methods has a positive effect on the financial loss of spoilage goods.

is also supported that in small business, number of production mistake caused by others than human error, machinery, materials and production methods has a positive effect on the financial loss of spoilage goods.

H6: Financial loss of spoilage goods has a negative effect on small business profit.

, **is not supported**. It means, in small business, statistically, financial loss of spoilage goods has no significant negative effect on profit.

The final result of the model is presented in the next page:



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 product 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 spoilage goods, maybe because the raw material they used for productions is not number one quality. On the other hand, the loss of spoilage goods has no impact on small business profit, and maybe this result is an indication that relatively 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.

References

- American Society for Quality Control, (2000), ANSI/ISO/ASQ Q9000-2000 Quality Management Systems-Fundamentals and Vocabulary, Milwaukee.
- Besterfield, Dale H. (1998), Quality Control, 5th edition, Prentice-Hall International Inc, Englewood Cliffs.
- Cheng, Eddie W.L. (2001), SEM being more effective than multiple regression in parsimonious model testing for management development research, *Journal of Management Development*, vol.20 no.7, 650-677.
- Donnelly, D.P., Quirin, J.J. and O'Bryan D. (2003), Auditor Acceptance of Dysfunctional Audit Behavior : An Explanatory Model Using Auditors' Personal Characteristic, *Behavioral Research in Accounting*, vol. 15, 7-110.
- Feigenbaum, Armand V. (1991), Total Quality Control, 3rd edition, McGraw-Hill International, Singapore.
- Ghozali, I., (2004), *Model Persamaan structural-Konsep dan Aplikasi dengan Program Amos ver.5*, Badan Penerbit Universitas Diponegoro.
- Gregson, T. (1992), An Investigation of the Causal Ordering of Job Satisfaction and Organizational Commitment in Turnover Model in Accounting, *Behavioral Research in Accounting*, vol.4, 80-95.
- Hornigren, C.T., Foster G., Datar, S.M. (2006), Cost Accounting - A Managerial Emphasis, 12th edition, New Jersey, Prentice-Hall Inc.
- Hansen, Don R. and Maryanne, M. Mowen (2003), Cost Management Accounting and Control, 4th edition, South Western, Ohio.
- Kaplan, Robert S. and Anthony A. Atkinson. (1998), Advanced Management Accounting, Prentice-Hall, New Jersey.
- Kotler, Philip (2000), Marketing Management Analysis, Planning, Implementation, and Control, Prentice-Hall, Inc, New Jersey.
- Porter, Michael P. (1985), Competitive Advantage, The Free Press, London.