

Fishbone Analysis of the Quality Control of Ceramic Products: Study of the Export Ceramic Center in Plered Purwakarta, Indonesia

Sam'un Jaja Raharja*

Department of Business Administration, Faculty of Social and Political Sciences, Universitas Padjadjaran

Ria Arifianti

Department of Business Administration, Faculty of Social and Political Sciences
Universitas Padjadjaran

Rivani

Department of Business Administration, Faculty of Social and Political Sciences
Universitas Padjadjaran

— *Review of* —
**Integrative
Business &
Economics**
— *Research* —

ABSTRACT

This study aims to analyse quality control of ceramic production in Plered Purwakarta, which is a ceramics manufacturing centre in West Java, Indonesia. This study employed a qualitative research method. Data collection techniques used includes a literature study, observations, in-depth interviews and stakeholder discussions. Data were analysed using the fishbone approach. Results show that the growth of the ceramic handicraft industry in Plered Purwakarta is not supported by adequate human resources, capital and equipment. This deficiency resulted in the poor and nonstandard quality control of Plered ceramic products. Improper product control and poor quality are attributed to inadequate equipment, increased demand of goods but limited equipment, lack of workforce support and low labour education. These challenges increase the difficulty of developing ceramic production designs. Various stakeholders must be involved, especially in giving training and developing ideas in design, quality control and production process.

Keywords: ceramic Plered, product, quality control, fishbone analysis

1. INTRODUCTION

Plered is a ceramic industry centre in Purwakarta Regency. This centre offers good quality ceramics compared with other areas and is famous in the local and overseas markets. Ceramics is a mainstay product of Purwakarta Regency. Marketing of this product penetrated national and international markets. Orders for Purwakarta ceramic come from various cities, such as Bandung, Jakarta, Malang and Palembang. Purwakarta ceramics penetrated the international market since 1984. International markets include Singapore, Australia, the United States and the Middle East. However, the ceramic industry in Purwakarta is becoming sluggish.

Anjun Village, a Plered sub-district, has closed approximately 48 large-scale ceramic industry players. Twelve players survived. The lethargy of their efforts is due to many factors related to production: (1) many competitor products from Japan, Korea and China; (2) scarcity of raw materials of clay in the surrounding area; (3) limited production technology and long production process of its competitors and (4) the limited ability of

each craftsman in terms of design. The completion of work is sometimes delayed. Only nine containers can be fulfilled given the average order per year of 12 containers.

Quality control is needed and expected to direct the process undertaken and achieve objectives. Quality products are important to the company. Suwitho (2006) stated that the quality of a company's products, the firm's set price and the availability of goods to supply consumers are the factors that determine demand.

This study aims to analyse the quality control of ceramic products using fishbone analysis.

2. LITERATURE REVIEW

2.1. Concept of Quality Control

Quality is the overall feature and characteristics of products and services that are capable of satisfying visible or disguised needs. The concept of quality operation is on a manufacturing basis, and the standards are met from the beginning. A product is considered of good as quality and is an appropriate and calculated variable (Heizer and Render, 2009)

Quality is defined as the ability to meet or exceed customer needs at present and in the future, which means that the product or service is suitable for customer use. This case relates to the abilities used, customer benefits and customer satisfaction (Schroeder, 2000). According to Heizer and Render (2009), quality control or total quality management (TQM) can be used for the following:

1. Continuous improvement (people, equipment, suppliers, materials and procedures) with the philosophy that every aspect of operation can be improved to perfection.
2. Plan-do-check-act
3. Six Sigma (refers to TQM with high process capability)
4. Employee empowerment (employees in every production process)
5. Benchmarking (selection of standards, services, costs or habits that represent the best performance of a process or activity)
6. Just-in-time (JIT) system refers to cutting quality costs, improving quality, lowering quality and improving the JIT system easily
7. Taguchi concepts: improving quality (quality toughness, quality loss function and target oriented quality)

The TQM tool by Heizer and Render (2009) includes the following:

1. Checking sheet: a form designed to record data
2. Scatter diagram: a graph of the value of a variable confronted with another variable
3. Cause-cause diagram: a tool for recognising process elements (causes) that may affect outcomes
4. Pareto diagram: a graph to recognise and map a problem or defect in decreasing frequency sequence
5. Flowchart: a diagram that describes the steps in a process
6. Histogram: a distribution that shows the frequency of occurrence of a variable

7. Statistical process control diagram: a time-diagram on the horizontal axis to map the value of a statistic

2.2. Cause and Effect Diagram (Fishbone)

The exposed Ishikawa diagram of forms or diagrams is used to identify quality issues and inspection points. The shape of this diagram is similar to a fish bone that has a head, fins and thorns. This fishbone diagram is useful in addressing the problem of quality control, customers and unsatisfied companies. Each “bone” represents a possible source of error (Heizer and Render, 2009). This diagram shows an impact or effect of a problem with various causes. The impact or effect is described as a muzzle of the head. Weber et al. (2017) stated that the optimal combination of activities enables them to influence one another and should be considered in terms of the number of cycles of combined activities and the length of time between the activities within each cycle.

According to Mardiansyah and Ikhwana (2013), the benefits of the fishbone diagram analysis are as follows:

1. Can use real conditions to improve the quality of products and services and efficiency in the use of resources and can reduce costs
2. Can reduce and eliminate conditions that cause the nonconformity of products or services and customer complaints
3. Can standardise existing or planned operations
4. Can provide education and training for employees in decision-making activities and take corrective action

3. RESEARCH METHODS

The research method used is a qualitative method of research procedures that produce descriptive data in the form of written or oral words and observable behaviour of the people. The approach used is explorative approach, which digs highly detailed information from people who know the existing problems.

The data collection techniques used are as follows.

1. Observation is a data collection technique that involves making observations and directly recording the object of research but does not involve undertaken activities.
2. In-depth interviews involve collecting data face-to-face with informants to obtain a complete picture of the topic under study.
3. Triangulation involves combining various data collection techniques and data sources that already exist.

Data analysis techniques include:

1. Quality control method used by the company
The company uses certain quality control methods to analyse production data to see the number of product defects generated.
2. Cause-and-effect diagram
A cause-effect diagram is a tool for recognising process elements (causes) that may affect outcomes. This graphical analysis tool describes the process elements to analyse potential sources of process irregularities. These main causative factors can be grouped into the following:
 - 1) Material/raw materials
 - 2) Machines
 - 3) Man/labour

- 4) Methods
- 5) Environment

The steps in creating a cause and effect diagram are as follows:

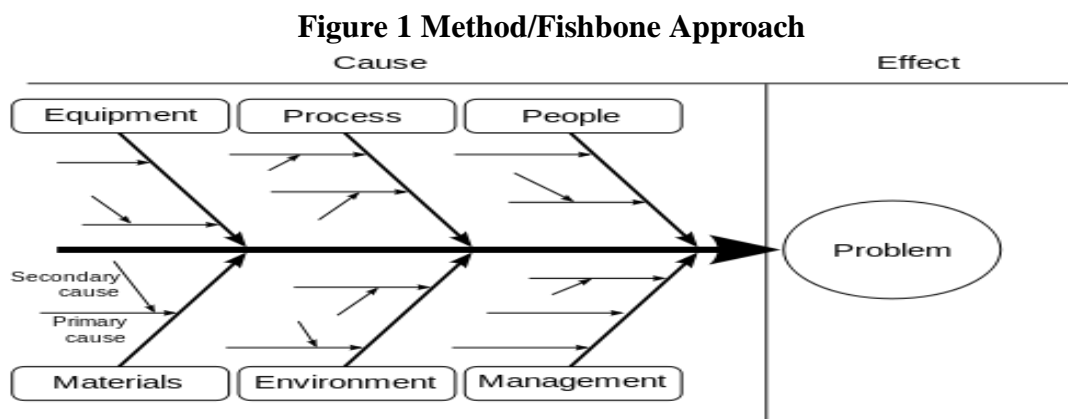
- 1) Identify the main problem.
- 2) Place the main problem on the right of the diagram.
- 3) Identify minor causes and place them in the main diagram.
- 4) Identify minor causes and place them on major causes.
- 5) Evaluate the completed diagram to determine the real cause.

4. RESEARCH RESULT AND DISCUSSION

4.1. Quality Control of Ceramic Products Using Fishbone

Quality control system is a system that consists of examination, analysis and action; action involves controlling the quality of a product using existing techniques and equipment. (Feigenbaum, 1992; Beckford, 2017). Feigenbaum (in Christensen et al., 2014) stated that the total quality control's organisation-wide impact involves the managerial and technical implementation of the customer. Quality-oriented activities are the prime responsibility of the general management, the mainline operations of marketing, engineering, production, industrial relations and finance, and the quality control function. Ishikawa (in Christensen et al., 2014) stated that practicing quality control involves developing, designing, producing and servicing a quality product that is most economical, most useful, and always satisfactory to the customer.

One tool in quality control that is used to analyse a product is the fish bone method. This method aims to determine the cause of the deterioration using the fishbone method. The fishbone method or approach of a fishbone or a causal method is a tool for recognising process elements (causes) that may affect the outcome. The cause is divided into equipment, process, people, materials, environment and management, which can be described as follows.



Sources: Heizer and Render (2009)

4.1.1. Analysis of Human Facets

The human facet concerns human labour and the abilities that exist in man. Human labour concerns the craftsmen and the ability and skill of artisans in processing or forming attractive ceramics.

The skill of artisans is in processing clay into ceramics. However, this skill is not supported by education. Educated artisans only graduated from elementary or junior high school or did not finish elementary school. Their skills can be passed from generation to generation. They cannot predict the amount of product produced given their poor ability.

One of the handicrafts in the Plered district is exported by PT Joshua and sometimes holds or participates in exhibitions facilitated by the government to invite and attract visitors. Direct buyers who order ceramics from Plered come from Dubai, England and South Korea. The percentages of local and foreign buyers are 30% and 70%, respectively. Therefore, the majority of buyers are still dominated from overseas. Language and technology become obstacles for export market share. The velocity of money can also reach three months, but profit can be up to IDR 300 million. The profit of the local market is not great, but turnover is fast because of daily transactions.

4.1.2. Analysis of the Management Aspect

The average ceramic business is a family company. The subjectivity factor is high. Thus, company management is difficult to develop. Decision-making in management is time-consuming and imposing. Thus, the company may incur in large losses and bankruptcy. Management still involves the family although employees come from outside the family environment.

4.1.3. Analysis of the Process Facet

The process aspects associated with the method are the ways used to achieve the goal. These old ways of processing are still followed by artisans. The craftsmen's method of forming or making ceramics is passed down from their families across generations. They have attempted to use a new method, which only lasted briefly or temporarily. The amount of training lasts only two to three weeks because the supervision of extension workers came from *Universitas Indonesia, Institut Teknologi Bandung or Universitas Pendidikan Indonesia*. The craftsmen revert to their old method. The ceramics production process is divided into three stages:

1) Material Selection

The clay is selected for smoothing into the machine. Clay processing is present.

2) Formation up to combustion

a) The formation of ceramics is done in two ways.

- Clay is formed using a mould. Processing using prints is fast. Seven hundred ceramics can be produced a day.
- The clay is formed using a rotary engine that makes with large jugs or sizes. Not so much is produced in a day.

b) The formed ceramic is stored in the shade.

c) The finished ceramics are dried under the hot sun. When the weather is hot, the ceramics can be dried in 2 days; otherwise, approximately five to seven days.

3) Combustion

Burning is conducted in traditional and modern ways. Traditionally, ceramics are placed in a furnace and covered by bricks. Burning is done on two sides. The

process must be sped up. Manual burning takes approximately 24 hours. Modern combustion involves putting something in a furnace with coal fuel, grain and electricity use. Burning can be done for 18 hours. Modern combustion is not intense because it is slightly more expensive than the traditional way. Traditional and modern combustion is always rejected or considered inappropriate. Production failure is approximately 20%. Defective items are not removed but are collected and destroyed and then reprocessed.

4) **Finishing**

Basic white colouring and final finishing is done. This production activity shows a difference between household and ornamental ceramics. For household ceramics, finishing is conducted before combustion to avoid poisoning upon use. For ornamental ceramics, finishing is done after combustion.

4.1.4. Analysis of the Environment Side

The environment in Plered District worked for ceramics craftsmen. These craftsmen rely on average income from making ceramics. Only a few are shattered because they do not like to work as craftsmen.

4.1.5. Analysis of Equipment Side

Machines or tools are used/required to achieve the goal. Machines are used for printing and burning ceramics into household goods or decoration items. Artisans use the old way even though a new machine is available because the time difference between using new and traditional machines is not significant. Modern machines run for 18 hours, whereas traditional machines run for 24 hours. Modern machines use electricity and are expensive.

Facilities and infrastructure that support the product are directed towards technology production process and marketing. The process of production technology has been described previously. In terms of marketing process technology, the craftsmen are helped by the marketing process. This process previously includes exhibitions only, which are difficult for potential buyers to access because they have to travel far to see the goods. At present, marketing can be done online. In 2015, a digital Kampung support program from Telkom provided website creation training and Wi-Fi or Internet for SMEs.

Packaging training must also be supported. The products must be packed in an interesting way to attract buyers. The ceramic market in Plered remains affected by bomb/terrorist issues in Indonesia. For example, the bomb incident in Jakarta has caused the ceramics sales to drop dramatically, and the visitors of the local market decreased significantly because of the construction of the Cipularang Highway Road.

4.1.6. Analysis of Material Facets

Clay is used to achieve goals and is associated with capital (finance).

Plered craftsmen have a never-ending supply of clay but needs financial support to achieve desired goals.

Profit from manufacturing ceramics is large, but the craftsmen lack capital and financial calculations, which they cannot master because of their lack of education.

Another obstacle is the craftsmen's limited working capital, which makes pottery ceramic artisans increasingly dependent on third parties. This situation happens when the demand for pottery from the export market through a third party is quite large, and the third party company provides advance payment as the artisans' working capital.

Limited working capital causes ceramic pottery artisans to prefer fulfilling orders in the form of semi-finished pottery products. This outcome is detrimental to the craftsmen because the price of the product is much lower than the price of the finished ceramic products.

5. CONCLUSIONS AND SUGGESTIONS

5.1. Conclusion

Results show that the Plered ceramic industry has less quality control over its products because of inadequate equipment, increasing demand for goods but limited equipment, unskilled labour and low education. Thus, developing ceramic production in terms of design is difficult.

5.2. Suggestion

Government involvement is needed, especially in providing training for the development of design and marketing ideas.

REFERENCES

- [1] Beckford, John (2017). *Quality: A Critical Introduction*. 4th Edition. New York. Routledge
- [2] Christensen, Chris, Kathleen M. Betz and Marilyn S. Stein (2014) *The Certified Quality Process Analyst Handbook*. Second Edition. Milwaukee. Quality Press
- [3] Heizer, Jay and Barry Render (2009). *Operation Management*. Prentice-Hall. America.
- [4] Feigenbaum, A.V (1992). Total Quality Control 40th Anniversary edition McGraw-Hill.
- [5] Mardiansyah and Andri Ikhwana (2013) *Perancangan dan Perbaikan Sistem Kerja Dalam Upaya Mengendalikan Kecacatan Pada Proses Pembuatan Nata De Coco Studi Kasus Di PD. Suci Segar Garut* Jurnal Kalibrasi. Vol. 12 No 1 (pp 1-17)
- [6] Schroeder. Roger. G. (2000). Contemporary Concepts and Cases Operations Management. New York Irwin Mc. Graw Hill.
- [7] Suwitho. (2006). *Pengelolaan Kualitas dan Implikasinya Terhadap Kepuasan Pelanggan..* Jurnal Akuntansi, Manajemen Bisnis dan Sektor Publik Volume 3 No 1 (pp 54-64) STIESIA. Surabaya
- [8] Weber, Michal et al (2017) A Production Function of Education: Interdependency between Lecturing and Practicing. *Review of Integrative Business and Economics Research*, Vol. 6, Issue 4, pp 1-14