# Relationship Between Lean Manufacturing Practice and Product Quality in a Halal Food Industry: A Case Study in Tanjung Karang, Selangor, Malaysia

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## Abstract

Malaysia has set a goal to become known as a halal-hub country in nearly every product category, from food to clothing. Manufacturers and food operators benefit from JAKIM Halal certification since it ensures that their products are halal and may be used as a standard for consumer safety and quality assurance. Lean manufacturing has been linked to higher product quality and overall business performance for decades. Therefore, the study's aim to investigate the relationship between lean manufacturing and product quality in the halal food industry. In this study, a close-ended questionnaire was distributed to 68 employees in the halal food industry in Tanjung Karang, Selangor. The findings show that two of the four product quality components, performance and features, were shown to have a significant correlation with lean manufacturing practices. This shows that by using lean manufacturing practices, more than one of the highest quality aspects of a product may be achieved. These insights will help the associated company improve its manufacturing practices while keeping the quality of its halal products comparable.

## Keywords
Lean manufacturing practice, product quality, halal manufacturing, and halal food industry.

## 1. Introduction
Halal comes from the Arabic word "halal," which meaning "legalized" or "valid," and may be translated as "lawful" or "accepted" in English. Halal items are referred to as the food health and quality control scale on a global scale (Majid et al. 2015). The halal and good notion relate to foods that are healthy, natural, safe, harmless, and of high quality. Halal food guidelines are founded on this concept. Halal certification is widely regarded as the gold standard for food safety, quality control, and other benefits for Muslim and non-Muslim customers alike (Baharuddin et al. 2015). When it comes to creating halal food, the majority of halal food producers face a variety of challenges, including concerns with the halal certificate. Authority, awareness, experience, cost, customer perception, market competitiveness, and supply chain management have all been cited in past research as among the challenges faced by the halal food manufacturers (Batu and Regenstein 2014; Yusuf et al. 2015; Krishnan et al. 2017).

Muslim clients are suspicious of their food choices and selections due to the size of food chains, the amount of halal difficulties, and bribery (Ahmad et al. 2018). As a result, the Malaysian government has enacted legislation to guarantee that halal items are of high quality. Malaysia was the first country to pass halal-related legislation, and it also has a comprehensive halal insurance system. The Department of Islamic Development Malaysia (JAKIM) has begun the establishment of the Halal assurance system known as MS1500:2009 General Guidelines for Halal Food Processing, Planning, Handling, and Storage to coincide with the implementation of global quality standards such as the International Standard of Organization (ISO) (Kamisah et al. 2018).

Halal products in Malaysia, notably in the food business, face major challenges. One of the six challenges faced by entrepreneurs is authority (Yusuf et al. 2015). JAKIM, who was in charge of their halal certification application, was the first roadblock. The second aspect is entrepreneur awareness, which is all about them. The third difficulty is pricing; as operating costs have risen; the firm has lost sight of the funding needed to get a halal certificate. Customer perception comes next, followed by market competitiveness. Finally, supply chain management is a significant challenge for halal businesses (Yusuf et al. 2015; Krishnan et al. 2017). Meanwhile, Batu and Regenstein (2014) cited the food additive, source of gelatin, halal certificate fraud, and consumer respect as hurdles in the halal food industry.

The purpose of lean manufacturing was to eliminate waste such as defects that needed rework, unnecessary production, material or human activity, long waits, stock outflow, and excess supply. It now covers a wide variety of industrial processes, starting with the most crucial stages of a product's life cycle, such as product design, retail, and wholesale (Mrugalska and Wyrwicka 2017). Lean is a manufacturing approach that focuses on continuous improvement and organizational learning. Through the Toyota Production System, Taiichi Ono, a Japanese industrial engineer and businessman, promoted lean manufacturing ideas across the world (TPS). The elements or concepts of lean manufacturing include pull-market (Kanban), continuous improvement (Kaizen), levelling schedule (Heijunka), just-in-time (JIT), total production management (TPM), total quality management (TQM), and 5S. Six typical advantages of lean manufacturing processes may be found (Melton, 2005). Fewer process waste is one of them, followed by shorter lead times, less rework, cost savings, improved process knowledge, and lower inventory. According to Hofer et al. (2012), the most significant benefit of lean manufacturing processes is improved inventory management. Many lean manufacturing tools, on the other hand, are reliant on the researchers themselves. There are a variety of approaches for evaluating the effectiveness of lean manufacturing. One of them is product quality. Product quality, according to Garvin (1984), is comprised of eight elements: performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality.

Product quality is a combination of engineering and manufacturing traits that reflects how effectively the company in question meets the needs of its consumers (Reeves and Bednar 1994). By enhancing things and eliminating flaws, product quality implies adding innovations capable of matching market expectations and developing customer loyalty. Product quality and customer satisfaction are important factors in determining if a product is good or bad, and whether it should be kept or retired in the future (Hoe and Mansori 2018). As a result, product quality has its own set of indicators for determining if a product is good or bad, such as price, brand extension, brand alliance, and emotion. The company's reputation, its employees, and, most crucially, its customers will all benefit from exceptional product quality. Clients that are pleased with the goods will stick with it.

The identification of product quality attributes as well as the implementation of lean manufacturing in organization add to the present body of knowledge on the subject. The aim of the research is to find out how existing lean manufacturing practices affect product quality in the halal food business in Tanjung Karang, Selangor. The findings are expected to assist increase awareness about the need of employing lean manufacturing to preserve or improve a company's halal product status while reducing waste.

Yusuf et al. (2015)'s criteria are the most relevant for our current study. Figure 1 displays the theoretical framework, which was chosen since the research is being done in the Malaysian Halal food business, which shares many of the difficulties that Yusuf et al. have addressed (2015).

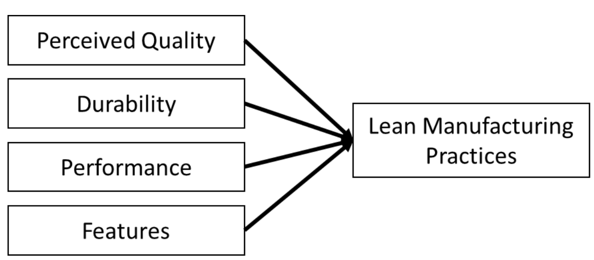


Figure 1. Theoretical framework

## 2. Methods

In this study, a quantitative method was employed to fulfil the research objective. A set of closed-ended questions was generated, which was self-developed and updated based on previous research (Ansel et al. 2011; Pandya et al. 2017; Diaz-Reza et al. 2019; Novikov and Iniesta 2019). Some of the instruments have to be adjusted to match the study's needs. The questionnaire was divided into three sections: Section A (demographic information), Section B (lean manufacturing practices measurement), and Section C (product quality measurement), each with six, ten, and twenty items. Cronbach's alpha was utilized in this study to determine if the prepared questionnaire could be used for further research or not. On a 5-point Likert scale, all of the items in Sections B and C were evaluated. The study's hypotheses are as follows:

H1: There is a significant relationship between lean manufacturing practices and perceived quality.
H2: There is a significant relationship between lean manufacturing practices and durability.
H3: There is a significant relationship between lean manufacturing practices and performance.
H4: There is a significant relationship between lean manufacturing practices and features.

The survey included employees from a halal food firm in Tanjung Karang, Selangor, Malaysia. A purposive random sample strategy was employed to reach the targeted respondents due to the enforcement of movement control orders (MCO) in Malaysia during the data collection period. As a consequence, the survey was conducted in the most comfortable manner possible, utilizing the online medium of Google Form and the medium languages of English and Bahasa Malaysia. The data collection took around two weeks, and 80 samples were collected in total. Only 68 of the returned responses, however, were appropriate for further inquiry. The remaining returned responses were rejected due to their inadequacy. SPSS version 26.0 was used to analyze the data. Based on the study objective, descriptive analyses were conducted to determine the frequency, percentage, and mean score (Table 1).

Table 1. Central of tendency

| Score | Central of tendency |
|---|---|
| 1.00 – 2.33 | Low |
| 2.34 – 3.67 | Moderate |
| 3.68 – 5.00 | High |

## 3. Results and Discussion

### 3.1 Descriptive Analysis

Gender, age, ethnicity, academic qualification, length of working experience, and the total number of workers in their department are among the demographic data obtained from the employees who volunteered for this study. Table 2 shows that females make up the bulk of participants (66.2 %, n=45), while men make up just 33.8 % (n=23). This suggests that women account for more than half of those who responded. The majority of respondents (75.0 %, n=51) were between the ages of 20 and 30, with those between the ages of 31 and 40 (22.1 %, n=15) and those over 40 (2.9 %, n=2) coming in second and third. Only two Chinese respondents (2.9 %) were among the 97.1 % of Malay respondents (n=66). The number of respondents with an SPM/SPMV/SKM and a Bachelor's degree is practically identical, with 23 and 24 respectively. Diploma, PMR and below, and Master's degree/Ph.D holders came in second, third, and fourth, respectively, with 14.7 %, 11.8 %, and 4.4 %.

The majority of respondents (67.6 %, n=46) had fewer than three years of work experience, with those with four to six years of work experience (14.7 %, n=10) following closely behind. Individuals with more than 9 years of work experience (8.8 %, n=6) also received a similar number of responses (8.8 %, n=6). In addition, respondents were asked about the overall size of their department's workforce. The most common responses were that their department had fewer than 10 people, which accounted for 28 (41.2%) of the total. A total of 29.4 % (n=20) said their department had more than 30 people. The remaining respondents (14.7 %, n=10) stated that they work with 11 to 20 or 21 to 30 people. Due to disparities in the input and output of their job, various departments may apply different lean manufacturing techniques. The production department's input/output might differ from the accounting department, for example, and vice versa. This shows that lean manufacturing isn't only for one industry. It may be used in any element of a business, but it must be well-planned and structured to be effective.

Next, respondents were also asked if they had ever heard of lean manufacturing or if they had ever received any training in this area. Figure 2(a) shows that almost all of the respondents (95.6%) had heard the term "lean manufacturing" at some point during their careers. This shows that almost every worker nowadays is familiar with the term "lean manufacturing practices." Furthermore, as seen in Figure 2(b), 61.8 % have undergone formal lean manufacturing training.

Table 2. Demographic of the respondents

| Item | Frequency (n=68) | Percentage (%) |
|---|---|---|
| **Gender** | | |
| Male | 23 | 33.8 |
| Female | 45 | 66.2 |
| **Age** | | |
| 20 to 30 years | 51 | 75.0 |
| 31 to 40 years | 15 | 22.1 |
| 41 to 50 years | 2 | 2.9 |
| Above 50 years | 0 | 0.0 |
| **Ethnicity** | | |
| Malay | 66 | 97.1 |
| Chinese | 2 | 2.9 |
| Indian | 0 | 0.0 |
| Other | 0 | 0.0 |
| **Education background** | | |
| PMR and below | 8 | 11.8 |
| SPM/SPMV/SKM | 23 | 33.8 |
| Diploma | 10 | 14.7 |
| Bachelor’s degree | 24 | 35.3 |
| Master’s degree/Ph.D | 3 | 4.4 |
| **Working experience** | | |
| Below 3 years | 46 | 67.6 |
| 4 to 6 years | 10 | 14.7 |
| 7 to 9 years | 6 | 8.8 |
| Above 9 years | 6 | 8.8 |
| **Total workers in the department** | | |
| Below 10 workers | 28 | 41.2 |
| 11 to 20 workers | 10 | 14.7 |
| 21 to 30 workers | 10 | 14.7 |
| Above 30 workers | 20 | 29.4 |

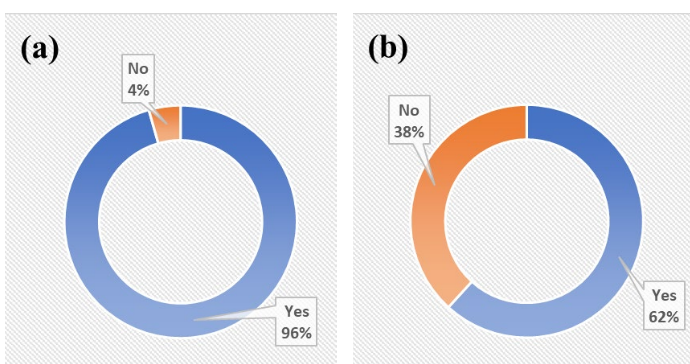


Figure 2. (a) Have you ever heard of the term "lean manufacturing"? and (b) Have you undergone any lean manufacturing training?

### 3.2 Level of Central of Tendency

The reliability coefficients for the constructs are listed in Table 3. Cronbach’s alpha for lean manufacturing is 0.932, perceived quality is 0.945, durability is 0.925, performance is 0.909, and 0.951 for features. Cronbach and Gleser (1959) concluded that owing to strong reliability coefficient values, all of the constructs' Cronbach's ranging from 0.871 to 0.937 were proposed as psycho-metrically sound and may be employed for further investigation.

Meanwhile, based on the descriptive analysis of this study, Table 4 demonstrates the central tendency level of lean manufacturing and product quality in the halal food industry. The sum of the mean divided by the total number of elements is 3.31, which is the mean value for lean manufacturing processes (10 items). As a result, the halal food industry's central tendency for lean manufacturing practices is moderate. After dividing the overall mean by total items (5 items), the mean value for perceived quality, durability, and performance of the product was 3.64, 3.65, and 3.44, showing a significant level of central tendency.

Table 3. Reliability analysis

| **Construct** | **No. of item** | **Cronbach's α** |
|---|---|---|
| Lean manufacturing practice | 10 | 0.932 |
| Perceived quality | 5 | 0.945 |
| Durability | 5 | 0.925 |
| Performance | 5 | 0.909 |
| Features | 5 | 0.951 |

Table 4. Central of tendency

| **Item** | **n** | **Mean** | **Std. deviation** | **Level of central of tendency** |
|---|---|---|---|---|
| Lean manufacturing practice | 68 | 3.3118 | 0.9119 | Moderate |
| Perceived quality | | 3.6353 | 1.0198 | Moderate |
| Durability | | 3.6471 | 0.8451 | Moderate |
| Performance | | 3.4441 | 0.9310 | Moderate |
| Features | | 3.7294 | 0.8976 | High |

## 3.3 Normality Test and Spearman Rank-Order Correlation Coefficients

A normality test is a method of verifying whether a variable or set of data matches the regular normal distribution. Visually or numerically, the normalcy test can be carried out (Normality Test 2020). The normality test results for the variable used in this investigation are shown in Table 5. The Kolgomorov-Smirnov test was used to assess data normality because the sample size was more than 50. As an independent variable, the normality test for lean manufacturing practices obtained statistic is 0.146 and P values of 0.001. Meanwhile, product features (statistic=0.221 and P value=0.000), perceived quality (statistic=0.164 and P value=0.000), durability (statistic=0.162 and P value=0.000), and performance (statistic=0.140 and P value=0.002) are among the dependent variables.

Table 5. Normality test

| **Item** | **Kolmogorov-Smirnov[a]** | | |
|---|---|---|---|
| | **Statistic** | **Df** | **Sig.** |
| Lean manufacturing practice | 0.146 | 68 | 0.001 |
| Perceived quality | 0.164 | 68 | 0.000 |
| Durability | 0.162 | 68 | 0.000 |
| Performance | 0.140 | 68 | 0.002 |
| Features | 0.221 | 68 | 0.000 |

[a] Lilliefors significance correlation

All of the findings obtained for the-P values of the normality test were considered to be abnormal in this study since they were less than 0.05. Furthermore, the data in this study is said to have an anomalous distribution. In the halal food industry, however, a non-parametric test is necessary to evaluate the correlation between lean manufacturing practices and product quality. The non-parametric measure of Spearman correlation is used in this research to see if two paired variables of data in this study have a significant correlation.

According to Table 6, the r=0.378 and significant=0.001 correlation coefficient between lean manufacturing practices and perceived quality is moderate. As a results, the investigation's primary hypothesis is accepted. Meanwhile, the r=0.232 and significant=0.057 association between lean manufacturing practices and durability is poor. With r=0.425 and significant=0.000, the link between lean manufacturing practices and performance is strong. Meanwhile, with r=0.473 and significant=0.000, there is a strong connection between lean manufacturing practices and product features. The majority of the hypotheses for this study are acceptable in general. The findings of the durability items, on the other hand, reveal a weak correlation with lean manufacturing practices, thus this hypothesis may be dismissed.

Table 6. Analysis on Spearman rank-order correlation coefficients between lean manufacturing practice and product quality

| Item | Model | Unstandardized coefficients | | Standardized coefficients | t | Sig. | Hypothesis accepted or rejected |
|---|---|---|---|---|---|---|---|
| | | β | Std. error | β | | | |
| Perceived quality | Constant | 2.234 | 0.437 | | 5.107 | 0.000 | Accepted |
| | avLP | 0.423 | 0.127 | 0.378 | 3.320 | 0.001 | |
| Durability | Constant | 2.936 | 0.381 | | 7.706 | 0.000 | Rejected |
| | avLP | 0.215 | 0.111 | 0.232 | 1.935 | 0.057 | |
| Performance | Constant | 2.006 | 0.391 | | 5.138 | 0.000 | Accepted |
| | avLP | 0.434 | 0.114 | 0.425 | 3.817 | 0.000 | |
| Features | Constant | 2.006 | 0.391 | | 5.138 | 0.000 | Accepted |
| | avLP | 0.434 | 0.114 | 0.425 | 3.817 | 0.000 | |

## 4. Conclusion

The purpose of this research is to investigate the correlation between lean manufacturing practises and product quality in the halal food industry in Tanjung Karang, Selangor. From the survey, o nly 61.8 % of the 68 respondents in this study had formal training in lean manufacturing, despite the fact that 95.6 % were aware of and had heard of the approach. As a result, it's plausible to assume that employees and employers in the halal food industry in Tanjung Karang, Selangor, see lean manufacturing practises favourably. In addition, o nly product quality attributes have a high level of central tendency, with a mean of 3.7294, according to the descriptive analysis of the gathered data, while the others have a moderate level, ranging from 3.3118 to 3.6471.

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## Biography

**Nur Hidayah Misron** is a final-year undergraduate student at Universiti Tun Hussein Onn Malaysia, majoring in Technology Management (production and operations). Her final year research, which she is working on with Dr. Mohamad Ali Selimin, focuses on lean manufacturing practices and product quality in the halal food business.

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