

# Using DMAIC in Improvement of Customer Satisfaction and Facilities provided at Commuter Stations

**Roslina Mustapha<sup>1</sup>, Nurul Fadly Habidin<sup>2</sup>**

<sup>1</sup>Department of Business Management, Faculty of Management and Economics,  
Universiti Pendidikan Sultan Idris, 35900 Tanjung Malim, Perak, Malaysia

<sup>2</sup>Department of Management and Leadership, Faculty of Management and Economics,  
Universiti Pendidikan Sultan Idris, 35900 Tanjong Malim, Perak, Malaysia

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## Abstracts

This paper discusses the use of six sigma approach to improvement of customer service and facilities at commuter stations. The management of commuter stations should be sensitive to the needs and desires of the passengers. In this study, DMAIC approach taking into accounts the views of the customer (VOC) to the dissatisfaction of commuter services and facilities available at commuter stations.

**Keywords:** Six sigma, DMAIC, customer satisfaction, business management

## 1. Introduction

The performance of a business, whether private or public sector is depends on customer satisfaction. For commuter service almost 20 years of presence in Malaysia, there are still some problems, especially to people with disabilities (PWDs) who want to use the commuter service. Using the six-sigma approach is one way to solve the problem of quality of service. Problem solving is an activity to change what is actually happening to what is supposed to happen (Evans & Lindsay, 2007).

People with disabilities are not left behind in the services for commuters as it is one of the convenient public transports, safe and cheap. Not all commuter stations provide facilities for the disabled. For example, is not all a toilet or prayer suitable for the disabled? There is no lift for the disabled using the footbridge. More dangerous yet is that they are forced through the substrate using a wheelchair. Even with the help of employees KTM, this act is dangerous. In commuter station also no employee will help the disabled to enter and exit a commuter. This is very dangerous for them and their safety.

Conceptually, DMAIC approach can be applied in the service industry to repair the system in the process of adding value and satisfaction to customers, particularly to address issues that exist in the facilities provided for the disabled (Habidin, Yahya, & Shukur, 2015). So this research is to identify weaknesses in commuter service for the passenger.

Parties should provide a KTM commuter station management system that can give satisfaction to the passengers to make improvements from time to time on an ongoing basis. Therefore, this article talks involving the DMAIC approach, taking into account the perspective of the customer (VOC) to improve service quality as the KTM commuter train station is the only organization which offers train services in Malaysia.

## **2. LITERATURE RIVIEW**

The management of commuter stations should be sensitive to the needs and desires of the passengers. Geetika (2010) in his study to identify the most important factors influencing satisfaction of passenger trains in India. Improvement initiatives can be established on the basis of customer complaints either positive or negative perception of the service they feel.

DMAIC is the core methodology of six sigma. The methodology ensures quantitative methodology for continuous improvement and reduction of costs by cutting the variation in outputs to the level appropriate for a particular organization (Kakuljan & Kakuljan, 2008; Habidin & Yusof, 2013). The main point of every six sigma project is the voice of customer (VOC). Customers in the contexts of this project are the passengers using commuter and improvements will be made to ensure that passengers get the best service.

To implement the six sigma methodology, one of the ways that can be used is DMAIC (Define, Measure, Analyzed, Improve and Control). According to Kakuljan and Kakuljan (2008), DMAIC phases as defined as follows:

- (1) Define - this stage within the DMAIC process involves defining the team's role, project scope and boundary, customer requirements and expectations , the goals of selected projects and time providing the service.
- (2) Measure - measuring the performances of existing processes. This includes identifying the criteria, data collection, benchmarking and monitoring subsequent improvements and the capability.
- (3) Analyze - analyzing existing processes. Analyzing the collected data about processes, comparing them with required data, researching and identifying the cause of gaps between observed and required data.
- (4) Improve - the improvement of process. Proposing improved processes, developing and testing the improved process and implementations.
- (5) Control - to ensure that the improvements are sustained and that ongoing performance is monitored. Process improvement are also monitoring results and comparing them with the required data.



Figure 1. DMAIC Methodology

### 3. Discussion

To discuss further, DMAIC approach is used to identify the causes that affect the quality of service on the KTM commuter station.

#### Step 1: Define the problem

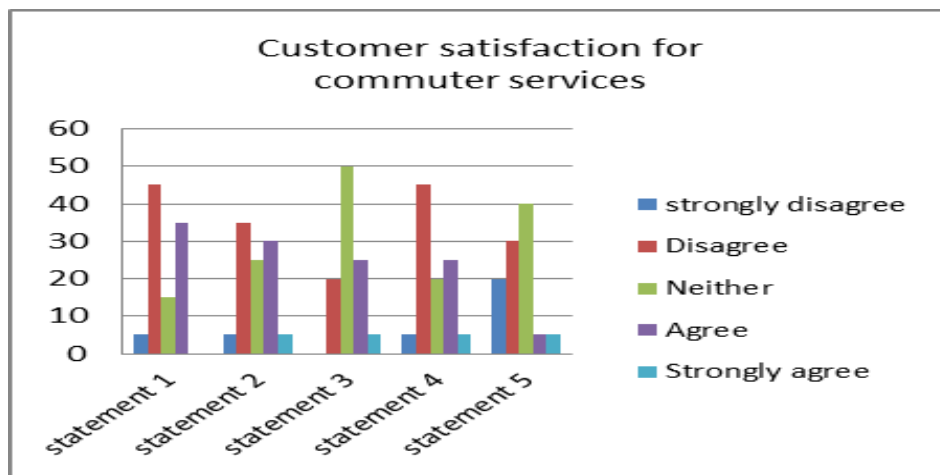


Figure 2. Customer Satisfaction for Commuter Services

Statement 1	I am very satisfied with commuter services
Statement 2	I am very satisfied with the facilities provided to the passenger
Statement 3	I really like the commuter service
Statement 4	I do not have any problems when using the facilities at commuter stations
Statement 5	I am very satisfied with all the facilities provided for the disabled and senior citizens

Source: Questionnaire

Based on the graph, customer satisfaction is still not satisfactory. To achieve the quality of train services as possible require the cooperation of all parties. If in Japan, the train is the preferred choice as the country's population Japanese provide efficient and fast.

Fonseca, Pinto, and Brito (2010) conclude that reliability, security, speed, comfort and punctuality are quality dimensions of greater important for the public transport services.

Therefore, researchers have used a modified questionnaire method in accordance with commuter services to identify dimensions involved with commuter passenger satisfaction. Therefore, it is the responsibility of the KTM to understand and satisfy passenger commuter service.

One of the basic aspects of the six sigma methodology is to identify things that are important to the quality (critical to quality - CTQ) that determine customer satisfaction (Habidin, Yusof, Omar, Mohamas, Janudin, & Omar, 2012). In service delivery, it is important to gather the information required by passengers for activities related to the operation of the process so that those services meet the CTQ (Habidin & Yusof, 2012). CTQ by Noriaki Kano classified into three categories which are the cause of dissatisfaction, the cause of satisfaction and pleasure. Identify CTQ is based on the needs of the customer or the customer's voice (voice of customer).

**Step 2 Measure the current process**

In this second step, based on the questionnaire some major problems have been identified.

Table 1

*Analysis of the Problems Identified*

No.	Statement	Agree (%)
1	Provide friendly customer	15
2	The staff had enough knowledge of commuter services	40
3	The staff were efficient in managing customer	20
4	The staff is ready to help the disabled	25
5	The staff is ready to help the elderly	20
6	Passengers always use the facilities provided by the well	15
7	Passenger according to the rules set by KTM	20
8	Passengers are always boarded a commuter line	10
9	Passengers disabled and elderly are always given help	15
10	Elevators and escalators are always in a state	35
11	Special access for the disabled	40
12	Automatic vending machines are in good condition	5
13	KTM always deliver the latest information about the service	45
14	The information submitted is accurate and clear	20
15	KTM is always informed about the arrival and commuting to customers especially for the blind.	15
16	Employees are always motivated and efficient in his work	35
17	Employees are always motivated to keep the facilities provided	5
18	Employees are always motivated to help the disabled	20

Source: Questionnaire

**Step 3: Analyze the cause of the problem**

According to sources the questionnaire as shown Table 1, there are 18 items that showed a low level of 40% down. Based on the results, we can build a diagram boned fish diagram to explain the reasons for dissatisfaction commuters to service commuter station.

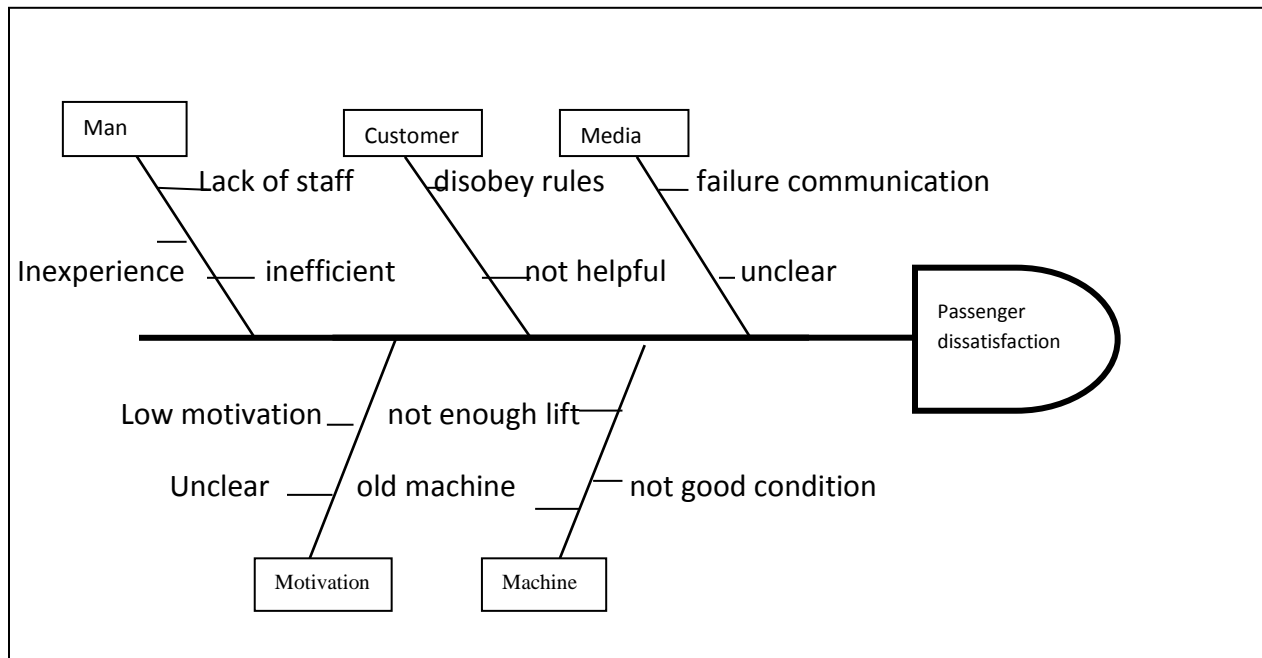


Figure 3. Fishbone Diagram

Based on the study Geetika (2010), the findings related to the quality of service have some similarities to this article. According to Geetika (2010), availability of good quality and quantity of refreshments at affordable prices is the key factor impacting customer perception of service quality. In addition, other factors that passengers consider important at railway platform are behavior of staff, porters, parking and quality of the information systems. Appropriate action plans may be taken to enhance basic facilities and improve security particularly for the disabled and the elderly.

Based on questionnaires, the facility has been identified for improvement, such as Table 2.

Table 2

*Analysis Facilities that Need Attention*

No.	Statement	Agree (%)
1	Toilet in good condition	20
2	Toilets are clean	20
3	Toilet reserved for the disabled	50
4	Sufficient number of toilets for passengers	5
5	Surau in good condition	50
6	Surau always clean and neat	50
7	Prayer is available for the disabled	5
8	Adequate prayer space for passengers	15
9	Adequate iron wait	35
10	Elevator available for the disabled and senior citizens	20
11	Elevator available in all commuter station	40
12	Stalls selling food and beverages are available	30
13	Stand in a clean state	40
14	Food stalls are clean	10
15	Comfortable waiting room	40
16	Provided sufficient seats	30
17	Parking and clean	45
18	Secure parking	35
19	Shuttle bus is available for passengers	15

Source: Questionnaire

Based on Table 2, toilets require serious attention as the percentage of respondents who agreed with the statement and only 20% of the most noteworthy is the insufficient number of toilets for passengers especially during peak hours.

KTM must also take into account the facilities for the disabled for the use of prayer at commuter stations. While they may only passenger minority, their welfare cannot be ignored. Here found the location and condition of the mosque prayer is not possible for them to use the mosque. Some commuter stations, the *Surau* very small and cannot accommodate more passengers.

According to Geetika (2010), other factors important to note include treatment of staff, parking and also the quality of its presentation.

House of Quality (HoQ) is a simple and attractive service innovation tool which can be used to directly show comprehensive information which contained the voice of customer (VOC), technical response, technical correlation and matrix relationship. HoQ with further discussion on planning part which is can be used to assist management in knowing the overall

detail information of service and recognizes the solution for unsatisfied customer through priority improvement activity to enhance the customer satisfaction in future (Fazila & Nasir, 2007; Habidin, Yusof, Salleh, & Latip, 2014).

In this article, the Quality Function Deployment (QFD) with the formation house of quality (HOQ) is used to meet the goal to obtain information for planning remedial action. QFD approach begins where the customer needs is a customer perception is at a low level of satisfaction to note. This means that it needs to be solved in order of priority for the distribution of limited resources are used optimally parallel to maximize customer satisfaction.

QFD is a process that provides a structure for the development cycle (development cycle). This structure can be linked to the framework of a house. Its essence is the customer's requirements. While the framework is made up of the planning matrix, which contains details such as interest rates, the benchmark accepted by the customer (customer perceived) and factors of scale-up. The second floor contains the technical characteristics. The roof is interconnected between the technical characteristics. Wall is a matrix relationship between customer requirements and technical characteristics.

Other parts can be built to the new technology, function, process steps, analysis of competition and sales indicator. The use of the components is dependent on the scope of the project.

Refer to Figure 4 shows typical initial or basic matrix consisting of six rooms. The description of each column each are described as follows:

- Customer Requirements (Component A)

Looking statements to customer requirements, also called Voice of the Customer (VOC).

- Technical response (Component B)

A description of the goods or services to be developed in the Planning (Component F) is also called the Voice of the Organization.

- Technical correlation (Component C)

Explaining the effect or impact each other technical characteristics.

- Relations Matrix (Component D)

Applicable interaction is between customer requirements and technical description of the synergistic effect. Is an important part HoQ that will generate a matrix of priority.

- Technical Section (Component E)

Indicate priority technical response or target. This part is critical in any decision resulting from the priority matrix derived from the relationship matrix (Component D).

- Planning (Component F)



This section contains the interest rates, customer ratings, analysis of competitors, the strategic goals and plans for new products or services.

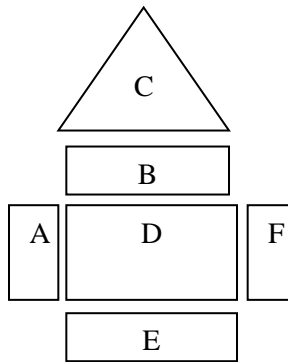


Figure 4. House of Quality Concept

According to Marvin, Gioconda, Federico, and Carl (2004) as illustrated by Figure 5, there are three phases of QFD model. The first phase is known as Planning Matrix is also known as the House of Quality (HoQ).

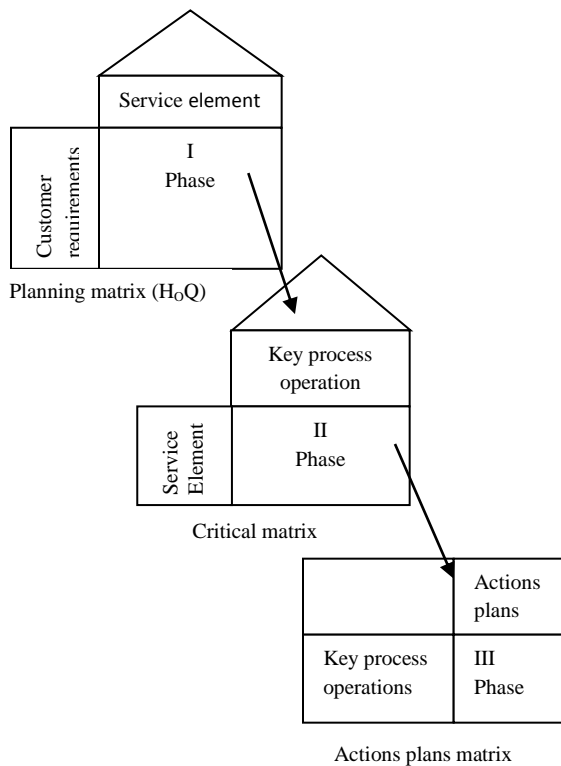


Figure 5. QFD approach in the service industry

The second phase is known as Matrix Critical Parts which is a continuation of the first phase, followed by the third phase of the Action Plan Matrix, which is the action of information obtained from two previous phase.

Some steps in the build HoQ by Marvin et al. (2004) is as follows:

1. Determination of customer needs (what's)

For this step of 18 VOCs that were obtained by questionnaire will be included in HoQ as Aspect Customer Satisfaction (What / Is). The composition made according to the mean value of performance satisfaction from high to low. This space is also called 'Customer Needs '.

2. Identify the processes or the latest service element (hows)

Identification of the service element is through discussions with some managers KTM and this space is also called 'the Technical Response' as shown below.

Man	The staff had enough knowledge The staff is ready to help the disabled
Customer	Passengers always use the facilities provided by the well Passenger according to the rules set by KTM
Machine	Elevators and escalators are always in a state Special access for the disabled
Motivation	Employees are always motivated to keep the facilities provided Employees are always motivated to help the disabled
Media	KTM always deliver the latest information about the service The information submitted is accurate and clear

Figure 6. Voice of customer in HoQ

3. Connect the service element as the 'roof'

The space is filled yield answers KTM managers view. Generally, this space is a marker for the effect or impact and synergistic to each other in the areas specified services. This space is 'Technical Correlation '.

#### 4. Develop relationships between customer requirements and service elements

As a technical correlation, this space accommodates answer service center managers involved in the proposed list of VOC to be noted by the prescribed service .Average calculated responses of the four forms of management's views back to fill in this room. The answer is a relationship of scoring by stage 5 (strong ties), 3 (medium correlation), 1 (weak ties) and 0 (no relation). To facilitate the presentation made the marks are replaced with symbols that have been set. This area is also known as 'relationship matrix'.

#### 5. Analysis and development HoQ

For this last step, the two spaces involved, namely the 'Technical Department' and the 'Planning'. Two spaces is a decision that will be used for action planning for improvement and it has been sorted by priority.

House of Quality (HoQ) is presented as a summary of the results of the discussions and decisions, in which the latest achievements in the quality of services provided, will be featured prominently as a whole and individually (Brown, 1991). However, for details on the improvements may be needed for further study in the future for further details on the person responsible and the assignment until the problem is resolved to the roots.

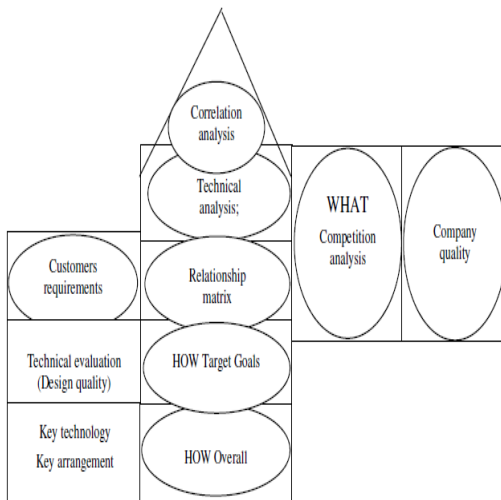
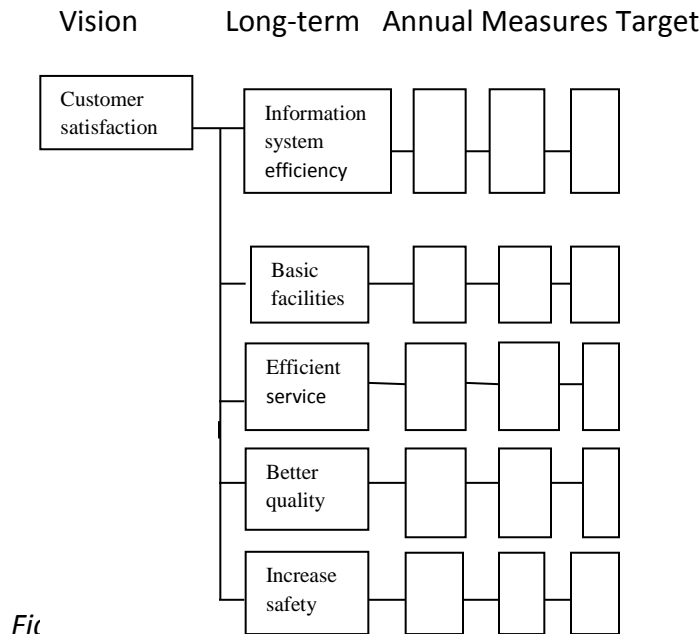


Figure 7. Frame of house of quality

#### Step 4: Improve and implement the solution

Improve is the step where creative solutions to existing problems can be developed and tested, using various experiment or piloting techniques. The key deliverable in the Improve step is verifiable improvement through measurement. The best ideas for improvement, based on what was learned in Measure and Analyze, are tested and implemented on a limited basis to determine if there is statistical evidence of sustained improvement. Once a team improves a process, the results should become quite clear on a control chart.

After identifying the problem, a number of suggestions for improvement, including in terms of the services provided to passengers in commuter station (Gaspersz, 2007; Habidin, Salleh, Latip, Azman, & Fuzi, 2016). KTM will create a master story improvement as follows:



Fig

Master improvement story as an example Figure 8 involves long term, annual, measures and targets for the implementation of a project.

In the improvement phase, the causes for failure or poor quality must be identified with a solution that will reduce defects in the process. A failure mode and effect analysis or FMEA can be used to improve the process. These quality tools could be very well used for the improvement of organizations and institutions (Weinstein, Petrick, Castellano, & Vokurka, 2008). A step-by-step procedure is used to identify all possible causes of failure and their corresponding effects with recommended corrective actions to avoid the failure modes. Quality needs to be properly assessed with respect to man, customer, motivation, media and machine.

Deming cycle is a simple methodology to carry out repairs. Deming cycle consists of four phases of plan, do, study and act (PDSA). Overall, the Deming cycle is quite similar to the DMAIC but most of the focus is on the implementation of the Deming Cycle and learning so as to complete the repair phase DMAIC.

Often the first proposed solution should be improved or removed. Statistical hypothesis testing can be used to identify whether improvements are proposed to improve the cost-benefit Analysis of the performance can be applied to ensure that the repair can be held accountable for profit. Finally, a solution with the standard and implemented across the organization has been discussed. The process then goes back to step plan.



Figure 9. Deming Cycle

### Step 5: Control

KTM are using 6S (Sort, Stabilize, Shine, Standardize, Sustain, and Safety) to monitor the facilities available at commuter stations to ensure the comfort and satisfaction of passengers in commuter station.

Sort, namely to remove or dispose of all work items that are not used anymore in the performance of duties or activities. Implementation `sort 'can use the "red tag system" that is a method for identifying information and goods in a work area that is no longer needed in their daily work.

Stabilize which regulate and organize the items needed in the work area, then to label or mark so that everyone can find items easily. KTM can provide a 'stabilize check sheet'. For example, if a locksmith is unable to attend, his successor had no problem taking over.

Shine, custody or care that the work area is kept clean and shining. The implementation of 'Shine check sheet 'and` Shine cleaning plan' can be implemented to ensure smooth monitoring.

Standardize, creating a consistent implementation of the `sort ', ` stabilize' and 'shine'. This can be done by using a visual process controls and copyright `5S Agreements'.

Sustain, to ensure the successful and sustainable travel programs by creating `6S Audit Record 'to monitor the results that have been achieved.

Safety, give employees a guarantee of safety and prevent accidents at work.

So that information can be communicated throughout the organization, management should develop a system of visual communication in the context of Lean Six Sigma or often referred to as visual management and other visual depending on the place where visual

information is specified. An Examples work team performance improvement measurement or master story. The management can also use Pareto diagram for progressive analysis.

A revised FMEA was produced to form the 'control plan' and this is usually the major tool employed in this stage. Other tools, such as Poka-Yoke (mistake proof), SPC (statistical process control), chart, SOP (standard operation procedure), documentation and training plans are also used frequently in some steps (Hung & Sung, 2011).

#### **4. Recommendations**

Further study may be expanded in the outer aspect of the internal customer satisfaction survey, which is also important to improve the productivity of an organization.

It is proposed that KTM have regard to facilities such as 'feeder bus' is very important for passengers who do not own cars and rely on public transportation entirely. This is because not all residential areas near the station with commuter and not all passengers have their own vehicles especially students who commute using commuter facilities.

'A Feeder bus' should include several stations if it is located in a suburb which has a relatively small number of passengers. It can also benefit people with disabilities and senior citizens commuter service.

Improvements that can be done by management are:

- i. Improving communication amongst staff members, using updated systems to process complaints, and ensuring error-free transactions.
- ii. Training of staff to enable them in assisting customers and provide them with relevant and timely information. Courtesy, etiquette and communication skills could be honed through continuous training of the staff.
- iii. Improvements in the ambience of the outlet, better shelves and space management, clear electronic sign posts, clean walkways and aisles, lighting
- iv. Provision for children's area, food courts, and adequate parking space, security, and ATM facilities for passengers.

#### **5. Conclusions**

As an organization monopoly in railway services, should KTM provides the best service for the satisfaction of passengers. To this end a number of approaches have been taken to ensure the KTM continues to improve productivity and profitability based on voice of customer.

The study is expected to help the KTM to implement the best management as the approach taken by the management of LRT. KTM also can take the example of the approach of other countries such as Japan where rail transport is the main transportation for the people of Japan.

According to Seth and Deshmukh (2005), from their study, it appears that the key ingredients to service quality improvements are customer focus, motivated staff, effective

measurement and feedback system, effective implementation system and efficient customer care system.

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### **Corresponding Author**

Roslina Mustapha, mroslina250@gmail.com. Faculty of Management and Economics, Universiti Pendidikan Sultan Idris, Perak.

### **References**

- Brown, P. G. (1991). QFD: Echoing the voice of the customer. *AT&T Technical Journal*, (March/April), 18–32.
- Evans, J. R., & Lindsay W. M. (2007). *An introduction to six sigma & process improvement*. Jakarta: Selemba Empat.
- Fonseca, F., Pinto, S., & Brito, C. (2010). Service quality and customer satisfaction in public transports, *International Journal for Quality Research*, 4(2), 125-130.
- Fazila, S., & Nasir, M. S. (2007). *Perbandingan kepuasan pelanggan ke atas empat pusat khidmat menggunakan rumah kualiti (HoQ)*. Agensi Nuklear Malaysia: Bangi, Selangor.
- Gaspersz. (2007). *Lean six sigma for manufacturing and services Industries*. Penerbit PT Gramedia Pustaka Utama: Jakarta.
- Geetika, S. N. (2010). Determinants of customer satisfaction on service quality: A study of railway platforms in India. *Journal of Public Transportation*, 13(1), 97–113.
- Habidin, N. F., & Yusof, S. M. (2012). Relationship between lean six sigma, environmental management system, and organizational performance in Malaysian automotive industry. *International Journal of Automotive Technology*, 13(7), 1119-1125.
- Habidin, N. F., & Yusof, S. M. (2013). Critical success factors of lean six sigma for Malaysian automotive industry. *International Journal of Lean Six Sigma*, 4(1), 60-82.
- Habidin, N. F., Yusof, S. M., Omar, C. M. Z. C., Mohamas, S. I. S., Janudin, S. E., & Omar, B. (2012). Lean six sigma initiative: Business engineering practices and performance in Malaysian automotive industry. *IOSR Journal of Engineering*, 2(7), 13-18.

- Habidin, N. F., Yusof, S. M., Salleh, M. I., & Latip, N. A. M. (2014). The development and validation of green lean six sigma performance improvement tool (LSSPI) for Malaysian automotive industry. *Journal of Applied Science and Agriculture*, 9(21), 41-45.
- Habidin, N. F., Salleh, M. I., Latip, N. A. M., Azman, M. N. A., & Fuzi, N. M. (2016). The development of strategic balanced scorecard tool (SBST) for Malaysian automotive industry. *Journal of Industrial and Production Engineering*, 33(4), 271-285.
- Habidin, N. F., Yahya, N. Z., & Shukur, M. F. (2015). Using LSS DMAIC in improving emergency department waiting time. *International Journal of Pharmaceutical Sciences Review and Research*, 35(2), 151-155.
- Hung, H. C., & Sung, M. H. (2011). Applying six sigma to manufacturing processes in the food industry to reduce quality cost. *Academic Journals*, 6(3), 580–591.
- James, L. B. (1991). *Quality function deployment: practioner's approach*. New York: Marcel Dekker, Inc.
- Kukuljan, K., & Kukuljan, V. (2008). The usage of the six sigma method for the improvement of support for ICT services. In *Information and Intelligent Systems Conference*.
- Marvin, E. G., Gioconda, Q., Federico, P., & Carl, A. E. (2004). Customer satisfaction using QFD: An e-banking case. *Managing Service Quality*, 14(4), 317–330.
- Seth, N., & Deshmukh, S. G. (2005). Service quality models: A review. *International Journal of Quality & Reliability Management*, 22(9), 913–949.
- Weinstein, L. B., Petrick, J., Castellano, J., & Vokurka, R. J. (2008). Integrating Six Sigma concepts in an MBA quality management class. *Journal of Education for Business*, 83(4), 233-238.