# Quality Improvement in Hospitals through an Integrated Six Sigma Approach, TQM, and the Baldrige Assessment

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**Abstract.** This study analyzes the impact of Integrated Six Sigma on quality improvement, the impact of Total Quality Management on quality improvement, and the impact of the Malcolm Baldrige Assessment on quality improvement. This was a quantitative study conducted in hospitals in Indonesia. We had 400 hospital owners as the samples; they were selected through simple random sampling. Data were collected through online questionnaires distributed using social media. The questionnaire used a Likert scale with a range of 1-7. Data were analyzed using Structural Equation Modeling (SEM) with SmartPLS software. The independent variables were the integrated six sigma approach, TQM, and Baldrige Assessment, while the dependent variable was the quality improvement assessment. Findings confirmed that Integrated Six Sigma had a positive and significant effect on improving quality, Total Quality Management had no significant effect on improving quality, and Baldrige Assessment had no significant effect on improving quality.

**Keywords:** Quality improvement, hospitals, integrated six sigma, TQM, Baldrige assessment

## 1. Introduction

A hospital is an institution that is capital, technology, and manpower intensive [1]. In the process of offering healthcare services to the community, hospitals are vulnerable to conflicts. As other service industries have evolved over time, one of the key prerequisites for hospitals to continue is their ability to offer top-notch customer service. Patient satisfaction will be impacted by excellent service, and customers will be more loyal to the services provided by the service sector [2], [3]. Consumer loyalty is one indicator of how well a service meets quality standards. Customer loyalty will determine whether a customer will return or not and whether they will recommend the service received to others. Loyalty is the consistent repurchase of a brand by customers. Loyal customers will become spiritual advocates who will continue to defend the product or company under any circumstances and continue to recommend it to others [4]. Loyalty is very important to the continuity of an organization [5], [6]. For this reason, a strategy is needed to provide quality services according to patient needs. Customer demands on various aspects of service at the hospital are increasing. Increased education and socio-economic community demand change to better and quality health services.

For hospital administration to be more successful and efficient, it must be handled with modern and socioeconomic management [4], [7], [8]. A hospital must be able to respond to changes that

LePALISSHE 2022, October 29, Malang, Indonesia

DOI 10.4108/eai.29-10-2022.2334023

occur and immediately anticipate them by focusing on customers and markets and prioritizing patient safety. For this reason, it is necessary to have the right strategy in dealing with critical community challenges and competition between health facilities in order to provide the best service and become an option for the community. One solution is to take concrete actions to improve services in hospitals, both medical and non-medical. Medical services, especially those that are Customer Oriented, one of which is how health workers provide excellent service to patients and families so that with this excellent service, patients, and families will feel satisfied and comfortable with the services provided so that they will become a source of positive "word of mouth". Often there is a difference between what is expected and the reality the patient feels on the quality of service received.

Organizations that satisfy their customers are almost unbeatable [2], [9]. Even when the company has problems, its customers remain faithful, making them willing to make more frequent purchases, pay more, and do so. Conversely, if a company loses customers who were previously devoted or is unable to cultivate a strong bond with them, its marketing expenses will rise as a result of the need to bring in new clients to maintain its viability. The best course of action in an integrated system is to pursue quality improvement, known as Total Quality Management (TQM), a type of best management practice in a business or organization that highlights the company's or organization's overall quality paradigm [10], [11]. TQM is a management idea that puts more of a focus on serving customer needs by creating service products that are of the highest quality and have a positive effect on customer satisfaction. This concept aims to respond appropriately to any changes driven by internal and external forces [3], [12], [13]. The application of TQM is growing by using a more structured and comprehensive framework, one of which is the Malcolm Baldrige National Quality Award (MBNQA) framework as the best quality management practice to improve organizational performance. This study analyzes the impact of Integrated Six Sigma on quality improvement, the impact of Total Quality Management on quality improvement, and the impact of the Malcolm Baldrige Assessment on quality improvement.

## 2. Research Method

This was a quantitative study conducted in hospitals in Indonesia. We had 400 hospital owners as the samples; they were selected through simple random sampling. Data were collected through online questionnaires distributed using social media. The questionnaire used a Likert scale with a range of 1-7. Data were analyzed using Structural Equation Modeling (SEM) with SmartPLS software. The independent variables were the integrated six sigma approach, TQM, and Baldrige Assessment, while the dependent variable was the quality improvement assessment.

The hypotheses are:

H1: Integrated Six Sigma significantly and positively impacts quality improvement
H2: Total Quality Management significantly and positively impacts quality improvement
H3: The Baldrige Assessment significantly and positively impacts quality improvement

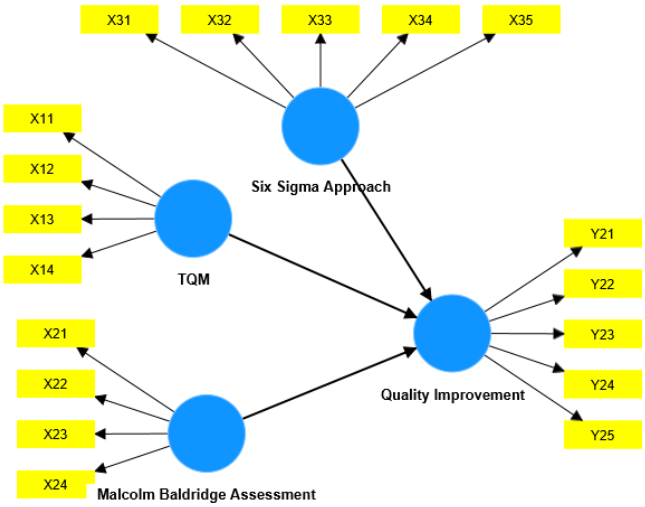


**Fig 1.** Research Model

## 3. Result dan Discussion

### 3.1 Convergent Validity

Figure 2 shows that each research indicator has an outer loading > 0.7, so all indicators are declared valid and can be used for further analysis.

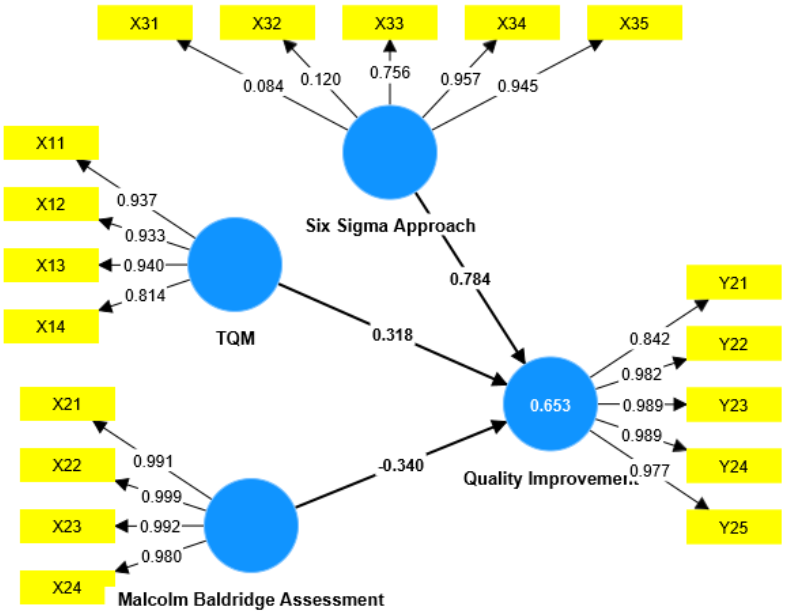


**Fig 2.** Loading Factors

### 3.2 Discriminant Validity

Table 1 shows that the AVE value of all variables is > 0.5, meaning that all variables have good discriminant validity. The composite reliability and Cronbach Alpha's values of all research variables are> 0.7, meaning they have a high level of reliability.

**Table 1.** Reliability Testing

| | Cronbach's Alpha | rho_A | Composite Reliability | Average Variance Extracted (AVE) |
|---|---|---|---|---|
| Integrated Six Sigma | 0.802 | 0.852 | 0.767 | 0.621 |
| Total Quality Management | 0.806 | 0.836 | 0.813 | 0.643 |
| Malcolm Baldrige Assessment | 0.805 | 0.812 | 0.727 | 0.612 |
| Quality improvement | 0.812 | 0.823 | 0.812 | 0.687 |

### 3.3 Coefficient of Determination

**Table 2.** R-Square

| | R-Square | R-Square Adjusted |
|---|---|---|
| Quality improvement | 0.653 | 0.623 |

Table 2 shows that the R-Square value for quality improvement is 0.623, meaning that Integrated Six Sigma, TQM, and the Baldrige Assessment can explain 62.3 % of quality improvement, while the rest 37.7% is explained by other factors excluded in this study.

### 3.4 Hypothesis Testing

Hypothesis testing in this study was carried out by looking at the t-statistics value and the p-value. The research hypothesis is accepted if the p-value <0.05

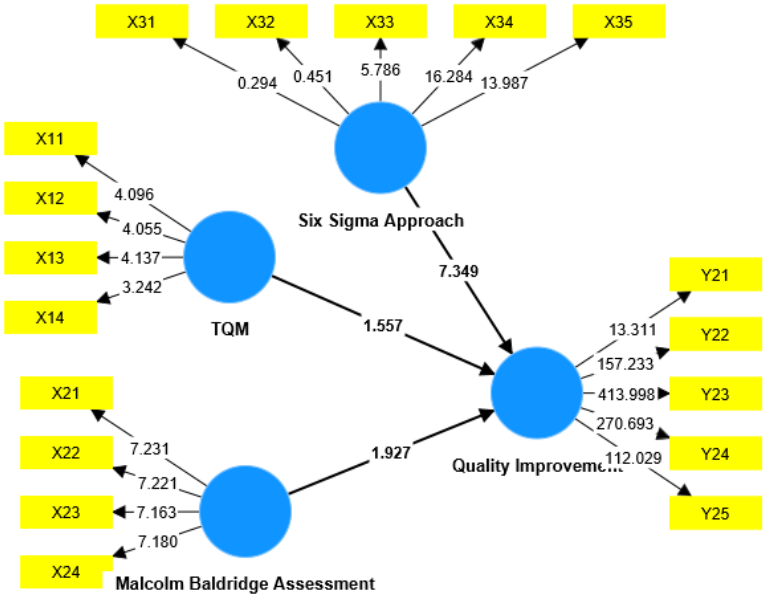


**Fig 3.** Hypothesis Testing

**Table 4.** Hypothesis Testing

| Hypothesis | T Statistics | P Values | Result |
|---|---|---|---|
| Integrated Six Sigma - quality improvement | 7.349 | 0.000 | Supported |
| Total Quality Management - quality improvement | 1.557 | 0.087 | Not Supported |

| | | | |
|---|---|---|---|
| Malcolm Baldrige Assessment - quality improvement | 1.927 | 0.065 | Not Supported |

### 3.5 The Impact of Integrated Six Sigma on Quality Improvement

Table 4 shows a t-value of 7.349 > 1.96, meaning Integrated Six Sigma positively and significantly impacts quality improvement. This result supports [1], [7]

### 3.6 The Impact of Total Quality Management on Quality Improvement

Table 4 shows a t-value of 1.557 < 1.96, meaning that TQM does not significantly impact quality improvement. This result supports [6], [10], [11].

### 3.7 The Impact of the Baldrige Assessment on Quality Improvement

Table 4 shows a t-value of 1.927 < 1.96, so the Baldrige Assessment does not significantly impact quality improvement. This result supports [4], [6], [10].

### 3.8 Discussion

TQM and Six Sigma have been proven conceptually and empirically as continuous quality improvement methods to help improve organizational performance. We felt the need to study TQM and Six Sigma methods in hospitals to meet the demands and needs of customers or patients to achieve performance excellence in the long term using the Baldrige Assessment. For hospital administration to be more successful and efficient, it must be handled with modern and socioeconomic management [4], [7], [8]. A hospital must be able to respond to changes that occur and immediately anticipate them by focusing on customers and markets and prioritizing patient safety. Today's society wants fast, easy, and excellent services [4], [6]–[8], [10], [11], [14], [15]. TQM and Six Sigma are important and strategic because they can provide harmonious services to assist operational efforts and excellent performance in organizations, especially in hospitals. For this reason, we examined the quality of service in hospitals with an integrated approach of TQM and Six Sigma through the assessment of the Baldrige method.

The Six Sigma method combines in-depth knowledge of systems, processes, techniques, statistics, and project management to enhance and maintain an organization's competitive advantage through a continuous improvement system while also improving quality and service, reducing waste and costs, and developing robust products and processes. Implementation of Six Sigma in hospitals includes various aspects such as providing services or direct care, administration and finance, as well as hospital operations [1], [10]. It has a positive role in reducing cycle time in emergency units, managing bed capacity, reducing medication errors, and positively impacting patient satisfaction.

According to [1], [10], the Baldrige Assessment provides a systems perspective for managing an organization and the key processes of an organization to achieve optimal performance. Malcolm

Baldrige's seven categories are mechanisms for establishing and integrating criteria in an effort to develop superior organizational systems. The systems perspective means viewing and managing the organization by integrating the components toward optimal performance. The Baldrige Assessment is organized into seven interrelated categories; Leadership, strategic planning, and customer focus represent the trinity. These groups were created to highlight and support the significance of strategy and customer-focused leadership. Human resources focus, process focus, and results represent the trinity of results. The company's job is completed by essential organizational processes and individuals, which yields higher performance results. The horizontal arrows in the Baldrige Assessment's core chart link the leadership trinity to the results trinity, an important link to organizational excellence. Two-way arrows indicate the need for feedback in an effective performance management system. Measurement, analysis, and knowledge management are important to organizational management's effectiveness and fact-based system for improving performance and competitiveness.

[1], [4]–[6] found that when compared to other variables, the leadership variable has the lowest average value. It is revealed that less-than-ideal leadership is still present in transparency, supervision, future regeneration, planning, and strategic planning management. The approach is fully disseminated without gaps within each area or work unit. Systematic evaluation and performance improvement based on facts and organizational learning is a key tool of organizational scope management; improvement and innovation supported by analytical excellence and shared across the organization Approach are well integrated with identified organizational needs.

According to [2], [3], the integration of TQM and Six Sigma with the Baldrige Assessment can achieve hospital performance by increasing the leadership role in hospitals, especially in transparency, supervision, regeneration in the future, as well as the process of planning and managing strategic planning; Developing and implementing strategic plans optimally, especially in carrying out SWOT analysis optimally, socializing to all hospitals, as well as monitoring and evaluating unit programs so that they are in line with the established strategic plan; Increase the ability to focus on patients or customers; Give high attention to the management and empowerment of employees, particularly in improving aspects of employee involvement, namely increasing employee competence, reward and recognition systems, as well as transfers and rotations that can increase motivation and also employee capabilities in improving performance; Focusing on quality improvement by increasing monitoring and evaluation efforts, as well as commitment in following up on information and data obtained. Developing an accurate and integrated information system so that it becomes the basis for the implementation of fact-based management.

It is hoped that it can further improve quality management to support the application of TQM and Six Sigma integration with the Baldrige approach in hospitals, especially on the variables obtained are not optimal. It is expected to take advantage of applying TQM and Six Sigma integration using the Malcolm Baldrige approach as a self-evaluation of the implementation of quality management in hospitals to build a quality culture and improve hospital quality. The re-evaluation of the quality management program that the hospital has carried out as a basis for consideration in adopting and implementing TQM and Six Sigma integration through the Malcolm Baldrige approach is expected. It is hoped that they can make policies to develop hospital quality management programs by utilizing the criteria for implementing TQM and Six Sigma integration through the Baldrige Approach, including providing infrastructure and supporting resources,

technical quality management training, and budget allocations needed by hospitals in their implementation.

## 4. Conclusion

Findings confirmed that Integrated Six Sigma positively and significantly impacted quality improvement, Total Quality Management had no significant impact on quality improvement, and the Baldrige Assessment had no significant effect. Thus, the quality of the hospitals assessed using the Baldrige Assessment on their TQM and Six Sigma integration needs to be improved. Four variables have an average value lower than the total average value of 7 (seven) variables in the Baldrige Assessment; the four criteria are leadership, strategic planning, human resource management, measurement, and analysis and management. Leadership and strategic planning variables require special attention because they have the lowest values. Additionally, according to the findings of in-depth interviews, leadership plays a major part in enhancing performance. Our in-depth interviews revealed that the strategic plans were not thoroughly disseminated to the units. As a result, the goals of the work program frequently do not align with the predefined strategic plan, which causes disparities in how well units function and how well the hospital as a whole is performing. It was also discovered that there were no guidelines for unit performance appraisals.

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