

Investigation of Six Sigma Practices and Process Innovation for Malaysian Healthcare Industry

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ABSTRACT: Healthcare industry has to face many significant challenges continuously in order to provide optimal performance. In order for Malaysia to achieve a developed nation status, improvements in term of healthcare services are required. Therefore, a quality management initiative is needed to achieve their goals. Six Sigma (SS) is clearly and proved as one of quality management initiatives for process changes. The abilities of organization to be innovative in industry give great impact to organization. In addition, process innovation can provide the additions of quality improvement toward product or service. Process innovation had been seen assist SS practices to achieve performance improvement. Thus, the purpose of this study is to review structural analysis between SS practices and process innovation. Examination of the research literature shows that there is a lack of empirical research that systematically examines the relationship between SS practices and process innovation. Therefore, this concept paper tries to examine how the SS can contribute on development of process innovation in healthcare industry. Next, the hypothesis has been developed based on the literature and the proposed research model for Malaysian healthcare industry also provided. For the future agenda, Structural Equation Modelling (SEM) techniques will used in order to get the empirical result.

KEYWORDS: Six sigma, process innovation, innovation, quality management initiatives, process improvement, healthcare.

1 INTRODUCTION

Healthcare industry is seen as an industry of great responsibility for the development of society and the nation. Coinciding with this, the healthcare industry should provide the great service to the community to incubate and form a healthy society which can contribute to the country. In order to look the welfare of citizen, the various programs and provision has been made by the Malaysian government. Through the presentation of the 2013 budget, a total of RM19.3 billion is allocated for operating and development expenditure in Malaysian healthcare industry [1]. Besides that, The Malaysian government establishing Malaysia clinic that aims to reduce the treatment costs to be paid by the people. This shows the healthcare industry to be one pillar in the development of the national economy.

In order for Malaysia to achieve a developed nation status, improvements in term of healthcare services are required. Reference [2] stipulate that Malaysia is in circumstance to provide the quality of healthcare in this country. Hence, one of the ways to achieve that goal is by implementing innovation in the healthcare industry that can assist to improve the quality in service. Nevertheless, [3] noted that there has been more challenging time for healthcare organizations to be innovative. This is because, healthcare industry face the challenges to be innovative in every process to be performed. Most of the department in the healthcare industry such as radiology, medication, surgery, pharmacy, and emergency involves human life.

Hence, the improvement through innovation can assist to reduce medical errors and achieve their goals. On top of that, there are some of previous studies discuss the innovation effort in healthcare industry such as [4], [5] and [6]. The previous study highlight that process innovation gets the attention from the healthcare industry too.

In addition, process innovation should practices together through quality management initiatives. Various quality management initiatives that can be implemented in organizations such as Six Sigma (SS), Total Quality Management (TQM), Balance Scorecard (BSC), Lean Manufacturing and so on. Reference [7] found that TQM has a positive and direct effect on technological innovation in Spanish industrial firms. In addition, study by [8] found that the TQM (leadership and people management; process and strategic management; and open organization) has a positive impact with innovation product innovation; service innovation; and process innovation) in Vietnamese industry. Thus, the implementation quality management initiatives can be success with the help from employing innovation in organization. However, the previous studies concerns the relationship between quality management initiatives like TQM with innovation get the wide attention but unfortunately not for SS practices with process innovation. Hence forth, the purpose of this study is to review structural analysis the SS practices and process innovation for Malaysian healthcare industry.

Next, this paper is structured as follows: section 2 presents the literature review of SS practices, process innovation and development of the propose hypothesis; in section 3, the methodology is described; followed by section 4 presented the purposed research model; and finally in section 5, conclusion and future research are discussed.

2 LITERATURE REVIEW

2.1 SIX SIGMA PRACTICES

Six Sigma (SS) practices is one of the quality management initiatives that increasing organization to implement. SS practices has received substantial attention and being executed in businesses worldwide not only in manufacturing industry but service industry too for improve and reduce the level of defect in the customer's perspective. Reference [9] identified the main aims of SS efforts include improving customer satisfaction, reducing cycle time, and reducing defects. Meanwhile, referring to [10] describes that the important key in SS practices are determine the customer requirements and improvements which are made based on customer's definition of defects. Apart from the factor customer requirements, according to [9] stipulated that the important key of SS practices is to meet the needs of market and technologies. This factor gives beneficial not only to the organization but also to the customers, employees, and shareholders.

The Commonwealth Health Corporation (CHC) became the SS pioneer in healthcare industry whereby employed SS practices in March 1998 under General Electric [11]. After the success story of CHC who benefited from the implementation of the SS practices, many healthcare organizations followed it. Most of healthcare organization focused on direct care delivery, administrative support and financial administration when implement SS. Reference [12] investigated the Scottsdale Healthcare which executed SS practices at Emergency Department. The outcome of this study reported that time to transfer a patient from Emergency Department to an inpatient bed was reduced and gained profits at \$600,000. In addition, researchers [13] explored the effect of employed the SS to implement the centers for disease control and prevention guideline for hand hygiene in four intensive care units in three hospitals and revealed that observed compliance increased from 47% to 80%, based on over 4,000 total observations. Hence the implementation of SS practices in healthcare industry had proved assist to achieve healthcare organization's goals.

Critical Success Factors (CSFs) in SS practices is important in order to gain the goals and great performance. Reference [14] stated the CSFs of SS consists management involvement and commitment; cultural change; communication; organizational infrastructure and culture; education and training; linking SS to business strategy; linking SS to customer; linking SS to human resources; linking SS to suppliers; understanding tools and techniques within SS; project management skills; project prioritisation and selection. Meanwhile, according to [15] identified the CSFs in service industry which are include the management commitment and involvement; company-wide commitment; cultural change; linking SS to business strategy; integrating SS with the financial infrastructure; organisational infrastructure; training and education; incentive program; customer focus; understanding the DMAIC methodology; project management skills; project prioritization and selection; and project tracking and reviews. However, in this study CSFs of SS practices for healthcare industry consist the four factors include leadership, customer focus, structured improvement procedure and focus in metric.

2.1.1 LEADERSHIP

To ensure business running smoothly, the organization should be led by an efficient leader. As a leader, they should master the leadership skills to manage their subordinates and process in organization. This is because, during the

implementation of SS, organization has to face many challenges that consist to gaining employee commitment and involvement [16]. Coinciding with this, leadership is needed to fill this gap by actively engage and socialize. Reference [17] also agreed leadership involvement is basis requirement to achieve the aims of SS practices. Besides that, referring to [18] noted that leader supports is needed in order to continuous improvement initiatives to be successful. By subordinate gain the support from leader continuously, they become more enthusiastic to do their work.

Reference [19] defines leadership as improvement specialist which is assigned with specific leadership roles and responsibilities in improvements teams. Hence, a leader takes the responsibility for determining the direction where his subordinate should be taken. On top of that, leaders also have to make decision and take the responsibilities to manage a work and prevent it from any damage and breach of duty that could affect the organizational performance and image. Thus, leadership is one of the CSFs that drive the implementation of SS practices in healthcare organization.

2.1.2 CUSTOMER FOCUS

Currently, customers more awareness towards the value of the product or service purchased. Comparison and evaluation is made before buying the products or services. Identify customers' requirements, expectations and needs become as the importance things to ensure the organizational performance can be achieved ([18],[20]). On top of that, every process of organization should meet the customer needs for increasing customer loyalty [21]. Customer loyalty plays an important role because it assists to enhance the organizational performance. In line with that, study by [18] said that the decision to determine customer's need can be critical to organization's long term survival. The stage of organization has a loyal customer, they continuously repurchase or reuse backs the products or services that provides by organizations. Furthermore, according to [22] stipulated the benefits to organization that get from loyal customer are the less cost to serve them; willing to pay more than other customer; and they act as word-of-mouth marketers for organization. At the end, the strength and durability of organization's brands will last longer in the market because of loyal customer.

Next, study by [17] stipulated that improvements efforts should focus on customers in order to achieve maximum effects when implementing SS practices. In addition, [23] found two key in customer focus which is the input process and the output procedure. In relation to that, input process require organizational to understand customer needs and integrate with organizational information while in output procedure, organization need to minimize variation of the process, reduce defects, and enhance process capability. Thus, by implementing SS practices in healthcare industry, organization should make a clear understanding the customer's expectation and requirements and finally give the great impact to healthcare organization.

2.1.3 STRUCTURED IMPROVEMENT PROCEDURE

To achieve the expected goals, improvement in operating structure is needed. Structured improvement procedure is one of the CSFs in SS practices to driven better performance in organization. For example, [17] defined the suitable key ingredients CSFs of SS practices and it adapted to vision, strategies, capability, and circumstance of a Korean company and found operating organization structured is one of them. Improvements in all operations should been executed in order to improve the quality of the product or service produced and to run the effective improvements in the organization, they must have effective planning and guidelines. Reference [24] noted that to increase the customer satisfaction, organization need to implement the effective improvement. Meanwhile, referring to [25] stipulated that improvement cannot be executed if don't have clear guidelines. Hence forth, the effective structured improvement procedure can be seen as one of the ways that can benefit not only to organization but also to its surrounding.

Reference [26] describe process improvement consist to remove the main problems that effect organizational performance and identify the solutions to it. Due to this, the structured improvement procedure assists to implement SS practices in organization. Therefore, in healthcare industry, the problem should be fixed immediately because it impacts on the customer (patients) that could harm them. Hence forth, structured improvement procedure is a step taken by healthcare organization to identify, analyse and make improvements on the organization's processes with a clear guideline in assist organization goal achievement.

2.1.4 FOCUS IN METRIC

Strategic performance measurement becomes one of the tools to see the overall organization performance. In line with the goals of the organization to improve performance in many aspects, the levels of performance for each unit in organization must be monitor and measure. The mechanism that often adopted today is the use of metrics whereby

associated with quality issues [27]. Focus in metric is one of the CSFs to assist process improvement in organization. Coinciding with this, study by [9] stipulated that SS provide a consistent way to measure the performance of a process or products. To keep the organization focused on the metric when implementing SS, employees play an important role to make it happen. This is because the best way to motivate the employees is introduce incentives or compensation a program in organization [17]. Thus, in order to implement SS practices in healthcare industry, organizations need to focus on the performance measures for assist organization to achieve their goal and continuously get customer loyalty.

2.2 PROCESS INNOVATION

At present, the challenges faced any organizations is the competition. In relation of this challenge, process innovation is needed to respond to these challenges [28]. Implementation of the process innovation can provide additions of quality to product or service. Reference [29] noted that innovation in process activities assist to increase the service quality. In healthcare industry, systematic and effective processes are emphasized. This is because healthcare organization aims to gain the higher quality of services to prevent the occurrence of negligence that might cause patient injury or death [30]. In order to avoid any carelessness that may pose a danger to patients, the process innovation is ideally suited to be adopted in healthcare organizations.

There are increasing numbers of empirical studies concern process innovations. For example, recently, [31] explored the relationship between the information technology adoptions with process innovation. From the research finding, they discovered that there is a significant relationship between information technology adoption and process innovation. Besides, study by [32] examined the effect of process innovations on firm total factor productivity growth in Spanish manufacturing firms. This study provided empirical evidence which that process innovations foster productivity growth in both for small and large firms.

In addition, according to [29] identified the three indicators of process innovation in Korean service industry which include operation innovation, customer relationship innovation, logistic innovation and organisation innovation. In relation all of previous study, this paper proposed process innovation in three indicators which are radical process innovation, incremental process innovation and service process innovation.

2.2.1 RADICAL PROCESS INNOVATION

To support the new improvement in business process organisation, need to implement radical process innovation as key to success. Radical innovation is defined as introduction of new product or process [33] and also major improvement or introducing the new process to organization and industry too ([34],[35]). Every organization has their own purpose and reason before implementing innovation. For example, [36] found that the reason for organization introducing radical process innovation is to increase their market share, to enter new market or foreign market, or to enlarge its product assortment. In healthcare industry, the radical innovation needs to be carefully managed because it assists to give a positive impact on customers and the industry itself if organization managed successfully and otherwise if failing. Thus, an effective radical process innovation should be adopted in order to attain the excellence performance in healthcare organization and industry.

2.2.2 INCREMENTAL PROCESS INNOVATION

Organizations that execute a process that has been successfully implemented by other organizations referred as adopted incremental process innovation. Incremental innovation defines as the continual process of improvement in organization ([35],[37]). Organizations in the healthcare industry can apply radical innovation on their existing processes because only dealing with low risk and onward assist to improve the performance. Based on [38] stipulated that to increase market life of their existing products or services in healthcare industry, organization have started exploring the incremental innovation because of the risk is more lower compared to radical innovation. On top of that, improvement in healthcare is urgent and important pursuit [39] because in healthcare industry, it is require zero tolerance for defects. By increasing the added value of existing processes, it assists for healthcare organization to achieve the goals.

2.2.3 SERVICE PROCESS INNOVATION

Services provided by the organization are evaluated by the customer. To ensure that the organization can keep a good image, organization need to improve the service by executed innovation in their service process. There a few researchers and authors defined the service process innovation. Reference [40] defined service process innovation as new development of service. Meanwhile, [41] refer service process innovation as redesign of service process delivery. Regardless of the definition

adopted, service process innovation is a new and improved ways in service delivery systems. Besides that, executed the service process innovation can assist organization to achieve the great performance in many perspective such as obtain better quality of service, able to getting efficient delivery system and improving the efficiency [42]. Implementing service innovation in healthcare organization is needed because nowadays, they are also support healthcare provision by offering health-check programs, prediagnosis testing, and follow up with the customers after treatment [6]. In line with this, healthcare organization must implement service process innovation for their growth and survival.

2.3 SIX SIGMA AND PROCESS INNOVATION

SS practices always defined as a process improvement by practitioners and researches [18],[30],[43],[44],[45] but the previous study concerning directly the relationship between SS practices and process innovation in healthcare industry still lacking. Reference [9] stated that to achieve the aims of SS, it requires breakthroughs in every area of operations. The absence of the innovation process, the difficulty of implementing SS can be seen. Reference [46] stated that SS projects deal with tasks, processes and operations. Improvements in the process will assist the implementation of SS. Hence forth, the process innovation is needed to assist when execute the SS practices accomplish organization goals.

Study by [47] examined the integration of SS practices and process improvement through Healthcare Quality Improvement Circle (HQIC) in dealing with troublesome needle-stick events that accoutred in a Taiwan hospital. The authors revealed that the accident rate decrease significantly when implement the SS and HQIC compared than before. In addition, [48] determined the overall sigma level performance of four processes of the Imaging Department (reception, X-ray, computed tomography, and radiologist diagnosis) considering process innovation through SS methodology. The finding showed that through implementation of SS on process innovation, the Imaging Department (ID) found to reduce defect after employed process innovation and obtained SS level (σ) which is higher than the initial sigma level of the ID before innovation employed in their process that was 36 patients per day with a process defect ($\sigma = 2.0$), following measurements in 15 days after process innovation was 28 patients per day with a process defect ($\sigma = 2.2$) and after 30 days of implementation was 24 patients per day with a process defect ($\sigma = 2.3$). Thus the SS practices have significant relationship to process innovation in healthcare industry.

To understand the relationship between SS practices and process innovation for Malaysian healthcare industry, the following propose hypothesis will be test.

H₁: There is a positive and direct significant relationship between six sigma practices implementation and process innovation for Malaysian healthcare industry

3 RESEARCH METHODOLOGY

The main aim of this study is to review structural analysis the SS practices and process innovation for Malaysian healthcare industry. Healthcare industries were chosen because the use of the requirement of quality management initiative and process improvement method in this sector is very important. Coinciding with that, the samples from healthcare industry were selected from the list of hospital in Malaysian healthcare industry. Next, for future, this study will use survey method to collect the data from sample. A set of survey questionnaire as a sampling method will carefully designed to ensure most of the issues concerning SS practices and process innovation were included.

Next, to find cause and effects between SS practices and process innovation, the Structural Equation Modelling (SEM) technique are employ to analyse the data gathered from the survey. Exploratory factor analysis, reliability analysis and confirmatory factor analysis to test the construct validity, reliability, and measurements loading were performed. Having analysed the measurement model, the structural model was then tested and confirmed. Besides that, to analyze the preliminary data and provide descriptive analyses such as means, standard deviations, and frequencies, the Statistical Package for the Social Sciences (SPSS) version 17 will use. On top of that, SEM using AMOS 6.0 will use to test the measurement model.

4 PROPOSED RESEARCH MODEL

Based on literature review, exploring process innovation get the wide attention from the practitioners and researchers but there are limited empirical studies that focus directly the relationship between six sigma practices and process innovation

in healthcare industry. In addressing the problems, authors propose to analyse the relationship between six sigma practices and process innovation for Malaysian healthcare industry. Figure 1 presented the proposed research model.

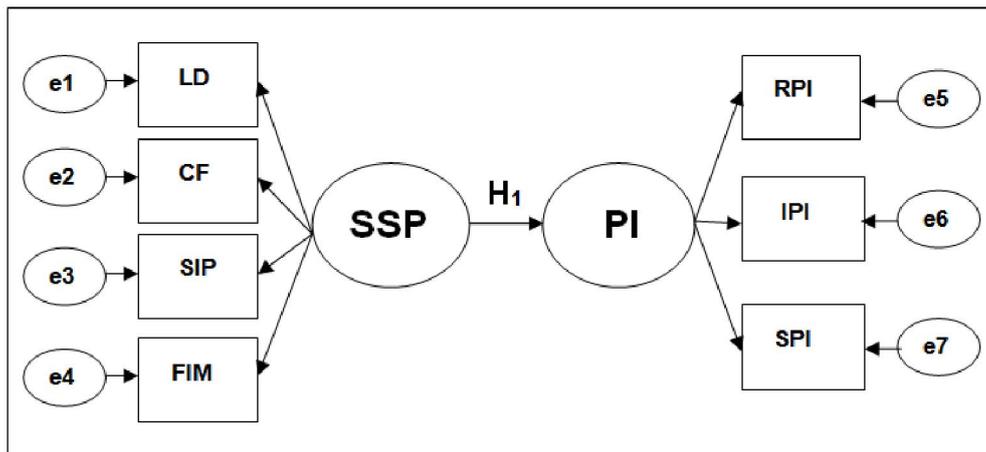


Fig. 1. Proposed Model of the Study

Note: SSP: Six Sigma practices; LD: Leadership; CF: Customer focus; SIP: Structured improvement procedure; FIM: Focus in metric; PI: Process Innovation; RPI: Radical process innovation; IPI: Incremental process innovation; SPI: Service Process Innovation

5 CONCLUSION

Recently, consideration has been made by customer before they buy or use the products or services. Coinciding with that, healthcare organization must improve their quality of product or services to meet customer requirement by improving the process. Process improvement supports the healthcare organizations to enhance healthcare outcomes. To implement SS practice, process improvement (through process innovation) assists the organization to achieve the targets that already set [48]. This paper provides the research review of SS practices and process innovation and attempts to make contribution in this area through a study based in Malaysian healthcare industry. Examination of the research literature shows that there is a lack of empirical research that systematically examines the relationship between SS practices and process innovation. In order to that, the purpose of this study is to carry out structural analysis the SS practices (leadership; customer focus; structured improvement procedure; and focus in metric) and process innovation (radical process innovation; incremental process innovation; and service process innovation) for Malaysian healthcare industry. For the future agenda, a set of questionnaire are developed. Next, analyse according to SEM techniques will used in order to get the empirical result. Facts that have been highlighted in this study hopefully can contribute to the organization and researchers to investigate more deeply the relationship between SS practices and process innovation with better awareness.

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