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## **Path Analysis of the Core Competency of Thai Private Hospitals in the ASEAN Economic Community**

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### **ABSTRACT**

The objectives of the research were to study path relations between a lean healthcare system, Six Sigma practice and internal quality management of core competency of Thai private hospitals to be an ASEAN Economic Community (AEC) medical care center. The population and sample group of the study were the Hospital Accreditation (HA) officers of Thai private hospitals between December 2012 and May 2013. The sample group totaled 312 persons. The study tool included questionnaires and a path analysis was employed to analyze the data. The findings of the study determined that (1) The lean healthcare system indirectly influences, through internal quality management, a hospital's core competency to be an AEC medical care center, (2) Six Sigma practices directly influence a hospital's core competency to be an AEC medical care center, (3) Six Sigma practices indirectly influence, through internal quality management, a hospital's core competency to be an AEC medical care center, (4) Internal quality management directly influences a hospital's core competency to be an AEC medical care center.

**Key words:** Lean healthcare, internal quality management, core competency, AEC, medical care center

### **INTRODUCTION**

All societies in all countries expect to be have access to a quality healthcare system that they can trust and in which they have confidence. However, regardless of the measures societies take to provide such systems, the healthcare systems are frequently found to be inefficient and unsatisfactory, being filled with conflict and risk. Therefore, it has become essential to develop a methodology to promote quality improvements in hospitals and healthcare services that can be adapted to specific situations (The Healthcare Accreditation Institute, 2013). For example, reducing patient waiting time in hospitals was identified as an issue to be addressed under the umbrella of quality management (Gowen *et al.*, 2006). Presently, the lean management system was implemented to consider patient flow and value added flow (Bernstein, 2008). Also implemented was Kaizen, an improvement philosophy that concentrates on waste elimination and reduction applied in healthcare (Riley *et al.*, 2010) to improve patient care by reducing errors, waiting times and margin costs while improving and increasing interactions within the organization and among the staff (Graban, 2008).

Presently, many hospitals are facing problems associated with margin cost increases (Suharitdhamrong, 2012) and as a consequence, many overseas hospitals have applied the lean system to their management network (Womack and Jones, 1996; Liker, 2004). Hospitals that adopt the lean system concentrate on increasing the flexibility of nursing facilities and patient healthcare (Russell and Talor, 2011). Chiangmai Mahanakorn Hospital applied Womack and Jones' lean healthcare system (Womack and Jones, 2005) to develop a working process that could reduce time, maintain standard quality management and operate efficiently (Norkaew, 2010). In Thailand, many hospitals improved the quality of their services by implementing the lean healthcare system which helped them to reduce patient time waiting and provide error protection. These hospitals included Songkhanakar Hospital, King Mongkut's Hospital, St. Louis Hospital, Surathanee Hospital, Siriraj Hospital and Sao Hai Hospital.

Currently, societies worldwide are in need of improvements the overall quality of life they are able to provide societies are facing pressures from production and service industries to reduce costs, improve production, reduce the cycle time for production and waste from production, reduce warehouse space and increase work space. Additionally, to ensure sustainability, it is necessary that these improvements be part of a continual process. Six Sigma which was popular for a long time in quality improvement (Goh, 2010), became the prototype of the quality improvement concept (Russell and Talor, 2011). Six Sigma proved to be an efficient and successful tool for increasing production and reducing rejection rates in factory industries. However, the implementation of Six Sigma in the service industry was different from its application in the production industry as its application and benefits are more limited within the context of the service category. Six Sigma has been applied in both the healthcare industry and the banking industry (Abdolshah *et al.*, 2009). Today, the lean system and Six Sigma are applied together and are known as Lean Six Sigma. When implemented in hospitals it can reduce work rotation. In the situation model, the average work rotation was reduced by 57.4% from its present operation, the flow rate was increased by 375.5%, staff productive increased by 30.4% and increased service quality by 120.7% (Tepchit, 2006).

The advantages of Thai healthcare in the AEC compared with the healthcare provided by neighboring countries include the specific market target and the quality of the healthcare. Furthermore, Thai healthcare in the AEC offers the largest hospitals in Asia, the Bangkok Hospital and the Bumrungrad Hospital which were the first hospitals certified by the ISO 9001 and the first to receive JCI accreditation (Enderwick and Nagar, 2011). In addition to the standard quality of Thai private hospitals, Thai hospitals in the AEC concentrate on providing a quality customer service system that addresses the specific customer group. For example, the hospitals in Southern Thailand, such as those in Songkhla province, offer a prayer room for Muslim customers and separate drinking water for Buddhist customers, ideas that followed the philosophy of the lean system as strategies to satisfy customers by embracing the religious cultures of the various regions.

## **THEORY**

**Lean healthcare:** Lean's idea was highly popular among the healthcare businesses because of its margin reduction. For example, Pella Corporation assigned its efficient staff to learn the medical business at a regional medical care center, while Boeing Company was so confident in lean management philosophy that it sent 30 executives from the Virginia Mason Medical Center in Seattle to study for 2 weeks at the Toyota plant in Japan.

The Maytag factory group in Iowa implemented the operating system and the operators then facilitated the excellent lean management system in their regional healthcare system. The hospital staff prepared the outsource to be responsible for healthcare insurance and executives administrators of the factory worked together to reduce waste and plan the investment flow and data flow, including that of the healthcare system. The groups found that every health insurance company and employer identified the specific demands of the company and defined the claim procedures of employers for health insurance. However, the different data regarding customer demands depended on various conditions and required significant time to process, thereby requiring the service company to continually repeat the conditions.

Most of the lean systems implemented in hospitals included flowcharting, mistake-proofing, rapid management and the Kaizen improvement philosophy.

According to the Lean framework, all activities must be evaluated quickly to build confidence in customers. Therefore, non-value added activities were eliminated. According to TPS, there are three types of waste (or 3 MUs or 3 Ms) (Verma and Boyer, 2008) as follows:

- **Muda:** Muda is a Japanese word which when used in production means to waste or refers to non-valuable production or non-valuable service. The word “value” was established by customer who were pleased to pay for valuable activities
- **Mura:** The second type of waste, unstable production, was found in present production processes. The just-in-time warehouse management strategy could reduce unstable and uncertain production processes
- **Muri:** This type of waste was the result of work overload. This waste can be reduced by standardizing the production process

As per the lean healthcare concept, the patient is the most important customer. Therefore, the hospital should meet the customers' needs by maintaining quality standards and providing patients with easy and convenient access to services. Accordingly, the hospital should focus on customer satisfaction from the initial contact until the patient is discharged from the hospital. One way to do this is to focus on patient flow and on patient data flow by designing a new package service that reduces patient waiting time, such as time spent waiting for the doctor and time spent, waiting for blood draws, etc. Additionally, the hospital should focus on interactions between the hospital staff and patient and on encouraging the patient to participate in his or her own health program, etc.

To apply lean methodology in hospitals, there were two perspectives. One group emphasized applying lean to overall quality improvement, while the second group wanted to apply lean to data and patient flow. To provide patients with the best treatment, the following steps were applied:

- The first step was to draw a process map and then to evaluate waste in the process using Value Stream Mapping (VSM). VSM assesses the duration of performing various steps of the procedure as well as the quantity and time of value added and non-value added activities. In each step, a process plan would improve the quality of teamwork and the processing of the steps, thereby adding value to the patients' experience. Each step incorporated source and time, including margin costs, without value added
- In the next step, working together, the members of the team identify the objective and design a new procedure by mapping to reduce critical factors as much as possible. For example, reducing time patients spend waiting for admission and reducing time patients spend waiting for results of tests prior to admission, etc

**Six Sigma:** Six Sigma was a flexible system known for its success in sustainable business by concentrating on customer demands. Based on statistical data analysis, Six Sigma is an improvement strategy that incorporates management orientation and the presentation of innovative business processes (Verma and Boyer, 2008). The principles of Six Sigma are as follows:

- The main methodology is to concentrate on understanding the customers' demands and on satisfactorily meeting those demands to receive quality feedback in return. Six Sigma is the scientific method used to support the evaluations by customers and to evaluate the feedback data of the organization's goods and service
- Data management is a necessary part of Six Sigma performance. The data collected for the company is relative to the company's objective, thus facilitating the company to make unbiased decisions
- The internal analysis of Six Sigma involves prioritizing the necessary activities associated with the production of goods and with providing satisfactory customer service. Therefore, the quality improvement provided by Six Sigma increases automatic efficiency by producing quality products and by providing quality service to the customers
- Six Sigma performance incorporates a proactive management style. In other words, accordingly to Six Sigma, management should identify original problem before the problem occurs, thus preventing the problem
- The staff in each division of the company should work cooperatively and to create and sustain a proactive operation. When Six Sigma is successfully implemented, teamwork crosses over into other divisions
- The goal of Six Sigma is perfection. Six Sigma's acceptable level of quality is 3.4 ppm. It was hypothesized that the normal distribution under a normal curve was set by the level of SD (standard deviation) from the mean

**Internal quality management:** Service differs from goods production because service quality involves an element of time as well as a degree of interaction between staff and customers. Accordingly, service quality (Russell and Talor, 2011) includes the following dimensions:

- **Time and timeliness:** How long do the customers wait for service or was the service completed on time? In the case where delivered goods were returned, would the goods be delivered overnight?
- **Completeness:** Was the response to the customer's demand satisfactorily completed? Were the goods ordered via catalogue or purchase order delivered within a satisfactory time frame?
- **Courtesy:** Were the customers treated appropriately by the company's representatives? Were the company's representatives polite and efficient when dealing with customers over the telephone?
- **Consistency:** Was daily service delivery prompt and on time? For example, was the newspaper delivered on time everyday?
- **Accessibility and convenience:** Was the service easy for customers to access and use? For example, when customers called in to place an order, was the call answered quickly?
- **Accuracy:** Was the service efficient and accurate every time? For example, was the bank account statement accurate every month?
- **Responsiveness:** How does the company address the unexpected problems that often occur in a service company? For example, can the operators answer questions about goods listed in the catalogue if the catalogue did not provide adequate details of the goods?

**Competency of organization:** According to Armstrong, the definition of competency is that every person operates at an acceptable level and satisfactorily meets the desired output. Competency also, however, refers to the behaviors necessary to attain excellence in the job, that is, behavioral competencies. Thus, competencies are those behaviors required of an individual to effectively perform a job.

Main competencies of organizations consist of the following 4 factors:

**Shared mindset:** This factor is the driving factor behind competitive advantage. Building a shared mindset is one of the processes in creating organizational culture. A shared mindset is the ideal form, consisting of shared norms and shared assumptions. If the staffs of organizations had shared mindsets, there would be a level of unity that would propel the organization to achieve its targets. There are 2 factors that contribute to a shared mindset-data and behavior. It has been stated that the more people who have access to the information, the greater the opportunity to develop a shared mindset. Behaviors also influence a shared mindset in that behaviors often reflect the unity associated with a shared mindset. When staffs have a shared mindset, there are 2 concerns-what is to be shared and with whom should it be shared.

**Management and human resource practices:** Human resources management in organizations builds strong competencies using 3 methods. These include recruitment and development procedures, evaluations and rewards procedures and communication and job and organizational design. Attitudes influence behaviors and they influence the administration of an organization. The policies, standard practices, organizational culture and internal practices all dictate the types of messages staff receive, how they receive they messages and how they spread the messages. This, in turn, influences attitudes and behaviors.

A functional management group is one where line managers and human resources professionals work together to meet the organizations objectives. While the organization's team establishes policy and organizational operations, it is the employees with their various competencies that operate the organization. Any organization that wants to be able to compete with other organizations should transform the various competencies of their employees into organizational competencies. A fully competent and competitive organization manages 6 sectors of human resources-capacity selection, capacity development, capacity appraisal, rewards, organization design and communication.

**Capacity for change:** Capacity for change is a critical element for an organization. Research of 1,000 managers found that the capacity of managers was separated into only 2 categories-capable managers and incapable managers-while the capacity for change process was divided into 4 steps, as follows:

- **Step 1:** Current state of the system
- **Step 2:** Plan for change
- **Step 3:** Transitional management change
- **Step 4:** Desired outcomes

The index of capacity for change was measured using reduction in time waiting of many activities, development of quality products, feedback from customers and design of administrative system.

**Leadership:** Leadership is crucially important to the success of an organization. Leadership refers to the personal ability to influence other people or groups as they work to reach the objectives of an organization.

To change the vision of an organization, leaders must take the following steps:

- Transform organizational visions to a shared mindset that includes both internal and external environments and operators
- Apply a shared mindset to develop activities that will enhance competency development, which, in turn, results in change
- Improve the human management process such that it effectively influences idea and behaviors of personnel within the organization

A transformational leader concentrates on the external environment of the organization, such as competitors, customers and the global market. However, they also focus on developing competencies within the organization. The tools leaders use to accomplish the organizations goals include assignments and activities for staff development and for building cooperation and trust among colleagues.

## **MATERIALS AND METHODS**

**Materials:** Data collection tool: a questionnaire that consisted of 5 parts, as follows:

- **Part 1:** Contained general information questions about Thai private hospitals. The questions yielded qualitative data on both nominal and ordinal scales
- **Part 2:** Included questions about the lean healthcare system and yielded quantitative data on a Likert scale. Each question offered a choice from among 5 levels of opinion. The questions addressed the following topics: Efficiency trade-offs, service flow by the pull service system, supply chain concentration, customer orientation and training and employee empowerment
- **Part 3:** Included questions about Six Sigma practice and the data gather was quantitative and assessed on a Likert scale. Each question offered a choice among 5 opinion levels. They topics addressed support from high level administrators, customer relationships, supplier relations, office management, quality data, service design, process management and steps toward structural improvement
- **Part 4:** Included questions about internal quality management and the data gathered were quantitative in nature and assessed using a Likert scale. Each question offered choices from among 5 levels of opinion. The areas covered were service efficiency, service procedures and service consequences
- **Part 5:** Included questions about the hospital's core competency to be an AEC medical care center. The questions were quantitative in nature and assessed on a Likert scale. Each question offered choices from among 5 levels of opinion. The topics covered included operational procedures, planning and procedural controls and capable behaviors

## **Methods:**

- The population and sample group in the study was comprised of HA officers from Thai private hospitals between December 2012 and May 2013. Using purposive sampling, a sample group of 312 persons was selected

- Variables
  - The exogenous variables were the lean healthcare system and Six Sigma practice
  - The endogenous variables were internal quality management and hospital's core competency to be an AEC medical care center

**Research framework:** The research results of Core Competency of Thai Private Hospitals' Organization to be the Medical Care Centre in ASEAN Economic Community (AEC) (Ponanake, 2014) found that opinion levels in the lean healthcare system influenced hospital's core competency to be an AEC medical care center with statistical significance at 0.05. Furthermore, quality management influenced a hospital's core competency to be an AEC medical care center with statistical significance at 0.01. The research of Rajeev Chadha *et al.* (2012) found that the lean system was applied to enhance quality management in hospitals. Gowen *et al.* (2012) studied the differences in the effects on service among continuous quality improvement, Six Sigma and lean management system in hospitals. The results of their study indicated that Six Sigma effectively influenced organizational restructuring whereas lean management did not significantly influence organizational restructuring. They also found that Six Sigma was an advantageous factor for competitors. Verma and Boyer (2008) posited that under Lean framework, all activities had to carefully be evaluated with respect to quality to ensure that customers actually received value from the activities and that unvalued added activities should be eliminated. Moreover, the research of Kersten and Koch (2010) studied the impact of quality management on service quality and the logistics of the successful service providers. Their study found that effective service process has a positive impact on the success of a business, that is, aside from the disharmonized model of service. Shuai *et al.* (2007) studied "The Impact of ERP Implementation on Corporate Supply Chain Performance" by examining the relationship among ERP, the core competency of an organization and supply chain performance and capable behaviors. From the study, it was determined that ERP affects supply chain performance through the core competency of the organization. This research found that the framework in Fig. 1 could be used for a path analysis of the core competency of Thai private hospitals entering AEC by the lean healthcare system and Six Sigma practice based on internal quality management.

**Abbreviations of variables:**

LHC = Lean healthcare system  
Sixsigm = Six Sigma practice  
QM = Internal quality management  
Corecomp = Hospital's core competency to be an AEC medical care center

**Research Hypothesis:**

- The lean healthcare system indirectly influences a hospital's core competency to be an AEC medical care center through internal quality management
- The lean healthcare system directly influences a hospital's core competency to be an AEC medical care center
- Six Sigma practice directly influences a hospital's core competency to be an AEC medical care center



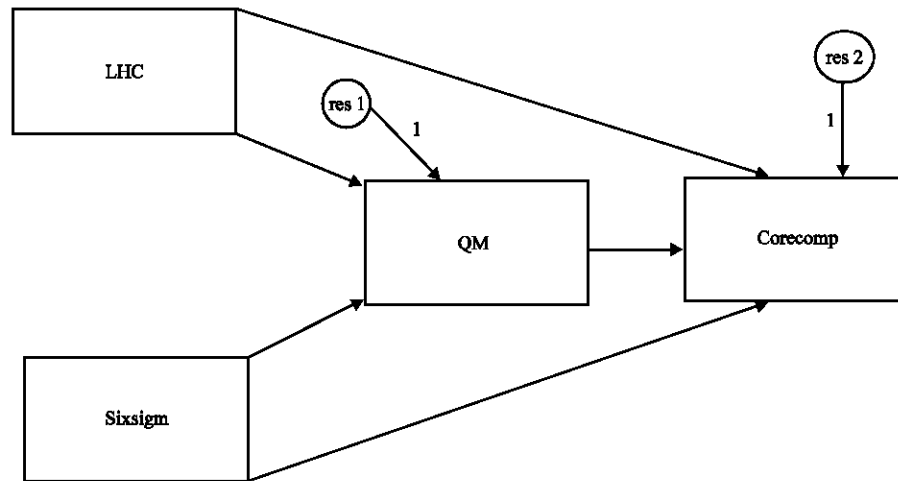


Fig. 1: Research framework

- Six Sigma practice indirectly influences a hospital's core competency to be an AEC medical care center through internal quality management
- Internal quality management directly influences a hospital's core competency to be an AEC medical care center

#### Statistical data analysis:

##### Descriptive statistics:

- Personal data of sample group, statistics from data analysis, i.e., percentage
- Lean healthcare system, Six Sigma practice, internal quality management and hospital's core competency to be an AEC medical care center. The statistical analysis included frequency, percentage, mean and Standard Deviation (SD)

##### Analogical statistics analysis:

- Path analysis of variables of the lean healthcare system, Six Sigma practice and internal quality management of a hospital's core competency to be an AEC medical care center
- Testing goodness of fit model using Chi-square ( $\chi^2$ ), GFI, CFI, RMSEA (Hair *et al.*, 2010), as shown in (Table 1)

## RESULTS

Table 2 shows that there is strong agreement about the lean healthcare system (mean 3.8762), Six Sigma practice (mean 3.9031), internal quality management (mean 4.0817) and hospital's core competency to be an AEC medical care center (mean 3.8791).

Table 3 shows that there is strong agreement regarding the lean healthcare system in efficiency trade-off (mean 4.0814), supply chain concentration (mean 3.9026), service flow by pull system (mean 3.7853), employee empowerment (mean 3.7652) and customer orientation and training (mean 3.759).

Table 1: Goodness of fit model using Chi-square

Statistic	Criteria
Chi-square ( $\chi^2$ )	p-value > 0.05
Root Mean Square Error of Approximation (RMSEA)	< 0.05
Goodness of Fit Index (GFI)	≤ 0.90
Comparative Fit Index (CFI)	≤ 0.90

Table 2: Mean ( $\bar{x}$ ), standard deviation (SD) and opinion level of the lean healthcare system, Six Sigma practice, internal quality management and hospital's core competency to be an AEC medical care center

Variables	$\bar{x}$	SD	Opinion level
Lean healthcare system	3.8762	0.55585	Strong agreement
Six Sigma practice	3.9031	0.58155	Strong agreement
Internal quality management	4.0817	0.57008	Strong agreement
Hospital's core competency to be an AEC medical care center	3.8791	0.64441	Strong agreement

Table 3: Mean ( $\bar{x}$ ), standard deviation (SD) and opinion level of the lean healthcare system

Variables	$\bar{x}$	SD	Opinion level
Efficiency trade-off	4.0814	0.56878	Strong agreement
Service flow by pull system	3.7853	0.73468	Strong agreement
Supply chain concentration	3.9026	0.59989	Strong agreement
Customer orientation and training	3.7596	0.72192	Strong agreement
Employee empowerment	3.7652	0.66912	Strong agreement

Table 4 shows that there is strong agreement regarding Six Sigma practice with respect to customer relationships (mean 4.0994), service design (mean 4.0359) and quality data (mean 3.9223). The support from high level administrators is also strong for process management (mean 3.8550), supplier relationships (mean 3.8494), office management (mean 3.7865) and steps for structural improvement (mean 3.7030).

Table 5 shows that there is strong agreement with respect to service efficiency (mean 4.1417), service procedures (mean 4.0878) and service consequences (mean 3.9992).

Table 6 shows that there is strong agreement regarding a hospital's core competency to be an AEC medical care center with respect to planning and procedural controls (mean 3.9412), operational procedures (mean 3.9175) and capable behaviors (mean 3.7941).

The initial examination of path analysis found that the deviation value was independent, normally distributed with no multicollinearity. The results of the analysis of the correlation among variables is as shown in Table 7.

Figure 2 shows the relationship between the exogenous variables and the endogenous variables in accordance with the hypotheses and the data from the sample. The  $\chi^2$ -test which found that the p-value was less than 0.05 (p-value = 0.000), indicating that the model of the hypothesis did not correspond with the data from the sample. Thus, the adjusted model of analysis is shown in Fig. 3.

Table 8 shows that the model fit testing between the exogenous variables and the endogenous variables in accordance with research papers and reports on sample data found that the p-value of ( $\chi^2$ ) was more than 0.05 (p-value = 0.272) and indicated that the model of hypothesis corresponded with the sample data. The RMSEA value was 0.026 which is less than 0.05, CFI = 1.000 and GFI = 0.998. Therefore, it can be concluded that this model has good of fitness.

Table 4: Mean ( $\bar{x}$ ), standard deviation (SD) and opinion level of Six Sigma practice

Variables	$\bar{x}$	SD	Opinion level
Support from high level administrators	3.8566	0.67606	Strong agreement
Customer relationship	4.0994	0.66709	Strong agreement
Supplier relationship	3.8494	0.69430	Strong agreement
Office management	3.7865	0.70292	Strong agreement
Quality data	4.0359	0.69541	Strong agreement
Service design	3.9223	0.65837	Strong agreement
Process management	3.8550	0.73031	Strong agreement
Steps of structure improvement	3.7030	0.77802	Strong agreement

Table 5: Mean ( $\bar{x}$ ), standard deviation (SD) and opinion level of internal quality management

Variables	$\bar{x}$	SD	Opinion level
Service efficiency	4.1417	0.62678	Strong agreement
Service procedures	4.0878	0.65610	Strong agreement
Service consequences	3.9992	0.57601	Strong agreement

Table 6: Mean ( $\bar{x}$ ), standard deviation (SD) and hospital's core competency to be an AEC medical care center

Variables	$\bar{x}$	SD	Opinion level
Operational procedures	3.9175	0.66688	Strong agreement
Planning and procedural controls	3.9412	0.74973	Strong agreement
Capable behaviors	3.7941	0.72939	Strong agreement

Table 7: Correlation among variables

Variables	Sixsigm	QM	Corecomp
LHC	0.840	0.744	0.743
Sixsigm	-	0.862	0.858
QM	-	-	0.826

Table 8: Model fit testing

Test statistics	Statistical value	p-value
$\chi^2$	1.208	0.272
GFI	0.998	-
CFI	1.000	-
RMSEA	0.026	-

Table 9: Value of direct influence, indirect influence, spurious influence and total influence of LHC, sixsigm and QM towards corecomp

Variables	Direct influence	Indirect influence by QM	Spurious influence	Total influence
LHC	-	0.026	-	0.026
Sixsigm	0.628**	0.301	-	0.929
QM	0.381**	-	0.496	0.877

\*\*Statistical significance at 0.01

Figure 3 shows the calculations of direct, indirect and spurious influence and total influence of LHC, Sixsigm and QM towards Corecomp are shown in Table 9.

Table 9 indicates that the lean healthcare system (LHC) did not directly influence a hospital's core competency to be an AEC medical care center (Corecomp), while Six Sigma practice (Sixsigm) directly influenced a hospital's core competency to be an AEC medical care center as (Corecomp) = 0.628. Furthermore, internal quality management (QM) directly influenced a

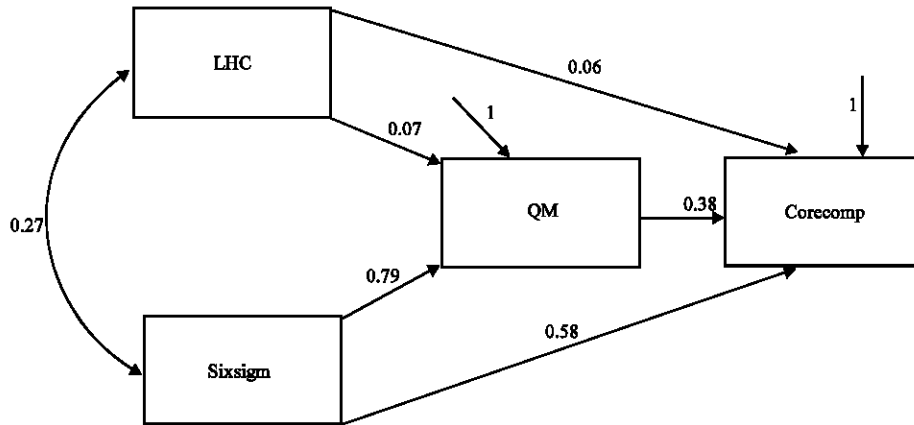


Fig. 2: Model of path analysis

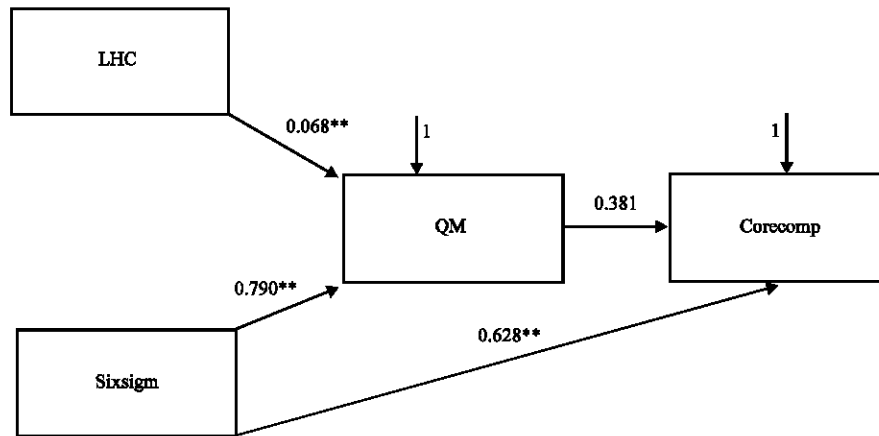


Fig. 3: Adjusted model of path analysis

hospital's core competency to be an AEC medical care center as (Corecomp) = 0.381 and spurious influence = 0.496.

The lean healthcare (LHC) indirectly influenced a hospital's core competency to be an AEC medical care center as (Corecomp) = 0.026, whereas Six Sigma practice (Sixsigm) indirectly influenced a hospital's core competency to be an AEC medical care center as (Corecomp) = 0.301.

The lean healthcare (LHC) had complete and direct influence on internal quality management (QM) = 0.068. Six Sigma practice (Sixsigm) had complete and direct influence on internal quality management (QM) = 0.79. Lean healthcare (LHC) had total influence on a hospital's core competency to be an AEC medical care center as (Corecomp) = 0.026. Six Sigma practice (Sixsigm) had total influence on a hospital's core competency to be an AEC medical care center as (Corecomp) = 0.929. Internal quality management had total influence on a hospital's core competency to be an AEC medical care center as (Corecomp) = 0.877.

## DISCUSSION

The results of this study indicate that Six Sigma practice influences, both directly and indirectly, a hospital's core competency to be an AEC medical care center AEC (Corecomp) through

internal quality management. Furthermore, this demonstrates the highest level of overall influence which corresponds with the research of Core Competency of Thai Private Hospitals' Organization to be the Medical Care Centre in ASEAN Economic Community (AEC) (Ponanae, 2014). The study also finds that the opinion levels of Six Sigma practices influence the core competency of organizations of Thai private hospitals to be AEC medical centers with a significance of 0.05. This corresponds with the research of Gowen *et al.* (2012) who studied the differences in the effects of continuous quality improvement, Six Sigma and the lean effective system in hospitals. The results found that Six Sigma is effective in the restructuring of an organization which corresponds to Parast (2011), who studied the impact of Six Sigma in innovative and effective organizations with respect to service in private hospital by concentrating on the responses to customer demands. It was found that the hospitals in Southern Thai responded to specific customer demands which was a competitive strategy to improve quality of service and care by offering prayer rooms and separating halal food containers for Muslims customers, an advantage over competitive hospitals in the AEC. The research also corresponds to the research of Zu *et al.* (2008), who studied the evolving theory of quality management and the role of Six Sigma. The research results found that Six Sigma influenced quality management performance.

The research found that Six Sigma practice with respect to customer relationships of Six Sigma had the highest mean. The researcher commented that hospitals concentrated on the responses to customer demands and that the responses were satisfactory as were the responses to outpatients, to the admission procedures and the service quality specifications. If they wanted to increase core competency of Thai private hospitals to be the medical care center entering the ASEAN Economic Community (AEC), they should incorporate Lean Six Sigma into the improvement process. Tepchit (2006) found that Lean Six Sigma could reduce the average work cycle from its present performance by 57.4%, increase of flow rate by 375.75%, increase productivity by 30.4% and increase service by 120.7%.

The lean healthcare system in business directly influences only hospital's core competency to be the medical care center in the ASEAN Economic Community (AEC) and internal quality management, at the lowest level, indirectly influenced the same. This corresponds to the research on Core Competency of Thai Private Hospitals' Organization to be the Medical Care Centre in ASEAN Economic Community (AEC) (Ponanae, 2014). The study finds that quality management influences the core competency of Thai private hospitals to be the medical centers in the ASEAN Economic Community (AEC) at a significance level of 0.01 and corresponds with the research of Kaynak (2003) regarding the relationship between overall quality management and its impact on organizational efficiency. The study also finds that quality management impacts the effectiveness of the organization, thus quality management impacts the core competency. Furthermore, the researcher commented that the majority of the hospitals conform to HA standards, thus promoting improved healthcare service through continuous quality improvement and health and safety environment management, concentration on medical expertise in order to meet customers' needs unless their high level expectations of hospital's services quality. For example; the hospitals open the specialized medical services for 24 h.

## **CONCLUSION**

The researcher suggested that Thai private hospitals should implement a queuing system for patients as part of Lean Sigma to delete the bottleneck and to better concentrate on value and waste elimination using the 3 MUs or 3 Ms to eliminate or reduce waiting time of patients, as follows:

- Waste (muda) refers to slow investigation, equipment preparation and other unnecessary procedures, such as requiring customer information and the queuing of patients
- Redundant service (mura) was the discontinuous service training of staff, the discontinuous participation of customer service design, such as health check programs and the discontinuous improvement of quality service
- Workload (muri) refers to unnecessary tests and walks through hospitals to contact appropriate staff due to poor hospital planning and operation designs. This waste could be reduced by standard job improvement

To build the core competency of Thai organizations to become an AEC medical care center, the hospital should concentrate on qualitative service perceptions regarding patient safety. Such qualitative service is comprised of (1) Time and Timeliness: How long did the customers wait for service? Was service provided in a timely manner? (2) Completeness: Was the response to the customers' demands appropriate? (3) Courtesy: How well did the hospital treat the customers? (4) Consistency: Was the service provided consistent at the same level at different times to different persons? (5) Accessibility and Convenience: Was the hospital easily accessible? (6) Accuracy: Was the service provided by the hospital staff consistently effective and appropriate? (7) Responsiveness: How quickly did the hospital respond to the customers' demands?

In the lean healthcare system, the important problems revolve around the supply chain which includes environmental management and Green Supply Chain Management (GSCM) and incorporating these into the philosophy of organization. Employing this approach would contribute to the organization's ability to gain profits, meet objectives and increase its market share by reducing its environmental risk management (Rao and Holt, 2005; Zhu *et al.*, 2007; De Figueiredo and Mayerle, 2008). Moreover, reverse logistics could be applied in the planning and the application of lean techniques, patient flow control, medicine distribution and distribution of information from the point of consumption to the point of origin for valued added service, including reducing the environmental impact.

The researcher recommends that future research should analyze and translate the results of using SEM to study the relationship between and effects of the Six Sigma practice factors and the internal quality factors on a hospital's core competency to be an AEC medical care center.

## **MANAGERIAL RELEVANCE**

Based on the data collected from the sample group, it was determined that the lean system in healthcare business was applied in hospital groups through internal quality management to establish core competency of Thai private hospitals in competition. Lean's benefits include that it reduces costs in hospitals by eliminating the non-value added activities to meet customer satisfaction. A popular tool used by the lean system to assess the non-value added activity is the Value Stream Mapping (VSM) (Fitzsimmons *et al.*, 2013) as presented in the Brown paper analysis method. It would be advantageous when establishing the core competency of Thai private hospitals entering AEC competition to eliminate the waiting time of patients and to improve patient flow control. Among the benefits of Six Sigma Practice is that it eliminates service failures. Thus, the hospital can use a visual control management system and the Poka-Yoke method (or fool proofing system) to protect work errors, service failures or quality issues in drug dispensaries. Visual control can also reduce waste due to service failure (Swink, 2011). For example, the hospital can prepare bins, separate color labels for Prepack and add identification tags in clear positions in order to

prevent problems with medication errors, expired medicine and other issues (Ponnanake *et al.*, 2014). Hence, the service process would be far more efficient and thereby contribute to the competitive advantage of AEC.

According to the hospital groups expanding their marketing to new emerging countries in the CLMV (Cambodia, Laos, Myanmar, Vietnam), i.e., Bangkok hospital expanded into Cambodia, Laos etc., patients were recruited by agencies and then delivered to a Bangkok hospital in Thailand, such as Bangkok Chantaburi hospital (located on the Eastern of Thailand), Bangkok Trad hospital (located on the eastern of Thailand and near border of Cambodia). Furthermore, the new business of medical tourism has become competitive, as indicated by Enderwick and Nagar (2011), who studied the challenges associated with new emerging markets. The conducted a case study via a health tour intended to increase the healthcare sectors on a global level which revealed the opportunity of competition in emerging economic countries. Four principal competitors in Asia, Thailand, India, Malaysia and Singapore succeeded in competing in Medical Tourism (MT). Thus, Thai private hospitals should design a service package based on the medical tour for patients in the CLMV group as an alternative for these customers and it would be highly advantageous to establish hospitals' core competency over competitors in the AEC, as well.

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