

CHAPTER II

LITERATURE REVIEW

2.1 Service Business

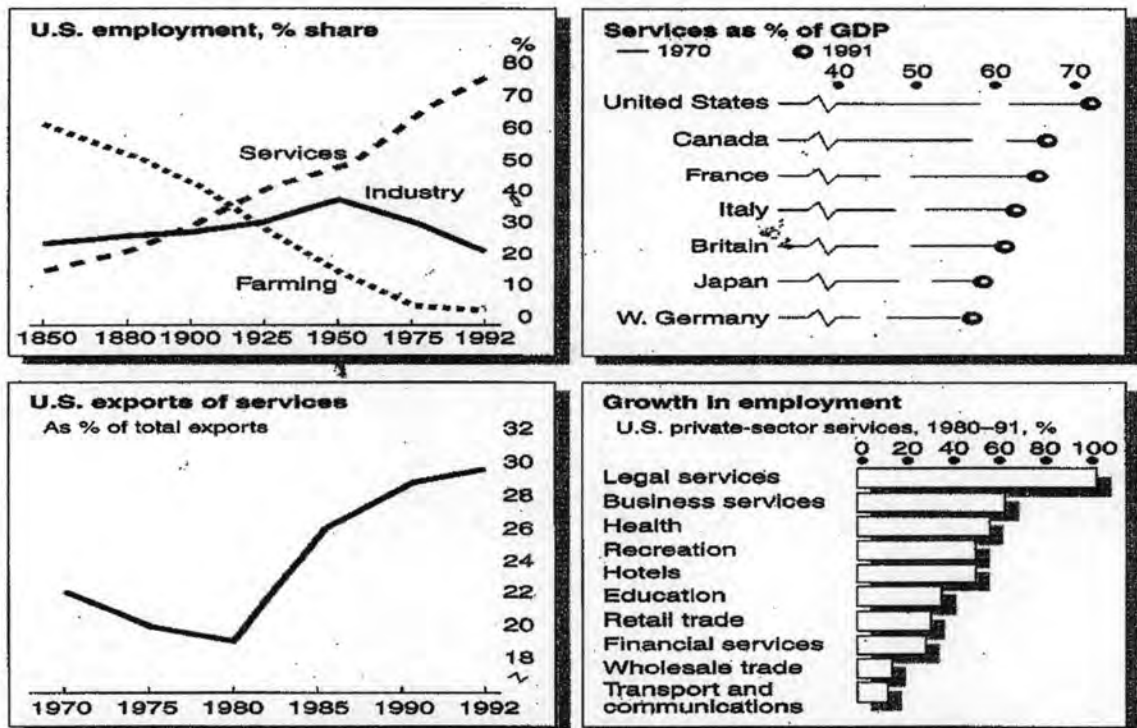
“Service” refers to the activities or behaviors that one offers to another in order to fulfill the requirements either for tangibles or intangibles. Unlike the goods which might certainly belong to the buyer, the service could not be owned by anybody but would be transacted to complete the commitments. Buying a service implicitly reflects an activity to purchase the experience which will be generated by the service provider, for example, buying the funny experience from a cinema complex, buying the delicious experience from a great restaurant and buying the intelligent experience from a well-known university. Satisfaction, therefore, is the key contribution that the customer would like to gather through those experiences.

Services, in general, have different business characteristics with goods so that the deeper understanding of service characteristics will consequently contribute the higher satisfaction of customer experiences. Some of the ways in which services are determined to differ from goods can be seen as the followings (Metters et al., 2006).

- *Intangibility of Services* – As stated in the first paragraph, customers normally consume services through their experiences so that nothing is left behind. However, they could have physical reminders such souvenirs and photographs during those services
- *Simultaneously Production and Consumption* – Many services, for example; live performance, are simultaneously produced by the providers and consumed by the customers. This makes quality control and capacity matching especially difficult.
- *Proximity to the Customer* – Most of the services have high level of direct interaction with the customers in order to provide the best experiences. By the way, too short gap between provider and customer could lead to service improvement difficulties.
- *Services can not be Inventoried* – Service generally lack of ability to build inventory since the customers always respect to the quickly responsiveness. Moreover, some businesses have to manage the waiting time backorder to provide faster services.

Economically, the term "Service Business" refers to the activities that are not the goods producing such Agriculture, Livestock, Construction and Manufacturing but the services producing, for example, Retailing, Wholesaling, Transportation, Education, Entertainment, Government, Hospitality, Healthcare and many others. In 1800, the United States business environment was considered as the pre-industrial society. 80% of the workforce engaged in the extraction industries such agriculture while another 20% was shared by the production and service. Not until 1900 that most of important activities had been changed to the goods production. Industries intensively focused on maximizing the productivity of resources to turn out more goods at cheaper price. The Fraction of workforce was almost equal among the extraction, production and service (Metters et al., 2006).

As the reflections of industrial development, from 1950 to the present, service industries has predominated the post-industrial economy and nowadays accounts for roughly 80% of the U.S. economy in both employment and Gross Domestic Product (GDP). And once looking closely into business characteristics around the world, service industries play the most significant roles to drive competitive advantage of the nations than ever.



Source: Bateson & Hoffman (1999)

Figure 2.1: Service Economics and Employment

In Thailand, although the goods industries such manufacturing has long been the major industry of the country since 1961 but the service sector is now playing a significant role as a key player to leverage the national productivities and the competitive capabilities of the country. In order to survive in the new economy, the service business capabilities in key area, for examples; Tourist industries, Hospitality industries, International Convention industries and Healthcare industries must be intentionally developed as the potential responsiveness of the global trends. Overall service portions have increase to 50% to 75% of the GDP and number of workforces for many countries including Thailand where the service businesses totally generates 50% of GDP and value about 2,300 billion THB (Kijlertpairoj, 2004).

Industry	1995 (%)	1996 (%)	1997 (%)	1998 (%)	1999 (%)
Agriculture	468.9 (11.2)	514.0 (11.1)	529.7 (11.2)	568.4 (12.7)	517.0 (8.93)
Manufacturing	1,641.9 (39.2)	1,819.8 (39.4)	1,831.1 (38.6)	1,750.7 (37.8)	1,813.3 (39.3)
Service	2,081.7 (49.5)	2,289.1 (49.5)	2,379.5 (50.2)	2,291.4 (49.5)	2,285.2 (49.5)
Total	4,192.5 (100.0)	4,622.9 (100.0)	4,740.3 (100.0)	4,628.5 (100.0)	4,615.5 (100.0)

Source: Kijlertpairoj (2004)

Unit: Billion THB

Table 2.1: Thailand's Gross Domestic Product (GDP) by Industries

According to the table, the fraction of number of workforces in the service industries has rapidly grown up comparing with the extraction and production industries. It also consequently reflects to the average population revenues which service businesses generally pay the higher rate than the others. This is the reflection of global business developments. New technology and modern machines replaced enormous workforces in the pre-industrial economy so that they would turn to the manufacturing where unlimited manpower was required. Once the technology followed into the industrial economy, they then moved to the service industries in the big city where high income people required conveniences. Service businesses in the post-industrial or new economy, therefore, expand both in the local and global contexts incredibly.

According to all above information, service businesses not only play a significant role for the new economy but also specify market trends for the new century. The market competition will be much more difficult than ever through the extension in numbers of firms and workforces. Moreover, the challenges become most difficult when the competition will not have countries' boundaries as in the past according to the rapid development of new technology and the internet. Free Trade Area (FTA) and World Trade Organization (WTO) agreements will certainly reinforce business difficulties to the service businesses all over the world. The study of operations in services, therefore, is now very important for the proactively service organizations who would like to survive from the competition and create competitive advantages to the top of business.

In addition, Baumol, Blackman and Wolff described the rise of service as the negative effects that a relative "cost disease" in service arises because, even though more services are not being consumed, the low productivity in services makes it appear as though they are (Metters et al., 2006). Unlike agriculture and manufacturing industry, the service has not seen such productivity growth for long history record. For example, considering cost of a product composition is \$9; \$3 for food, \$3 for goods and \$3 for services, with this composition, service would represent 33% of total expenditure. Rapid development and technology could change the cost of this product composition to be \$5; \$1 for food, \$1 for goods and \$3 for service. It definitely illustrates that service cost is still the same but represent 60% of total expenditure instead.

There are many supporting information which could reasonably illustrate why the service business is one of the most interesting subjects for improvement. The first reason goes to the huge opportunity in service since the empirical data have shown that 30-80% of the total cost comes from different kinds of wastes (George, 2003). It clearly implies that most of activities along the process could not add value to the customer effectively. Another reason focuses on the human resources who have never familiar with the analysis of data so that any changes become fearfulness while the final important reason points out that most of the service businesses still lack of knowledge and skills to apply productivity tools and techniques in order to improve their service quality successfully.

2.2 Healthcare Business

The role of healthcare business becomes much more important than ever because it is one of the human living necessities that most of the leading organizations closely pay attention to, for example, the English National Health Service (NHS) have been provided annual budget more than 70 billion pounds with 1.3 million staffs to serve 325 million patients (Bevan et al., 2006) while the U.S. healthcare spending reached 1.7 trillion dollars or 15% of GNP in 2005 (Phipps, 2006). Moreover, healthcare business is not limited with the country lines. There are many people who intentionally fly to other countries in order to receive the best care service. The aggressive market competition will not happen in the local boundary anymore but in the worldwide perspective.

According to the cumulative records (Phipps, 2006), U.S. healthcare performance illustrates

- The defect rate in the technical quality of American healthcare is approximately 4.5%
- Error rate is about 6,210 defects per million opportunities or 3.4 sigma
- Adverse events occur in 7.5% of medical or surgical admissions
- Between 40,000 to 98,000 Americans die from medical errors annually more than breast cancers, AIDS and motor cycle accidents
- Medication related errors for hospitalized patient cost roughly 2 billion dollars annually

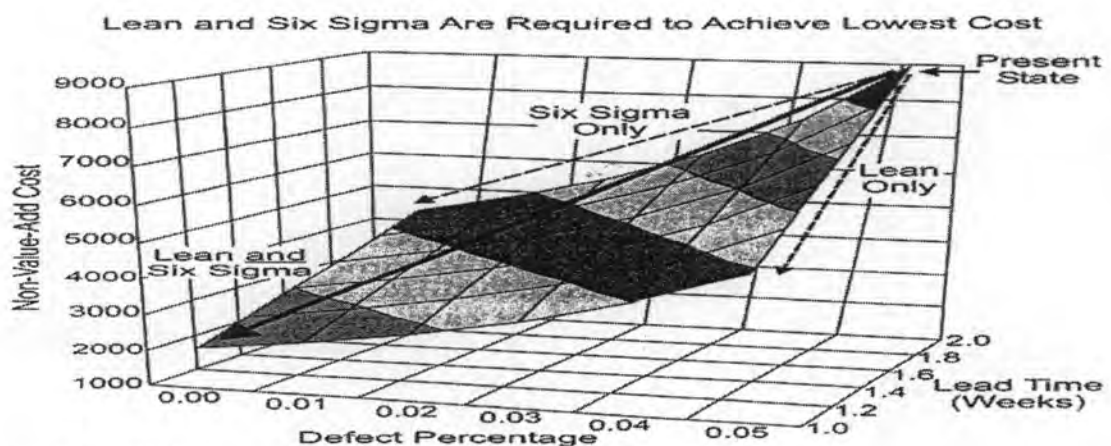
All above incorporates with the NHS records (Bevan et al., 2006) that the mean baseline sigma score of 2.0 reflects more than 30% of defective clinical processes.

In addition, the healthcare industry, nowadays, is universally facing with the problem of unlimited demand increments and reimbursement difficulties since patients continually demand more for less. The ambitious goal of proactive healthcare service provider is to improve outcomes of care, for example, hospital re-admission rate reduction, community-based service promotion, clinical quality and safety communication, service area renovation, care accessing channel increment, inequality elimination and service duration improvement. Healthcare, therefore, is another most interesting service sector which the performance gaps could be empirically fulfilled by one of the most powerful business development methodology named Lean Six Sigma.

2.3 Lean Six Sigma

"Lean Six Sigma is a business improvement methodology that maximizes share holder value by achieving the fastest rate of improvement in customer satisfaction, cost, quality, process speed and invested capital" (George, 2003). Actually Lean and Six Sigma used to be understood as the rival business improvement methodologies because of their manufacturing originalities and characteristics. Lean mainly focuses on waste elimination and non value-added activities minimization while Six Sigma pays attention to the product qualities and prefers variation control standard. In contrast, the fusion of both initiatives will lead to "an overarching improvement philosophy that incorporates data driven tools to solve problems and create rapid transformational improvement at lower cost" (Bevan et al., 2006).

Implementing Lean or Six Sigma alone in either manufacturing or service industries could not deliver the best solution that contributes highest benefits to the organization since both of them have unique strengths and weaknesses in different points of view. GE learned after using Six Sigma for several years that their quality levels had increased significantly but the process speeds, however, were still often poor in some areas because the factors that created slow speed would limit their ability to reach higher sigma level (Rago et al., 2006). Below figure illustrates the non value-added cost that can be saved from different ways of improvement. Lean only or Six Sigma only could bring some gains but it will reach the best if the firms could improve their quality and speed through the integrated approach.

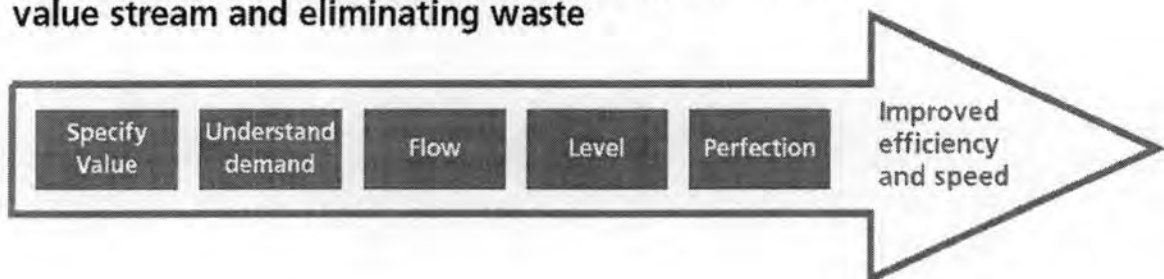


Source: George (2003)

Figure 2.2: Contributions of Lean and Six Sigma as the Integrated Approach

"Lean means using less to do more by determining the value of any given process by distinguishing value added steps from non value added and eliminating waste so that ultimately every steps add value to the process" (Bevan et al., 2006). Unlike Six Sigma that closely pays attention to the defects in quality and tries to eliminate variations in the process as many as possible, Lean, in contrast, deeply focuses on the production line speed, process efficiency and attempt to eliminate all kinds of wastes. Its basic concept is to identify the improvement opportunities in the existing environment since most of the activities in the service industries are plenty of costs that have never contributed any benefits to the organization. The well-organized sets of productivity tools and techniques will be implemented efficiently through 5 stages of Lean principles; Specify Value Value, Understand Demand, Flow, Level and Perfection.

Lean - focuses on dramatically improving flow in the value stream and eliminating waste



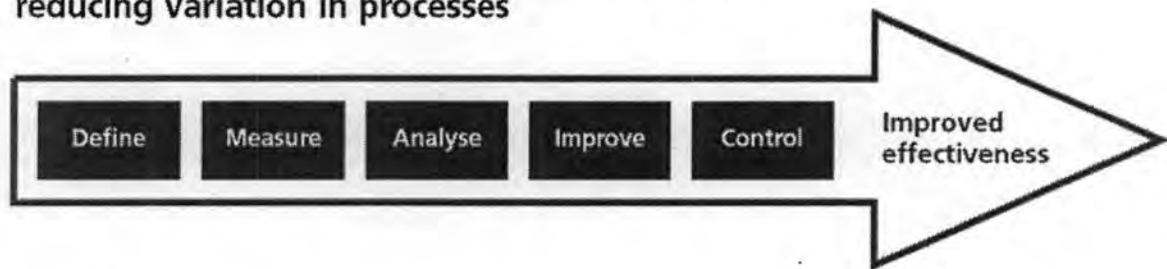
Source: Bevan et al. (2006)

Figure 2.3: Lean Business Improvement Methodology

Unfortunately, the powerful business improvement methodology such Lean still illustrates strategic weaknesses in some areas. The concept does not deal with the organizational infrastructure and culture change management as Six Sigma does. This leads to the inability to sustain the incredible benefits after closing the improvement projects. Another problem is that although its basic concept mainly discusses about how to eliminates non value-added activities and wastes but there are less information to cope with customer requirements than Six Sigma so that the intangible Critical-To-Quality (CTQ) are sometimes eliminated. The last and most important weak area of Lean goes to the variation which is the strongest area of Six Sigma. Most of the projects that could not meet their proposed target are the result of process variations which seriously impact the improving contributions at all.

The most powerful business improvement methodology which has been widely used in the world leading service companies such GE Capitals, Allied Signal, Starwood Hotels, Bank One and Lockheed Martin refers to the statistical-based problem solving approach called Six Sigma. Its basic concept is totally true that the outcomes of any processes will be the representative of what goes into the process at the moment or "Y" is a function of "X". The Six Sigma organizations, therefore, have to carefully control the Key Process Input Variables (KPIVs) that intensively impact to the interesting process in order to contribute the best customer core values or Key Process Output Variables (KPOVs). Multiple organized groups of quality tools and techniques which have been applied in the manufacturing and service industries for decades will be systematically implemented according to the 5 stages; Define, Measure, Analyze, Improve and Control.

Six Sigma - focuses on eliminating defects and reducing variation in processes



Source: Bevan et al. (2006)

Figure 2.4: Six Sigma Business Improvement Methodology

By the way, although the concept of Six Sigma has been used widely in the international businesses but it also has some strategic weaknesses available. The first problem goes to many times that process speed or cycle time has been subjected in the improvement loop. The Six Sigma rarely discusses about Work-In-Process (WIP) which is the first-order driver of cycle time (George, 2003) so that only quality aspects will be managed. Moreover, the Six Sigma's organized set of tools regularly contains less speed acceleration tools of Lean such Total Productive Maintenance and Time-Value Analysis. The weakest area, however, focuses on system interaction because most of Six Sigma projects prefer to limit scope as small as possible for effectiveness; thus, some of which will lack of big picture perspective and lead to the difficulties in coordination, communication and integration as well.

The integration of Lean and Six Sigma, therefore, works because it aligns the organization's vision that focuses on improving processes, allows problem-solvers to work together in the well-defined support system, has more working parts that can be morphed to meet any possible needs for operational improvement, incorporates the powerful DMAIC tools and processes to reduce variation and, at the same time, incorporates the powerful Lean tools to improve the mean performance (BMG, 2006). The standard improvement model such DMAIC (Define-Measure-Analyze-Improve-Control) is extremely helpful as the systematic roadmap for the taskforces which will have been established for specific projects. The fundamental concepts and special considerations for using Lean Six Sigma DMAIC process, including tools techniques, will be explained through the followings thoroughly.

- *Define* – The main work in this step is to complete strategic analysis of what the project should accomplish at the end and confirm all prospected concerns related to stakeholders such as customers' requirements and corporate. Define tools are used mainly to refine total project scope and appropriate boundary; for examples, Value Stream Mapping could help the project leaders to understand value-added process from the raw materials to the finished goods while the Project Charter would support them to keep the project on the right track. Two major challenges about human resources are focusing on how effective the project leader select the right members into their taskforces and how efficient they communicate problems with the same language.
- *Measure* – Here is the major benefit of Six Sigma which contributes the advance data management as the result of these two methodologies integration. The main task is to establish baselines for as-is situation, collect the investigated data and ensured that all documented data are valid and reliable. Measure tools generally start from the basic concept such brainstorming and Seven QC tools for collecting, stratifying and prioritizing the data to the advance techniques such Statistical Process Control, Gage R&R and Process Capability for analyzing and benchmarking as well. By the way, the major challenge for this stage is critical. As stating in the prior information that many people in service environments have had negative mindset with the data, thus the Management-By-Fact must be introduced and communicated companywide.

- *Analyze* – The purpose of this step is to make use of all information which have been trustfully collected from the last step in order to define the sources, or Key Process Input Variables (KPIVs), of poor quality products, wastes and wasteful opportunities and number of un-matched deliverables. All of Analyze tools specifically consider the relationships between input resources and output contributions; for example, Scatter Plot, Multi-Vari Chart, Regression Analysis and Design of Experiment (DOE). Moreover, some of which could be further extended for next step to find out the appropriate solutions as well. Problems and challenges here continue from the last step that most of the taskforces are not familiar with data analysis; therefore, project leaders will have been forced to work really hard on this.
- *Improve* – This is the step that will bring all of gathered information, analyzed data and specified KPIVs together to make critical changes in the process to mitigate and eliminate poor quality products, wastes and wasteful opportunities and number of un-matched deliverables. The contributions of this stage mainly come from Lean tools and techniques such Single Minute Exchange of Die (SMED), Setup Time Reduction, Queuing Methods, 5S, Poka-Yoke (Fool-Proof) and Visual Control plus the extended techniques from Analyze step such DOE. Employees' involvement and commitment are now plays a significant role to implement the appropriate solutions in the real process situation successfully.
- *Control* – The last step of Lean Six Sigma mainly focus on how the established taskforces could preserve incredible outcomes which they have contributed to the process as long as there will be the better way. Control key tools mostly influence to document the improved process, turn result into money, setup automatic alert equipments and create the control system. Major concern point out to the last-long and consistence of the improved process definitely.

Although there are enormous examples of world-class companies who successfully apply the concept of Lean Six Sigma, by the way, a lot of improvement opportunities are available in the service industries. Some magnificent applications are available as the followings.

Buell and Turnipseed (2006) of Chevron Texaco cordially explained in their papers about how Lean Six Sigma could efficiently improve Oilfield Operations in the North America. An improvement team utilized multiple Lean and Six Sigma tools such Storage Facility Re-layout, First-In-First-Out System and Visual Control to improve the rod pump design, pump repair and handling process. After implementation, the number of pump designs was reduced from 36 to 14 and inventory immediately dropped from 320 to 65 pumps while the storage locations reduced from 9 to only one centralized facility. Moreover, pump run life increased since the optimal settings had been identified. Financial benefit was immediately realized in reduction of rig standby time and consumption of excess inventory.

Joyce and Schechter (2006) of Lockheed Martin magnificently explore their experiences of incorporating Lean Six Sigma in the world-class organization. Never until 1999 when Lockheed Martin developed an approach called LM21 to identify best practices for increasing efficiency and improving financial and operating performance, Lean Six Sigma, principles of process improvement, have migrated to every business function over the entire company. Many tools and techniques such process mapping, statistical analysis, time analysis, defect elimination and especially the integration of methodologies have been used to reinforce the corporate competencies. LM21 has not only helped Lockheed Martin but also their stake holders to save billions of dollars in improving customer satisfaction, capturing repeat business and winning new business significantly.

Chaiyawong (2006) of Chulalongkorn University successfully applied the concept of Lean Six Sigma with a Savings Cooperative where many customer complaints about its counter service had been received. Most of which referred to the long time service in different reasons so that the process flow chart was created to study specific duration spent in each area with its variation as well. 5 complaints per quarter had been specified as the challenging key performance indicator. Project leader shortened the duration by applying many Lean and Six Sigma tools and techniques such Relations Diagram, FMEA and Visual Control, Poka-Yoke, ECRS etc. All of non value-added activities, for example, document transportations, service redundancies, information errors and system complexities, were removed forever while process variations were controlled efficiently.

2.4 Lean Six Sigma in Healthcare

Even though there are numbers of theses which were researching about the concept of Lean Thinking and Six Sigma in the manufacturing processes but there is only one, until now, talking about the fusion of these two powerful methodologies called Lean Six Sigma. Moreover, it is specifically focusing on the dentistry, one of service businesses which probably soon play a significant role in the aggressive competition of new economy. The other literatures are incredible examples on how to implement the concept of Lean Six Sigma in the healthcare service industry successfully

Fuengdenkhajon (2004) intentionally expresses the powerful improvement philosophy of Lean Six Sigma in his final thesis. His research objective is to improve responsiveness, one of service qualities, in the Dental Service industry by determining methods to reduce service lead time and improve readiness of required information. The research was conducted through five systematic approaches to find out some significant difference between patients' expectation and their perception levels. Long service lead time and cumulative queue have been addressed by new allocation method under the simulation which could conveniently shorten the testing duration while the payment period have been significantly reduced after rearranging their work method. Working standard has been formed and will be used to pursue continuous improvement so far.

Bevan, Westwood, Crowe and O'Conner (2006) proudly introduce some basic concepts of Lean Six Sigma which have been implemented successfully in the English National Health Service (NHS) where is the largest healthcare in the world. They found out that using Lean or Six Sigma alone could not lead this organization to the best solutions but the combined approach is gaining credence strongly. The full benefits of Lean Six Sigma have been realized when applied at both strategic and operational levels because application at operational results only in cost reduction, whereas, application at the strategic level results in wider benefit for the organization. After implementing period, they conclude that "Lean Six Sigma gives us the opportunity to get the basic concept right (through Lean) then take the variation out of the process (through Six Sigma)".

Rago and George (2006) accomplishedly implement the concept of Lean Six Sigma to improve many core processes in the Cardiac Surgery Unit of Stanford Hospitals and Clinics. After facing a loss of patient volume due to its inability to be cost competitive in managed care contracts, Lean Six Sigma have been brought to leverage its competitive advantages immediately. The cross functional team systematically conducted lots of improvement projects to reduce excessive tests, eliminate redundant processes, minimize working complexities, standardize drug treatments and manage patient queue in ICU. 15 million dollars are cumulative contributions which come from cost of Coronary Artery Bypass Graft (CABG) surgery reduced by 40%, mortality rates by 3.4%, patient time in ICU reduced 8 hours and the use of catheters dropped 15%.

Phipps (2006) recently introduced his Lean Core Lab project for M. D. Anderson in order to promote the concept of Lean Six Sigma in Healthcare industry. The project intention is to remove waste from process, reduce turnaround times and prefer approach prior to automation. Project boundary focused on high volume lab testing such Chemistry, Hematology, Coagulation and Urinalysis for both in-patient rooms and out-patient clinics. Detailed analyses had been conducted to study test volume, demand mix, product and operator flows, instrument capacity and personnel schedule. Process improvement then be showed through batching minimization, sample delivery time management, stockroom standardization, walking pattern design, lab area renovation, and lab consolidation. The in-patient and out patient turnaround time have been decreased 39% and 28% respectively.

Koning, Verver, Heuvel, Bisgaard and Does (2006) explained their Lean Six Sigma in Healthcare through the project case at Red Cross Hospital. The contributions of their project are intentionally separated into three working unit. By implementing the concept of Lean Six Sigma in the pilot hospital, the Human Resources Department could save 36,000 euro annually by reducing errors on invoices for 85% through the standardized worksheet and new administrative system, the Operating Theater department could leverage their service by 20% by decreasing the operating time through the preoperative preparation procedure and the Maintenance Department could generate 200,000 euro of saving by improving the service level through new standard operating procedure and work planning system as well.

2.5 Service Quality in Healthcare

In order to apply the concept of Lean Six Sigma in Healthcare business successfully, it is important to firstly recognize a growing importance of this industry and prepare itself to confront challenge by improving its process capabilities through the systematic approach. Excellent service quality measurement are strongly required in order to understand business as-is situation and specify the most appropriate to-be direction. By the way, there are many useful methodologies to evaluate service quality of the organization; therefore, Franceschini & Cignetti (1998) intentionally introduced their study about most of the famous service quality evaluation methodologies through their created map which could point out the strength and weakness features for each evaluation tools as below figure.

	SERVQUAL Parasuraman et al (1991)	TWO-WAY Schvaneveldt et al (1991)	SERVPERF Cronin & Taylor (1992)	NORM-QUALITY Teas (1994)	QUALITROMETRO Franceschini & Rossetto (1997)
Theoretical base ground	Service quality is calculated as differences btw. perceptions and expectations with important weight	Service quality is evaluated by questions about "objective" and "subjective"	Service quality is evaluated by perceptions only without expectations and important weight	Discrimination between ideal and feasible expectations to calculate service quality	Customer expectations and perceptions are evaluated in two distinct moments using MCDA
Data collection sample features	2 telecoms 2 insurances 2 banks	banks, laundries restaurants, supermarkets	2 banks 2 pest controls 2 fast foods	3 big department stores	library facility at DISPEA department
Sample size	290 to 487	330	660	120	100
No. of questions	22+22	Not declared	22	10+10+10+10+10	8+8
Response scale	7-point semantic differential	5-point semantic	7-point semantic differential	7-point semantic differential	7-point semantic comparative
Dimensions importance	Weights evaluate with const. sum	Not needed	Weights evaluate with const. sum	Weights evaluate with const. sum	7-point semantic comparative
Dimensions	Tangibles Reliability Assurance Responsiveness Empathy	Performance Security Completeness Ease of use Environment	Tangibles Reliability Assurance Responsiveness Empathy	Tangibles Reliability Assurance Responsiveness Empathy	Tangibles Reliability Assurance Responsiveness Empathy

Source: Modified from Franceschini & Cignetti (1998)

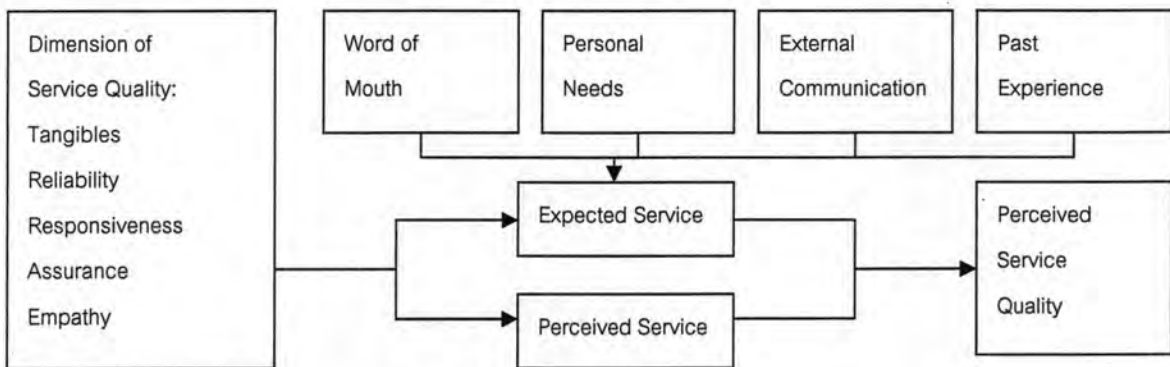
Table 2.2: Comparing Tools for Service Quality Evaluation

Parallel experimentation which had been carried out by Franceschini & Cignetti (1998) on examining SERVQUAL and QUALITROMETRO allowed a confirmation of qualities of both methodologies, but also showed some problems. The impressions obtained from customers indicate the usefulness of both tools, but the customers complained that SERVQUAL requires an excessive length of time to answer while QUALITROMETRO appears to be easy to use. On the other hand, a clear advantage of SERVQUAL is its ability to obtain the importance weights for particular dimensions in a better way than QUALITROMETRO. By the way, both of which illustrate almost similar results and there is no significant differences in any matters. They finally conclude that "the selection of the most appropriate tool depends on the particular context where service quality is to be evaluated".

Health Care Quality Steering Committee (2006) in department of Health, Rhode Island, stated in their document about Consumer and Provider Views on Key Dimensions of Quality Hospital Care: A Review of Literature that SERVQUAL has served as the basis for measurement approaches for service quality. The researchers determined that SERVQUAL is reliable and valid in the hospital environment but also caution about the relatively intense interaction between customer and healthcare providers. All in all, it inclusively stated that Parasuraman and his colleagues continue to reexamine their work and have refined the original scale in order to continue study the gap between expectations and the perceptions of service performance.

Wu, Hsiao & Kuo (2003) efficiently confronted the multi-facets for many crucial aspects of service business management. Their study intentionally integrated the five dimensions of SERVQUAL and adopted a Fuzzy theory set based research design. They had tested the theory in five hospitals not only for clarifying the positioning of service quality in the healthcare market but also for suggesting service strategy implementation priorities. The result could enable managers to collate the service strategy of the benchmarking hospital and competitors in the local market and also permits the hospital decision makers to consider the weight of the five dimensions while modifying the service strategy. Finally, the approach can clarify the fundamental strengths and weaknesses in particular five dimensions of SERVQUAL.

According to the reliable and valid applications in various service businesses especially in the healthcare itself, SERVQUAL, therefore, has been definitely considered to be used as the key service quality evaluation techniques. SERVQUAL, the fundamental instrument for measuring customers' perception of service quality, has been widely applied to understand the most important aspects in the transactions between service providers and their customers. It is important to determine standard performance by identifying the gap between customers' expectations and perceptions which eventually lead to the opportunities for improvements. Parasuraman, Zeithaml and Berry (1990), as the result of continuous researches, proposed a modified version of the service quality determinants in five dimensions; Tangibles, Reliability, Responsiveness, Assurance and Empathy.



Source: modified from Parasuraman et al. (1990)

Figure 2.5: Customer Assessment of Service Quality

- *Tangibles* – Appearance of physical facilities, equipment, personnel and materials
- *Reliability* – Ability to perform the promised service dependably and accurately
- *Responsiveness* – Willingness to help customers and provide prompt service
- *Assurance* – Knowledge and courtesy of employees and their ability to convey trust
- *Empathy* – Caring, individualized attention the firm provides its customers

The original SERVQUAL instrument in Appendix A consists of two sections. Expectation section cumulatively contains 22 statements to ascertain the general expectations of customers in the interesting service category; whereas, Perception section which orderly follow with another 22 matching statements to let the customer assessing an organization. Both of which base on 7-point scale starting from strongly disagree to strongly agree.

22 paired statements of SERVQUAL technique in both of expectation and perception sections are intentionally grouped into the five dimensions in order to represent the score for particular interests. Pertaining relationships between individual statements and dimensions have been specifically designed as follows; Statement No.1-4 for Tangibles, Statement No.5-9 for Reliable, Statement No. 10-13 for Responsiveness, Statement No.14-17 for Assurance and Statement No.18-22 for Empathy. The service quality assessment process gets involve with the calculation of differences between specified ratings whose surveyed customers assign to the paired expectation-perception statements. Particular weights will reinforce the relative importance of dimensions that customers attach to as well.

Performance gap in particular paired statements will constitute a model of service quality in the surveyed organization. SERVQUAL score can be used comfortably to analyze different level of customers' requirements; individual statement level, particular dimension level and the overall performance level. Because it is based on the 7-point scale, the primary score can be ranged from -6 (1-7) to +6 (7-1) depending on the difference between what customers expect to receive and the actual they perceived in the mean time. The higher (more positive) scores consequently reflect the higher level of perceived service quality. After all, the specified weights which have been survey to recognize the customers' relative importance of particular dimension will be multiplied to finalize the score.

$$SQs(Statement) = Ps - Es$$

$$SQd(Dimension) = \sum_{s=1}^m \frac{Ws \times SQs}{M}$$

$$SQt(Total) = \sum_{i=1}^n \frac{Ws \times SQs}{N}$$

Where

SQs	= SERVQUAL Score for individual statement	Ps	= Perception Score for individual statement
SQd	= SERVQUAL Score for particular dimension	Es	= Expectation Score for individual statement
SQt	= Total SERVQUAL Score	M	= Number of statements in particular dimension
Ws	= Importance Weight for individual statement	N	= Total number of statements

Source: Modified from Jannadi & Al-Saggaf (1999)

Figure 2.6: Statements Calculation for SERVQUAL Score

Even though the strength propriety of SERVQUAL instrument is its originality to design individual statements that could widely apply for various kinds of service businesses but, on the other hand, there has been an interesting weakness for this instrument. In fact, different service businesses would have different characteristics and different point of concerns. Some of which might appear to be common but not at all; therefore, the study of customer satisfaction survey in healthcare business is essentially required to ascertain that all of important perspectives are included. The Patient Satisfaction Questionnaire III (PSQ-III), in Appendix B, developed by RAND Corporation (2006) will be used as the comparative model both for understanding the specific requirements of the healthcare customers and modifying the original SERVQUAL instruments to be the most appropriate one.

The Long-Form Patient Satisfaction Questionnaire III (PSQ-III) has been originally developed by RAND Corporation in order to survey the customer satisfaction for medical service industry. Total 51 statements in 5-page questionnaire that based on 5-point scale could be universally used from small clinics to the full-course hospitals. Most of which could be similarly compared with the individual statements of SERVQUAL instrument but there have been some additional questions which are different and do matter for Healthcare business specifically. Statement no. 4, 10, 14, 19, 24, 27, 32 and 44 are about concern for customers to get trouble with medical bills and financial aspects. Statement no. 6, 18 and 41 are about concern for doctors to explain the reason for illness and medical tests. At last, statement no. 32 and 39 are about concern for circumstance to be private and convenient.

Although SERVQUAL model has been used widely in many kinds of service businesses, but three essential subjects from PSQ-III review should be added to the questionnaires to fulfill specific requirements in healthcare business definitely. The first statement about customers' Privacy Environment should be put into the group of Tangibles since it directly impact with the clinic facilities, while, the second statement about Illness Explanation must be added to the group of Responsiveness to reflect that patients receive all of information they should know. The last statement, Financial Guarantee, which is highly important to patients at heart, will be placed in the group of Assurance to ensure the reasonable costs of medical service. The completely modified questionnaires used for the research are available in Appendix C.