

## CHAPTER II LITERATURE REVIEW



This chapter reviews the relevant literature on the specific areas that involves 4 main categories, which are service quality measurement (SQM), Thai mobile service encounter, technology exploration and review of research method. Figure 2.1 illustrates the author's focus of this research.

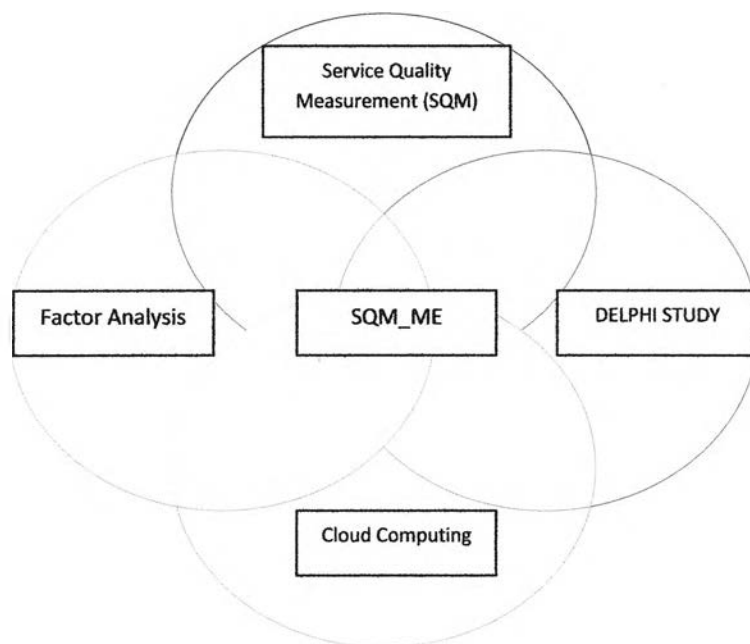


Figure 2.1 Literature review framework

Firstly, the review of SQM is conducted by using systematic literature review method. Keywords and phrases that were derived from the research question are selected. Boolean logic was used to allow more efficient searching which ensured the relevant information. The results of each search string were assessed on screen in order to select the contribution that relates to the inclusion criteria. Secondly, the review of Delphi study provides the understanding of the survey process that is conducted in two or more rounds and provides

the experts with the feedback of the previous round then the original assessments are adjusted. Thirdly, the review of factor analysis provides the background of research method for this study. The utilization of confirmatory factor analysis (CFA) approach will be able to restrict which variables will load on which factors, as well as which factors will be correlated. Finally, the review of cloud computing, which is the technology foundation for SQM-ME system, is done.

## **2.1 THE DEVELOPMENT OF SERVICE QUALITY MEASUREMENT**

### **2.1.1 Service Quality Definition**

Parasuraman, Zeithaml and Berry (2001) defined the definition of service quality as the differences between customers' expectation and their perception of actual service performance. Service quality is not only the outcome, but it also involves the service delivery process. Parasuraman (2001) supported that service quality involved the evaluation of service delivery. In manufacturing, the quality is usually measured by focusing on the outcome, which reflects the performance but in service, the measurement is more complicated. The effective management of service quality is the measurement of service quality by the response of customers to that performance (Christopher 1993). In addition, quality is an intangible and unclear construct (Parasuraman 1985). Quality is not a singular but a multi-dimensional phenomenon. Efforts in defining and measuring quality have come mostly from the goods sector. Many service organizations adopt knowledge of QM from manufacturing sector but the knowledge about the quality of goods is insufficient to understand service quality. There are many differences between product quality and service quality. Three characteristics of services-intangibility, heterogeneity and inseparability must be acknowledged for a full understanding of SQ (Markovic 2006).

Berry (1980) stated that intangible in service was problematic and led to the difficulty in measuring comparing with manufacturing which had a uniform quality. It makes research result unreliable as a result of the difficulty of perceiving intangible of end result (Johnson 1995). Generally, service cannot be counted, tested or verified it in order to make sure that

the quality reaches the qualified level. As a result of this difficulty, most firms have the problem about evaluating service quality (Zeithaml 1981). In addition, services are heterogeneous. They may vary across set of observation and lead to actual variance in service quality (Johnson 1995). Their performance often varies from producer to producer, from customer to customer, and from day to day. Consistency of behavior from service personnel (uniform quality) is difficult to maintain the customer expectation level (Booms and Bitner 1981) because what the firm intends to deliver may be entirely different from what the consumer receives. Moreover, service quality cannot only measure the outcome of the service providing, but also the service delivery process (Johnson 1995). Gronroos (1984) stated that service handling and service outcome of many services were inseparable. Quality evaluations are not made solely on the outcome of a service; they also involve evaluations of the process of service delivery (Lewis and Booms, 1983). Many definitions of service are available but all contain a common theme of intangibility and simultaneous consumption. The following represents a sample of service definitions:

**Table 2.1 Service Quality Definition**

Author	Year	Service Definition
Fitzsimmons	2006	A service is a time-perishable, intangible experienced performed for a customer acting in the role of co-producer.
Chi Chi	2003	High quality service has to meet several requirement such as customer satisfaction and its consequent loyalty and market share, new customer, productivity, financial performance and profitability.
Asubonteng et al.	1996	The differences between expectation of service quality prior to service encounter and the perception after receiving service
Zeithaml and Bitner	1996	Consumer overall impression. Services are deeds, processes, and performances
Gronroos C.	1990	A service is an activity or series of activities of more or less intangible nature that normally, but not necessarily, take place in interactions between customer and service employees and/ or physical resources or goods and/or systems of the service provider, which are provided as solutions to customer problems.

Author	Year	Service Definition
Quinn, J.B. , Baruch J.J., and Paquette P.C.	1987	Most authorities consider the services sector to include all economic activities whose output is not a physical product or construction, is generally consumed at the time it is produced, and provides added value in forms (such as convenience, amusement, timeliness, comfort, or health) that are essentially intangible concerns of its first purchaser.
Lewis and Booms	1983	How well the service delivered matches with expectation
Sasser E., Olser R.P. and Wyckoff, D.D.	1978	A service is intangible and perishable. It is an occurrence or process that is created and used simultaneously or nearly simultaneously.

According to the definitions of service quality, it can be summarized that service quality (SQ) is a focused evaluation that reflects the customer perception both tangible output and intangible experience to customer in precise and measurable variables.

### 2.1.2 Service Quality in Thailand

Thailand can be considered as a middle ranking developing country in QM term, which is better than Indonesia and the Philipines but less developed than Malaysia and Taiwan (Tannock, 2001). Before the economic crisis 1997, Thailand adjusted the production structure to support labor-intensive industries and was away from agriculture (Siamwalla, 2000). Thus many manufacturing firms adopted QM initiatives from developed countries in order to improve competitive advantage. A decade later, the QM implementation diffused from manufacturing to service industry. In general, the effective implementation of quality improvement initiatives in service operational environments is still lagging behind that of manufacturing (Lemak et al., 2000).

Laosirihongthong (2004) revealed five important factors of QM implementation, which were customer focus, leadership, employee involvement, continuous improvement and system vendor relationship. Tannock et al.(2002) drew attention to the TQM implementation in SMEs in Thailand. The critical success factors in Thai SME were identified in two main areas, which are management issue and information issue. For management factors, management

awareness and management knowledge relate to QM implementation success. This paper suggested that the organization with learning organization approach will have better opportunity to achieve successful implementation. In information issues, Thai organizations should concern with information system, which is important to success. The available resource of QM material in local language and need for simple roadmap of QM implementation are also important for Thailand context. Yukongdi (2001) revealed the effect of teams and attitude of Thai organizations to the implementation of total quality management (TQM). The result showed that the participating group that worked as a team reported a high level of skill utilization and satisfaction with participation. In general, the effects of team membership were more positive for lower-level employees than for professional and technical staff in Thailand. Krasachol (1998) suggested that the implementation of QM initiatives had relatively little progress, and were not accepted by some large Thai-owned groups. Mostly, QM implementations were focused in foreign-owned companies.

### **2.1.3 Key success factors of managing service quality**

In order to develop the KSFs for Thai service industry, the literature review was conducted to identify the key success factors that involve the successive QM implementation. The result of this stage revealed KSFs of QM implementation, which covered both product and service sectors. The list of these KSFs and key finding were shown in Appendix B.

The KSFs from the literature can be grouped into eight categories, which are employee participation, human development, organization characteristics, communication, management support, motivation system, performance measurement and financial support. Some organizations focus on employee participation by encourages employees to join in QM projects. In some cases, the participation is required by setting the policy. However, the firms should be aware about the number of QM projects implemented which can exceed the maximum capacity of the organization. The firms can also establish the motivation systems in order to gain the employees participation in QM activities. The next KSF is human

development, which supports the QM implementation as the foundation of QM project management. High quality project members can reduce time consumption and increase the quality of QM projects. Thirdly, the change resistant culture can lead to the failure of QM implementation. The firms should develop the culture in term of adaptability and flexibility. Next, the QM projects are mostly contacted with many functions in the organizations. The effective communication reduces cost and time consumption. The most important factors is the management support, which should be first issues for QM projects that QM managers have to ensure that the firm direction will support the QM projects.

After comparing the contribution from literature reviews, it can be summarized that the expected result of service implementation is to generate high service quality, which contains several dimensions such as consisting of reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding and tangibles. In order to implement QM project successfully, Thai service organization should concern about ten KSFs, which are:

**KSF 1: Management Support:** At the beginning of the QM project, a change agent team has to ensure that managements are willing to support it. The ongoing support and participate of top management are significant to QM project success. Financial support is also grouped in management support. The management team should support all KSFs that encourage the QM implementation. In addition, management teams should review the quality service assessment in order to manage and control the QM implementation as continuous activities.

**KSF 2: Regulation & Control System:** The key processes of service handling mainly involve human activities. The standardization of service quality is more difficult than manufacturing processes. Although service providers understand properly about the process of service handling, the level of service quality are always different. The service regulations and effective control systems could control and monitor the service quality during providing service to customers. In addition, the effective regulations can ensure the right responses in any situations.

**KSF 3: Service Customization & flexibility:** Quality of services requires flexibility. The quality of service does not mean all services must be the same, but the quality of service should achieve the expectation of customers and sometimes beyond expectation. According to the case study, some branches provide same services but different location. The process of service handling sometimes is different. If the service processes could be flexible to customize, the service will suit to customer expectation.

**KSF 4: Organizational Culture Development:** The firms have to reduce the resistance of change in the organization and review strategic policy and structure and develop to support the development of quality. The organizations that are familiar with change management programs seem to success in QM implementation. In service sector, customers could feel the organizational culture easier than manufacturing sector because they closely contact with service touch point. Thus the development of organizational culture is one of the most important KSFs in service industry.

**KSF 5: Employee Participation:** Service organizations have to ensure that QM programs are designed to cover all parts of service functions especially in service touch point. The increase of employee participation creates understanding and continuous improvement. To gain the employee participation especially in service industry, the firms should create various mechanisms and activities in order to ensure that employees are willing to join without any obstacles.

**KSF 6: Coordination and Communication:** The effective communication reduces the conflict, misunderstanding, implementation time, and cost. In addition, communication mechanism could stimulate the employee participations. According to the cases, many failure situations came from ineffective communications. QM initiatives were implemented in small groups and working team lost the information during the implementation.

**KSF 7: Human Development & Training:** The development programs need to be set up systematically. Once employees have skill and experience, they can generate high quality service value to customers. In service industry, human is the key elements in service process, thus human development and training can be compared with machine

maintenance in manufacturing sector. Thus service organizations should continuously develop employees to ensure high service quality.

**KSF 8: Motivation System:** The motivation system stimulates people to get involve the QM activities. The effective motivation system also creates the better way of performing their jobs. The motivation system does not require the rewards, but the firm can motivate employees by training them, educating them and trusting them. At service touch point, customers can feel the quality of service from service providers. The effective motivation systems encourage employees to work with heart and are willing to provide best service to customers.

**KSF 9: Change Agent Mechanism:** The implementation of QM involves a major change and requires change agent to act as a supporting team in the organization. The experience and knowledge of QM change agents can facilitate the QM teams to increase the level of service quality. In service sector, the development of service quality must be continuous process, so change agents mechanism is the crucial factors that increase the QM development capability to all functions.

**KSF 10: Performance Measurement:** The evaluation of service quality requires real time assessment because customers can feel the quality of service suddenly since they arrive the service touch point. The monitoring system of performance will be the baseline for the service quality improvement. The feedback of performance measurement has to return to management team in order to evaluate and generate the strategy for the next loop of the implementation.

#### **2.1.4 A comparison of SQ measurement models**

As stated earlier, SERVQUAL instrument by Parasuraman (1985) has been the most widely used SQM but it has also been criticized by many authors. Over a decade, various SQM instruments were developed in order to find the complete solution for measuring SQ in particular service area. In the early stage, SQM model was developed by Gronroos in 1984, called the two-dimensional model, which contains technical (outcome) quality and functional



(process) quality in service delivery process. In 1985, SERVQUAL was developed by Parasuraman based on gap theory. However, the SERVQUAL model is mainly based on functional quality rather than the outcome of the service encounter (Technical Quality). In 1987, the model of service success, developed by Beddowes (1987) showed the relationship between customer and staff expectation and linked employees attitude and behavior with customer royalty and profit. In addition, Cadotte (1987) developed disconfirmation model, which was explained that consumers using pre-consumption expectations in a comparison with post-consumption experienced to form an attitude of satisfaction.

In 1988, Service quality trade off continuum was developed by Haywood-Farmer. This model highlighted to appropriate mix of three dimensions, which were physical facilities, personal behavior of serving staffs, and professional judgment. In the same year, Johnston (2005) proposed customer processing framework. This model using service blueprinting tool, was designed for documenting and analyzing the customer process. This model defined the generic stage and identified the role of customer in engaging the service delivery process. Cronin and Taylor (1992) developed SERVPERF, which gave an idea about the expectations playing a less significant role in satisfaction formation. In addition, Teas (1994) still utilized standard of performance (what should happen) instead of predictive expectation (what will happen). Dabholkar (1996) linked the concept of SQ to customer satisfaction and developed the attribute and overall affect model. This model discovered that consumers use three factors to determine attribution's effect in satisfaction, which are locus of causality, stability, and controllability. From mid 1990s, various papers attempted to develop new SQM model that could be applied to specific industry. In 1997, P-C-P attribute model uses the form of the hierarchical structure, which contains Pivotal, Core and Peripheral level. Philip and Hazlett (1997) believed that every service sector consisted of these three levels, which could be defined as the inputs, processes and outputs of a service organization. In addition, the P-C-P model was proposed to give diverse weights to each of its three levels of attributed groupings.

Since 2000, many studies have focused on the important of internal service quality. Frost and Kumar (2000) applied the concept of original gap model to internal service quality. In addition, Soteriou and Stavrinides (2000) developed internal service quality DEA model, which was a linear programming-based technique for evaluating the performance of internal units. Recently, the research theme has been focused on specific service context such as Broderick and Vachirapornpuk (2002) – internet banking model; Zhu et al. (2002) IT-based model; and Santos' (2003) model of e-service quality. The summary of SQM model development is shown in Table 2.4.

**Table 2.4: The development of SQM model**

SQM Model	Description	Source	Year
Travel Agency Service Quality Model	The first dimension is "personal interaction". The second dimension is "physical environment". The third dimension of travel agencies service quality is "outcome".	Caro L. M.	2008
Model of e-service quality	The e-service quality have incubative (proper design of a web site, how technology is used to provide consumers with easy access, understanding and attractions of a web site) and active dimensions.	Santos	2003
Importance-satisfaction model	All quality attributes were mapped into the performance control matrix, and improvement strategies are then determined according to the region of each attribute.	Yang	2003
Antecedents and mediator model	This model examines some conceptual issues in service quality as: the relevant factors related to service quality better conceived as components or antecedents and the relationship of customer satisfaction with behavioral intentions.	Dabholkar	2000

SQM Model	Description	Source	Year
Internal service quality model	The model evaluated the dimensions, and their relationships, that determine service quality among internal customers (front-line staff) and internal suppliers (support staff) within a large service organization.	Frost and Kumar,	2000
Internal service quality DEA model (data envelopment analysis)	The model does not aim to develop the service quality measures, rather guides how such measures can be incorporated for service quality improvements. The data envelope analysis (DEA) model compares branches on how well they transform these resources (inputs) to achieve their level of service quality (output) given the client base.	Soteriou and Stavrinides	2000
Service quality, customer value and customer satisfaction model	The proposed model focuses mainly on post purchase decision process and repurchase decision making. The model incorporates key variables such as perceptions, service quality, consumer satisfaction, customer value and intentions to repurchase.	Oh	1999
PCP attribute model	The authors propose a model that takes the form of a hierarchical structure. Every service consists of three, overlapping, areas where the vast majority of the dimensions and concepts which have thus far been used to define service quality. These ranked levels are defined as – pivotal (outputs), core and peripheral (jointly representing inputs and processes).	Philip and Hazlett	1997
Retail service quality and perceived value model	Functional service quality perceptions directly influence consumers' willingness to buy. Functional service quality perceptions also	Sweeney	1997

SQM Model	Description	Source	Year
	influence technical service quality perceptions, which in turn influence product quality perceptions		
Attribute and overall affect model	The author proposed two alternative models of service quality for technology-based self-service options.	Dabholkar	1996
Model of perceived service quality and satisfaction	This model attempts to enhance the understanding of the constructs perceived service quality and consumer satisfaction. These are measured through set of ten attributes of advising.	Spreng and Mackoy	1996
Normative quality model (NQ model).	In this model service quality is measured by the gap between perceived performance and the ideal amount of a feature, rather than the customer's expectations.	Teas	1994
Non-difference score measure	SERVQUAL with a non-difference score measure would be more desirable with higher reliability.	Brown	1993
SERVPERF	SQ is evaluated by perception only without expectation and importance weight.	Cronin and Taylor	1992
Weighted SERVFERF	Dimension's importance x perceptions of performance	Cronin and Taylor	1992
Two way Model	The evaluation of service quality from two perspectives. The first "objective" involved the presence or absence of a particular quality dimension, and the second "subjective" involved the users' resulting sense of satisfaction or dissatisfaction.	Schvaneveldt	1991
Weighted SERVQUAL	Dimension's importance x perceptions of	Parasuraman	1991

SQM Model	Description	Source	Year
	performance (Performance – Expectation)		
Attribute service quality model (Service Quality Trade Off Continuum)	Services have three basic attributes: physical facilities and processes; people's behavior; and professional judgment. Each attribute consists of several factors. Each set of attributes forms an apex of the triangle	Haywood-Farmer	1988
Modified Service Journey Model	The experience at a given stage and the expectations formed prior to purchase help to shape the expectations for the next stage. "Service journey" is initiated by "need".	Nash	1988
The Customer Processing Operations Framework	The model identifies the important points prior to, during, and at the end of the service delivery where experiences at each point shape expectations for the next stage.	Johnston	1988
Behavioral Service Quality Model (The model of service success)	This model focus on inflating customer expectations through marketing efforts without balancing this with what the organization can offer through appropriate development of staff and systems. This model balance between customer and staff expectation.	Beddowes	1987
Disconfirmation Model	The confirmation/disconfirmation paradigm evaluates customer satisfaction by comparing actual performance with a standard or baseline. The performance is then classified as equal to, better than, or worse than the standard.	Cadotte, E.R., Woodruff, R.B. and Jenkins, R.L	1987
Gap Model (SERVQUAL)	It is based on Gap theory, SQ is calculated by the differences between perception and expectation. (factor analysis of 22 pairs of items)	Parasuraman	1985

SQM Model	Description	Source	Year
Technical & Functional Quality Model	The author identified three components of service quality, namely: technical quality ;functional quality; and image	Groönroos,	1984

It concludes that most SQM models refer to Gap model, especially in Gap 5, which is the gap between a customer's perception of the experience and the customer's expectation of the service. In addition, some SQM models suggest that the measurement should contain both physical process and human interaction. Then the output from service delivery process as perceived SQ should be compared with expected service quality that is derived from various factors such as word of mouth, personal needs, and reputation.

#### 2.1.5 Conceptual Framework

The review of previous service quality models leads to the integration of strength of each model and is compared with the system theory, which consists of input, process and output. Sirgy (1984) stated that the general systems theory was a research paradigm that explained how inputs, processes, and outputs each play an important role in the successful operation of the firm. In addition, Johnson et al. (1995) supported that the systems approach was particularly relevant to the study of services and service quality.

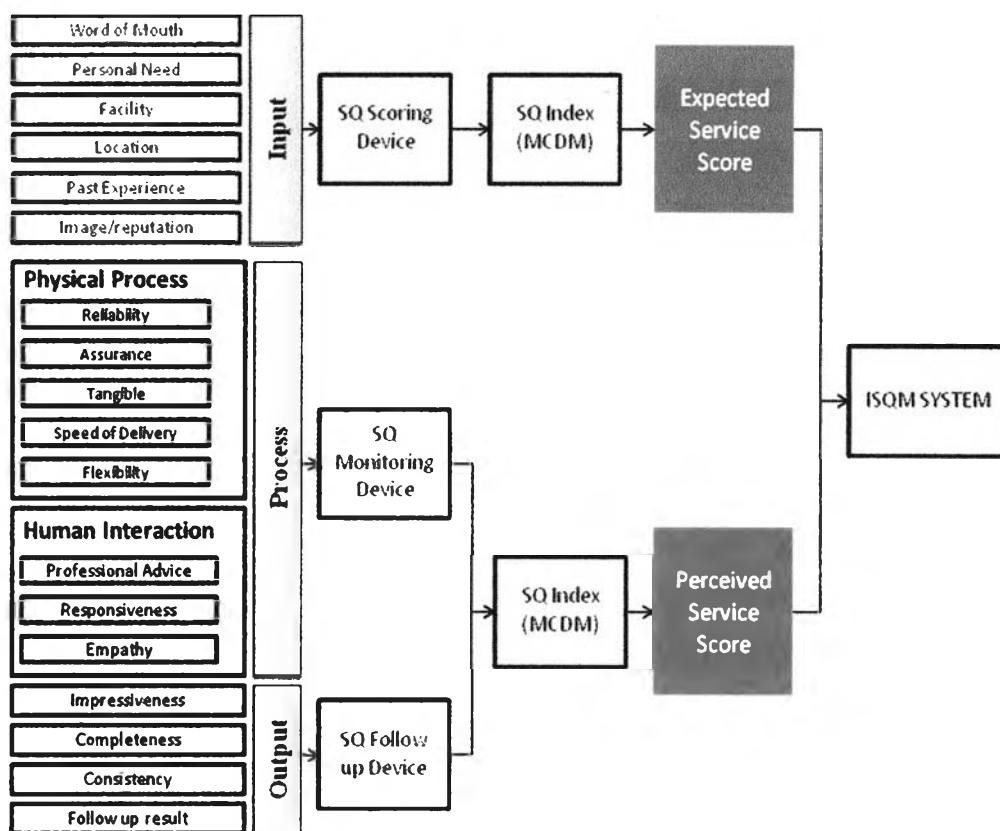


Figure 2.2: Conceptual Model of SQ Measurement Model

Figure 2.2 shows the conceptual model of SQM model that covers the end to end process of service delivery. The SQ attributes in the conceptual framework are derived from the synthesis of literature review. The expected service is derived from word of mouth, personal need and past experience. The expected service is compared with the perceived service, which comes from various dimensions. The input category includes overall surroundings and resource both tangible and intangible, SQ dimensions in this category are image, facility, location and ease of access. Next, the process category refers to the quality of interaction between service encounter and customer, which consists of reliability, assurance, tangible, speed of delivery, flexibility, empathy and responsiveness. The service output category is a measurement of what is produced as a result of providing the service, which contains impressiveness, completeness of service, consistency, and follow up results.

## 2.2 MOBILE SERVICE ENCOUNTER IN THAILAND

### 2.2.1 Overview of Mobile Service Industry in Thailand

Mobile service industry has been increasingly important over the last two decades. Malisuwan (2005) revealed that the beginning of mobile service started in Thailand was in 1986. Thai mobile industry is controlled by two state enterprises, the TOT and the CAT. Currently, three major private mobile companies occupy more than 97% of mobile service revenues in total. First, Advanced Info services (AIS), which was granted concession from the TOT. Second, Total Access Communications (DTAC), a subsidiary of UCOM, was granted concession from the CAT. Third, True Corporation (TRUEMOVE) is a company in telecommunication market which first launched services in 2001 under a concession granted by the CAT. The market share by revenue is described in figure 2.3.

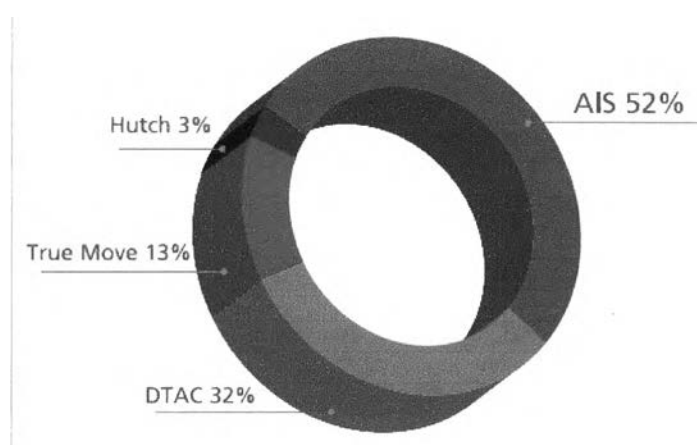


Figure 2.3 Market Share by Revenue

Source: AIS Annual Report 2009

According to AIS annual report (2008), the 2008 Thailand mobile telecom industry gained service revenue growth of 4% with 8 million new net subscribers. The total amount of mobile subscribers reached 61 million, representing a 15% increase from 53 million in previous year, pushing mobile market penetration to 94%. The increase in subscribers in recent years has mainly been driven by the behavior of multiple SIM users, who own more than one SIM and/or mobile phone to reduce their calling costs by taking advantage of different tariff plans. As a result of interconnection charge agreement, the main mobile



operators were obliged to pay for Interconnection Charge (IC) to their counterparts. Therefore, mobiles operators recently more emphasized on service quality improvement instead of price war.

## 2.2.2 Mobile Telecom Service Encounter

In order to understand service delivery process, a business process mapping is utilized, which reveals a chain of activities. The flow mapping process is helpful for this objective when it is brought into line with a more detailed narrative explanation of the main elements. Consequently, mapping of the process is performed in order to gain a clear understanding of how and why the service delivery process operates the way it does. The following detail shows what services are available for mobile customers. The common service types of mobile service shop are compared in table 2-6.

**Table 2.6: A Comparison of Service Types in mobile service shop**

Service Type	AIS	DTAC	TRUEMOVE
- Pre pay mobile service	Yes	Yes	Yes
- Post pay mobile service	Yes	Yes	Yes
○ Non-Voice Services	Yes	Yes	Yes
○ Voice Services	Yes	Yes	Yes
- Mobile Handset and Accessories Sales	Yes	Yes	Yes
- International Roaming Services	Yes	Yes	Yes
- iPhone Service Support	No	Yes	Yes
- After Sale Service	Yes	Yes	Yes
- Bill Payment	Yes	Yes	Yes
- Mobile Top Up	No	No	Yes
- Convergence Service	No	No	Yes

*(Source: DTAC shop, AIS Shop and Truemove Shop, 15/04/2008)*

### **Mobile Services**

Key functions of mobile service shops can be summarized as below:

- *Pre pay mobile service*

According to DTAC annual reports, most of mobile shop's revenue is derived from sales of prepaid airtime, which do not require a monthly subscription fee. Subscribers purchase a SIM card with an initial credit balance and can top-up their credit balance through various means, including purchase of top-up cards, transfer of funds through ATMs, transfer of credit balances from other mobile phone accounts, and "over-the-air" top-ups. (www.truecorp.co.th, 14/05/2009).

- *Post pay mobile service*

The postpaid service allows customers to choose a monthly service plan. Subscribers are billed monthly for subscription fees, airtime and the use of other voice and non-voice services (www.dtac.co.th., 1/04/2009)

- *Voice Services*

Mobile subscribers have access to local, domestic and international long-distance dialing. In addition, Truemove offers a variety of value-added services in different combinations according to the airtime package selected. These services include call waiting, call forwarding, call conferencing and caller identification. The company also offers our voice subscribers roaming services, which enable them to make and receive calls when outside Thailand.

- *Non-Voice Services*

Mobile operator provides a range of non-voice services to enhance customer lifestyles. Content is delivered through various channels covering all mobile-accessible channels and web-based services through the company website. Non-voice services comprise a variety of popular content, including photo-based communication, financial information services, games, cartoons, screen savers and ring tones, music and sports content. The numbers of subscribers are increasingly using our non-voice services, in particular ring-back tones, messaging and downloadable pictures, images and audio through mobile Internet services. Non voice services can be currently grouped into three main categories (www.truemove.co.th, 12/02/2009).

- *Messaging:*

Messaging consists of three sub categories, which are (1) Short Messaging Service ("SMS"), which allows subscribers to send short text messages to other mobile users (2) Voice SMS: Thailand's first voice short-messaging service allows subscribers to send audio messages to fixed-line and mobile handsets (3) Multimedia Messaging Service ("MMS"): allows subscribers to send pictures, text and sound/voice in a single-packet message.

- *Mobile Internet service:*

Mobile operator provides a range of internet service, including EDGE/GPRS and 3G/HSPA, which offer mobile data communications with GSM-based technology. In addition, mobile operators provides a Mobile Chat service, which is a WAP-based instant-messaging service, Mobile Web, which allows subscribers with compatible mobile handsets to access the Internet, including Blackberry and iPhone services: including Blackberry Messenger, chat, push-mail, and Internet surfing ([www.truemove.co.th/](http://www.truemove.co.th/) 13/06/2010).

- *Content:*

According to AIS website ([www.ais.co.th](http://www.ais.co.th), 13/02/2009), mobile operator provides content service, which consists of (1) Ring-back Tones: offers personalized ring-back tones and exclusive song selections; (2) Voicemail: enables subscribers to retrieve audio message recordings; (3) Multimedia Content Services: allow subscribers to access content such as music, sports, news and finance (through True Music, True Sport, TV, movies and others).

- *Mobile Handset and Accessories Sales*

Mobile operator offers a broad range of mobile handsets and related accessories. The key handset products are high-quality smart phones including iPhone 3G and iPhone 3G S as well as Blackberry. Handsets are either sold outright (untied to any service) or tied with mobile operator's monthly (postpaid) packages ([www.truemove.co.th/](http://www.truemove.co.th/) 13/06/2010).

- *International Roaming Services*

Mobile operator allows people whose network operators have international roaming agreements with Mobile operator to use its cellular network when traveling in Thailand. The subscribers may also use the networks of international operators with whom the provider has entered into international roaming agreements. The roaming services include voicemail, SMS, MMS, mobile Internet (via EDGE/GPRS), Email, Caller Identification, Missed Call Alert, Short Code, BlackBerry roaming and Wi-Fi service ([www.truemove.co.th/](http://www.truemove.co.th/) 13/06/2010).

## 2.3 REVIEWS OF RESEARCH METHODS

### 2.3.1 Systematic Literature Review

Systematic literature reviews method is selected by many researchers as the essential step in any research process to describe what work has been done on a topic and summarize the knowledge. A systematic review is a review of research that uses explicit methods to perform a thorough literature search and systematic screening method to identify the valid and applicable evidence. These systematic reviews can be applied in any field of research and groups. Selection and screening process are usually carried out by reviewing the titles and abstracts of the articles identified, and excluding those that do not meet inclusion criteria. Understanding the approach can minimize bias and help to assess if their findings should be applied to practice. High quality systematic reviews are published in many of the leading journals and electronic databases.

A systematic review reduces the influence of bias as below:

- All contributions from research papers in selected database are collected systematically.
- The contributions from research papers were classified and summary.
- It uses systematic and explicit methods to identify, select and critically appraise relevant research
- It uses systematic and explicit methods to collect and analyze data from the studies that are included in the review.

### 2.3.2 Delphi Study

The Delphi study was originally developed by the RAND Corporation in California in the 1950s and 1960s to elicit expert opinions (Woudenberg, 1991). The Delphi is a tool for discovering agreement and consensus by sharing the criticism (Buckley, 1995). Delbecq et al. (1975) provided a description of the Delphi process as the approach contained a survey

conducted in two or more rounds and provided the experts in the second round with the feedback of the previous round then adjusted the original assessments. The same experts assess the specific topic in two or more round and the result of the next round was influenced by the opinions of the other experts (Häder and Häder, 1995). Linstone and Turoff (1975) stated that the method required expert contributors submitted separately responding to questions to a central coordinator. Delphi method is suitable for an expert in a different location and if there are political issues among groups (Eto 2003). The benefits of Delphi technique are the potential for anonymity, ability to equalize participants, and ability to remove personality factors from the process (Howze, 2004). The sample size of Delphi study should be a sufficient number of experts. In addition, they should be willing to complete the entire study and provide enough information.

The selected experts in the Delphi panel are the perceived subject expertise, not for demographic representativeness. Scheele (1975) recommended the panel must be chosen from stakeholders who will be directly affected, experts with relevant background and experience, and facilitators in the field under study. Linstone (1978) suggested that large panels had more difficulty achieving agreement and were more difficult to manage the contribution. In addition, the accuracy of developed conclusion is very low with large numbers. The time consumption for the Delphi process can take around for 30 to 45 days (Barnes, 2007). Normally, the response rates for the second round are decreased, particularly in a paper-base method (Jillson, 1975). Computer-based techniques are far better than paper base approach. The utilization of email or internet-based methods has speeded up the process (Colton and Hatcher, 2004). Yong (1988) stated that a Delphi study involved a multistage procedure, including: the selection of panelists; the design of the questionnaire and the provision of feedback. Keeney (2001) stated that the Delphi technique combined opinion into group consensus.

### 2.3.3 Confirmation Factor Analysis

Factor analysis is a group of statistical techniques to test a hypothesized factor structure or model (Jun 2001). It includes several methods such as principal axis factoring, principal components analysis, image factor extraction, alpha factoring. According to Emory (1991), there are basically two types of factor analysis: exploratory and confirmatory.

- Exploratory factor analysis (EFA) is designed to determine the nature of the constructs influencing a set of responses.
- Confirmatory factor analysis (CFA) tests whether a specified set of constructs is influencing responses in a predicted way.

This study focuses on confirmatory factor analysis (CFA), which is another class of factor analysis methods for examining the results of hypothesized model. According to Byrne (2001), confirmatory factor analysis may be seen as a subset of the more general structural equation modeling (SEM) approach. In particular, CFA is a measurement model of the relationships of indicators including the correlations among the factors. Confirmatory factor analysis is normally based on a strong theoretical foundation that allows the researcher to specify an exact factor structure from previous study in advance. The CFA approach basically restricts which variables will load on which factors and which factors will be correlated. Interestingly, CFA approach also provides significance tests on each factor loading coefficient (Anderson, 1988). According to CFA method, each variable has an error term, related to it and expresses the proportion of variance in the variable that is not explained by the factors. The error terms also include measurement error due to any lack of reliability in data for the variables. Normally, the objective of CFA is to find out the covariance among variables consistent with a hypothesis.

Based on Child (1990), the process of CFA approach can be explained as below:

1. Review the related theory and research literature to proposed new model specification for CFA Testing.
2. Describe a model (e.g., diagram, equations) and involve attributes
3. determine model identification (e.g., if unique values can be found for parameter estimation; the number of degrees of freedom, df, for model testing is positive)

4. Collect data- Survey
5. Conduct preliminary descriptive statistical analysis (e.g., scaling, missing data, co linearity issues, outlier detection)
6. Estimate parameters in the model
7. Assess model fit
8. Present and interpret the results.

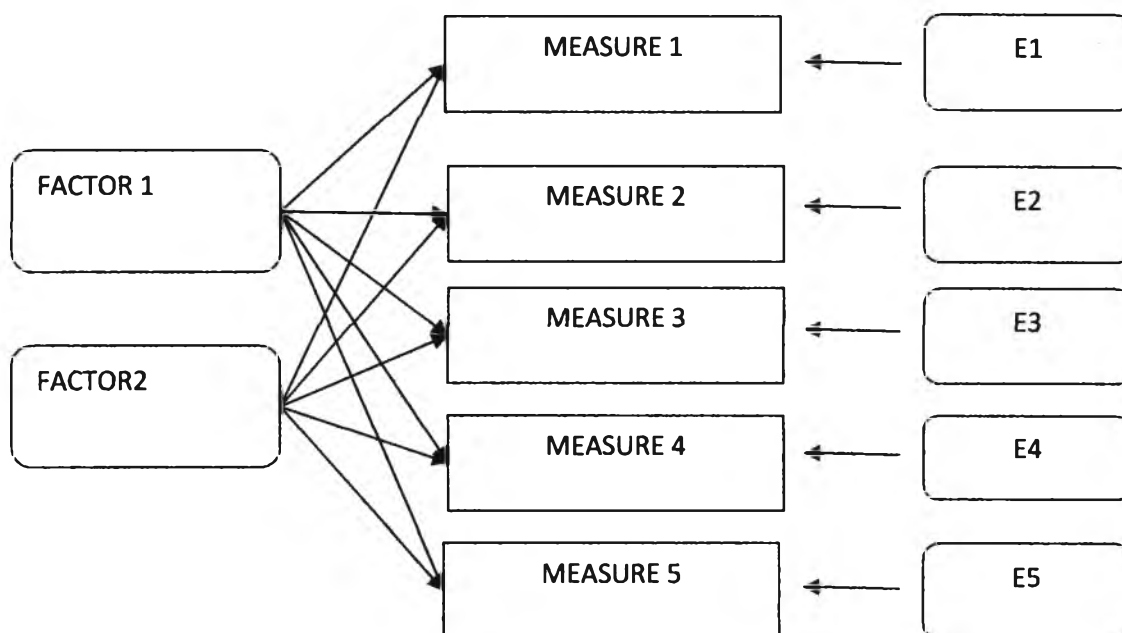


Figure 2.4: The common factor model.

## 2.4 CLOUD COMPUTING TECHNOLOGY

“Cloud computing is a better way to run your business. Instead of running your apps yourself, they run on a shared data center. When you use any app that runs in the cloud, you just log in, customize it, and start using it. That’s the power of cloud computing.”

(Source: [www.salesforces.com](http://www.salesforces.com), 23/06/2010)

Today, various companies are running all kinds of apps in the cloud. Barrett (2010) revealed that top 10 technologies in 2010 were studied by Gartner, Inc. analysts. The study

highlighted the top 10 technologies and trends that would be strategic for most firms in 2010. Cloud computing is one of the top ten technologies that present a style of computing that characterizes a model in which providers deliver a variety of IT-enabled capabilities to consumers. Cloud-based services can be utilized in a variety of ways to develop an application or a solution. The benefit of using cloud resources is not only reduce cost of IT investment but expand usage to new group of users, who cannot afford to pay some expensive software, but prefer to pay by using the program. In addition, consuming cloud services enterprises will increasingly act as cloud providers and deliver application, information or business process services to customers and business partners. In a report released this week, Gartner predicted that the projection of worldwide cloud services revenue would reach to more than \$68.3 billion this year, a 16.6 percent improvement from an already-robust 2009 and a harbinger of things to come. In addition, Gartner (2010) forecasted the trend of using cloud-computing services sales that would surge to more than \$148 billion by 2014. According to Gartner's forecast, enterprise customers accept that the era of traditional on-premise software and hardware installations has come and gone.

In the internet era, cloud computing is known as a technology that uses the internet and central remote servers to maintain data and applications. Cloud computing allows consumers and businesses to utilize applications without installation and access their personal storage information at any computer by using internet access. This technology allows for much more capable computing by centralizing storage, memory, processing and bandwidth.

Zhang (2010) defined the Cloud Computing as one of the emerging business opportunity today. The revenue of cloud model comes from the calculation of usage. It will calculate the utilization to distribute on the resource pool which is the massive computer. This type of resource pool is known as "the cloud". "The cloud" is virtual computation resources that can maintain and manage at the center by service providers. This is easier to upgrade and maintain. Cloud computing is the new paradigm of computer system that utilizes a combination of connections, software and services accessed over a network. The



scale of the cloud allows users to access supercomputer-level power. Users can access and upgrade resources as they require.

Cloud computing can be broken down into three groups, which are: "applications," "platforms," and "infrastructure." Each group serves a different intention and offers different products for businesses and individuals around the world. Cloud computing can massively reduce cost of IT budget. A study of VersionONE (2009) found that some companies achieved on average an 18% reduction in their IT budget from cloud computing and a 16% reduction in data center power costs. The projection of cost reduction by using cloud computing is growing. Cloud computing can be grouped into three categories: software as a service, platform as a service, and infrastructure as a service (Michael, 2009).

- 1) **Software as a service (SaaS) features:** this SaaS offered as a service on demand. A completed set of software operates on the cloud and services multiple end users or client organizations. There is some proven success of using SaaS such as salesforce.com, though many other examples have come to market. This includes the Google Apps offering of basic business services as well as email and word processing (Zhang, 2008).
  
- 2) **Platform as a service (PaaS):** It provides a platform for users to build higher level services. PaaS produces a platform by integrating an OS, middleware, application software, and even a development environment. It is then provided to a customer as a service. The customer manages and monitors the system via internet (Michael, 2009).
  
- 3) **Infrastructure as a service (IaaS)** provides basic storage and compute capabilities over the network. Sometimes we call this IaaS as virtual servers. Servers, storage systems, switches, routers, and other systems are pooled and made available to handle workloads that range from application components to high-performance computing applications (Chang, 2006).

This study focus on software as a service (SaaS), thus the comparison of traditional software and software as a service (SaaS) pay per use is revealed in table 2.7:

**Table 2.7: A comparison of software as a service (SaaS)**

Traditional Software	Software as a service (SaaS) Pay per use
<ul style="list-style-type: none"> <li><input type="checkbox"/> Customers have to install, manage and maintain by themselves (Vogels, 2008).</li> <li><input type="checkbox"/> Architect solutions based on individual company and require various specifications for specific type of software (Tsai, 2008).</li> <li><input type="checkbox"/> Infrequent, major upgrades every 18-24 months, sold individually to each installed base customer(Shao, 2009)</li> <li><input type="checkbox"/> Version control (Shao, 2009)</li> <li><input type="checkbox"/> Upgrade fee (Vogels, 2008).</li> <li><input type="checkbox"/> Streamlined, repeatable functionality via Web services, open APIs and standard connectors (Vogels, 2008).</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Easy to access because of delivery as Internet-based services (Zhang, 2008)</li> <li><input type="checkbox"/> Designed to run thousands of different customers on a single code (Buyy, 2009).</li> <li><input type="checkbox"/> Frequent, "digestible" upgrades every 3-6 months to minimize customer disruption and enhance satisfaction (Chang, 2006).</li> <li><input type="checkbox"/> Fixing a problem for one customer fixes it for everyone (Chang, 2006).</li> <li><input type="checkbox"/> May use open APIs and Web services to facilitate integration, but each customer must typically pay for one-off integration work (Chang, 2006).</li> </ul>

The future of the cloud computing was summarized by Shuai (2010) that the number of firms who abandon the use of its own system increase significantly. Private cloud computing services will be popular and business intelligence (BI) will be SaaS's next target. Consequently, this technology is the real opportunity for developer to invest and deploy to markets.

## 2.5 CONCLUSIONS

This chapter begins with reviewing service quality measurement model by using systematic literature review method. There are four main contributions from reviews. First, service quality is intangible and related to input, process and output that are created and used nearly simultaneously. Customers who enter to service station have some expectations, which come from various factors such as word of mouth, advertising, brand image and past experience. During service delivery process, two main SQ categories need to be highlighted. They are physical dimensions and human interaction dimensions. Second, the findings show ten KSFs for service quality implementation. They are management support, regulation, service customization, organizational culture, employee participation, communication, training, motivation system, change agent mechanism, and performance measurement. Third, the reviews of research methods provide the understanding to research used in this thesis. Delphi study is the survey process that is conducted in two or more rounds and provides the experts with the feedback of the previous round then adjusts the original assessments. This method will be explained in more detail in Chapter 3. The utilization of confirmatory factor analysis (CFA) approach will be able to restrict which variables will load on which factors, as well as which factors will be correlated. The review of cloud computing provides the technology foundation for SQM-ME system development. Finally, the proposed SQM model refers to input-process-output approach and reveals lists of SQ variables as a conceptual background for next chapter. Research strategy and methodology for this thesis are explained in Chapter 3.