A Quantitative Approach to Measure Customer Expectation for Service Innovation within Service Experience Delivery

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ABSTRACT
Customer-focused service design and innovation is the key for service providers to deliver what services customers actually want. Although numerous articles emphasize the importance of customer expectations in many disciplines, only there was the non real-time data captured by previous empirical research. Besides, there has been no mathematical mechanism to correctly catch customer expectations in previous research. Service providers must make additional efforts to analyze and predict customers' needs according to previous empirical research, yet the gap between service providers' prediction and customer expectations has been still obvious occurring in practice. Accordingly, the purpose of this study is to propose a systematical and quantitative expectation measurement model, which is based on Fechner's Law and the concepts of operation risk, for service providers to measure the real time customer expectations during service experiences delivery.

Categories and Subject Descriptors
I.5 [**Pattern Recognition**]: I.5.2 Design Methodology: *Feature evaluation and selection, and Pattern analysis.*

General Terms
Measurement, Expectation, Experience, Innovation.

Keywords
Customer Expectation Measurement, Service Experiences Delivery, Fechner's Law, Service Innovation

1. INTRODUCTION
Services represent the main economic activities and an increasing percentage of the GDPs of developed countries around the world. In order to increase the economic competence, many countries gradually enlarge to invest in the service industry. However, what kinds of innovative services customers can accept and how to deliver innovative services to customers are the important and complicated issues. Sundbo (1997) mentioned that innovations can be regarded as the search-and-learning process to enable service firms to generate and collect unique ideas. Voss (2004) noted that the key innovation is to build good experiences into a service in order to increase customer repeat business while we are engaged in service design. Even though there have been lots of researchers from different disciplines, especially in marketing, who focused on several customer issues including customer satisfaction, customer relationship management, customer expectation or customer loyalty, however, how to manage customer expectation is the kernel that would apparently influence other customer issues. Parasuraman et al. (1991) noticed that understanding customer expectation is necessary for service companies to deliver superior services. It is critical to manage customer expectations to achieve customer satisfaction successfully [25]. Thus, defining and operating competitive services with respect to customer expectations can increase the successful opportunity for the enterprises [22]. Hence, to design good service experience for customers needs to pay attention to customer expectation management.

For service innovation, building good service operations can increase the successful opportunity of managing customer expectations. A good service experience would be formed by several splendid operational processes. Customers can experience and enjoy services through operational processes in practice. Accordingly, service operation design attempts to create a good service environment and a pleasant atmosphere for customers. Voss et al. (2008) proposed the service operations management architecture to clearly define four major strategy components of the service delivery system (including Stageware, Orgware, Customerware and Linkware). Customerware strategy refers to manage customer touch points by using technology or employees in order to meet customer expectations. Managing customer expectation is still necessary within operation design to fulfill the good service experience.

Although customer expectation issue has been discussed for a long time, less research applied the determinants of expectations into practices. Service providers use the familiar empirical approaches (e.g. market survey, customer investigation or historical reports) to examine customer needs. Peppers et al. (1999) proposed that service providers can employ interactive and customized activities to realize what customers real want. However, these approaches do increase the cost and efforts of providers, yet the investigative results may not be good enough to represent actual customer needs during service delivery because previous operation design research was mainly investigated from

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the non real-time data (such as questionnaire surveys or case study). Furthermore, there were no systematical mechanisms found in past research to effectively measure customer expectations (which are influenced by determinants within service delivery) to manage the service experience delivered.

In this paper, we argue that without measuring customer expectation it would be not feasible to well implement customer expectation management and operations service strategies aimed at achieving good experience during service delivery. Accordingly, the research aims to explore the following research question: How can service providers effectively and accurately measure customer expectations in terms of the effects of service operation strategies during service experiences delivery?

This study is to propose an intelligent and theoretical measurement model for measuring real time customer expectation in order to comprehend actual customer expectations and behaviors, taking several important concepts, like customer expectation, operation design etc., into account to fulfill the service experience innovation. However, customer expectations, which are difficult to measure in terms of manipulation biases, can not be numerically represented and calculated by customers' external behaviors. Fechner's Law [31] is then adopted to serve as the psychological theory to underlie our expectation measurement approach to transforming customer expectations into numerical numbers during service experiences delivery. Besides, the concept of operation risk (which is built based on the probability concept) is used to portray the effect of the external stimuli (i.e. expectation tactics and service operations) on customer expectations. Hence, the main contribution of this study is to integrate the theories of Fechner's Law and operation risk into a computable and quantitative expectation measurement model. Not only researchers can apply this theoretical expectation measurement model to investigate and recognize the customer's psychological status for the further research, but also service providers can deliver innovative service experience to their customers based on the results of the measurement model.

2. BACKGROUND

2.1 Customer expectation

As mentioned earlier, the customer factor is extremely critical for service firms to achieve service innovation and acquire successful business value and profits during service experiences delivery. Especially, customer expectation management has been an important issue across different disciplines. For example, Calvert (2001) analyzed that how customer expectations in different countries and cultures related with the library services by the survey method. Lo et al. (2005) proposed a customer-based supply chain management framework based on customer expectations by the Delphi and interview methods. Kurtz et al. (1993) analyzed that the restaurant services influenced customer expectations by the survey method. Clow et al. (1997) used the survey method to investigate the relationship between service quality and customer expectations across diverse industries. However, these studies were almost based on the empirical methods to analyze the customer expectations issue. Although these research methods have systematical and discreet approaches to get the proper results, the customer data is always on non real-time. Consequently, there are two limitations in these non real-time studies in the social science discipline. First, humans' memories could be biased and become vague as time goes by. The reliability of these studies would be decreased in terms of the accuracy of humans' memories. Second, it is difficult to realize and analyze the actual customer behaviors based on the static data from the empirical approaches, because it is extremely dynamic and complex for customer behaviors in different timing, situations or context.

Accordingly, the process of service experience delivery is so changeable and needs the good service design strategy and operations to closely meet customer expectations within service delivery. Using effective service operation design is thus necessary to solve the previous research gap (such as the above limitations) by dynamically comprehending customer real-time needs. Besides, an important point is to develop a mechanism to measure customer expectations within service delivery.

2.2 Service operation design within service experience

Delivering good service experiences to customers is necessary but hard for service providers in terms of dynamic environments [8, 33]. Pullman et al. (2004) noted that service providers can increase customer loyalty to get high profit through developing their high ability of experience design. Thus, how to provide customers with good service experiences has been also a vital issue in the academia and the business field. However, there are many key issues correlating to the topic of service experiences. Customer expectation management is a major factor to influence customer service experiences and the other important matter is service operation which has been discussed for a long time in different disciplines [11, 28, 29, 33]. Service operations can be regarded as the real entities of services which customers can directly get in touch with. Consequently, service providers always deliver proper services to their customers through service operations. Service providers, therefore, can successfully manage customer expectations by the supports of good service operation settings. According to Nie et al. (1999), there are ten major service operation management issues around service providers, especially environments, employees and technology.

2.2.1 Environment issue

Physical Physical environment design has been continuously discussed in previous operation management research. Bitner (1992) proposed three main environment dimensions (e.g. ambient conditions, space/function and signs, symbols & artifacts) which service organizations should take into account while designing their physical purchase surroundings. Thus, environment design can influence not only the performance of service providers [2] but also the perception of service quality of customers [27]. Furthermore, the major objective of environment design is to build atmospheric purchase surroundings for customers [7, 13], so atmosphere has played an important role in designing environments. There have been many empirical results as the forceful evidences which show customers would like to spend lots of time and money in purchasing and staying in the cordial, warm or comfortable atmosphere surroundings [2, 3, 7,]. Accordingly, service providers should confront the basic service operation issue of environment design first. Environment design, moreover, should be extended the application boundary that the places customers would encounter.

2.2.2 Employee issue

Heskett et al. (1994) described that service providers should establish their own service-profit chain to increase their customers and potential benefits. The initial approach of the service-profit chain is to define the internal service quality of service providers which can represent the importance relationship between the frontline employees and the external customers. Accordingly, employees play an important role for contacting customers directly in service encounters. The external behaviors (such as warm talks, smiles or friendly treatment) of employees can influence the perception of customers [16]. Besides, service providers also have to take account of employee training, employee empowerment and service cultures in employment strategies [4, 16]. Service industries have procured the major economic activities in the twenty-one century, yet either the virtual products (e.g. services) or the physical products of the businesses still need the employees to be in touch with their customers. In other words, employees can be regarded as a service delivery media to closely enable customers to understand what value they can receive. Hence, this study deems that the employees' external behaviors will directly affect customers' feelings and purchase behaviors.

2.2.3 Technology issue

In order to increase the abilities of reposing customer needs, producing services or delivering services, service providers would implement Information Technology (IT) to enhance their competitive advantage. Service providers can not only raise and improve service performance [12, 18] but also increase the service quality [18] through applying IT into service processes. Furthermore, employing IT within service encounters can enable customers to achieve higher satisfaction in order to reach providers' business goals [12, 18]. Some research indicated that it is essential for service providers to consider the reliability and adoption of IT-based services for increasing customers' usage and trust [12, 15]. The nature of Information Technology is to support service providers to execute their jobs accurately and effectively in order to increase the service quality and reduce additional cost. Hence, it is necessary for service providers to deliver IT-based services within service encounters. Advanced technology would be regarded as a stimulus to enable customers stay in an exciting and memorable experience.

To sum up, good customer expectation management can lead service providers to gain in the experience economy. This study attempts to build a conceptual framework of delivering service experiences to enhance the feasibility and assurance of measuring customer expectations by service operations design including the environment, technology and frontline. Customers can stay in the atmospheric surroundings with pleasure emotions by using the warm light, the virtual reality technology and the employee with a smile. Accordingly, service providers can thoroughly implement customer expectation management based on such a good service operations design.

2.3 Fechner's Law

This study aims to propose a quantitative measurement model to measure customer expectations during services experiences delivery and customer expectations are regarded as the mental status of humans. Fechner's Law is then adopted to represent the relationship between the external stimuli and the sensations of humans.

According to Fechner's Law, if the magnitude and type of the external stimulus are known supposedly, the magnitude of sensations can be calculated through the mathematical formula. Hence, the service providers can utilize the determinants to influence their customer expectations. These determinants can be considered as the external stimuli and the customer expectations are likened to the sensations. This study tries to apply the concept of Fechner's Law into customer expectation management within services delivery for building an appropriately quantitative measurement model that can analyze and meet real customer needs in order to match the business goals.

In 1834 Ernst Heinrich Weber, a German physicist, presented a mathematical approach (Weber's Law) to measure the variation between two different stimuli (so-called Just Noticeable Difference, JND) which humans could be appropriately conscious of. The equation of the Weber's law shows as follows,

$$K = \triangle I \,/\, I \text{ (Constant)},$$

where $\triangle I$ represents the difference threshold between two stimuli, I represents the initial stimulus intensity of a human and K represents the constant of the specific sense that is the so-called the Weber proportion. For example, if a human can raise 5 kg, he will notice that it takes some effort. If he adds 0.01kg and lift again, he may not notice any difference between 5kg and 5.01kg. Furthermore, if he continues to add weight, he can notice that the just noticeable difference is 0.5kg. When he lifts up from 10kg, the just noticeable difference is 1kg. Hence, the ratio of $\triangle I / I$ (0.5/5 = 1/10 = 0.1) between these two examples is the same. However, Weber's Law does not explain that how a subjective consciousness of a human changes with the variation of external stimulus intensity.

Consequently, Fechner proposed that using the just noticeable difference as the basic sensation unit is feasible way for measuring the mental status of humans based on Web's Law. In other words, summarizing each just noticeable difference segment can be considered as the mental perception of humans. Fechner integrated the above equation to give another equation (so-called Fechner's Law or Weber-Fechner's Law) as follows [31],

$$S = K * \log R,$$

where S represents the intensity of mental perception of humans, R represents the intensity of the external stimulus and K is a constant. This equation of Fechner's Law shows that the relationship between mental perception and the external stimulus is logarithmic (as shown in Fig. 1). The logarithmic relationship describes that if the variation of the stimulus is a geometric progression, the related mental perception of humans is changed in an arithmetic progression.

In summary, the concept of Fechner's Law is to find a way that can describe the mental state of a human through physical incentives externally. As mentioned earlier, customer expectations are difficult for service providers to realize which represent humans' psychological statuses. Thus, the point is that this study attempts to employ Fechner's Law to describe the customer expectations mathematically. This study uses the external stimuli (i.e. expectation tactics and service operations) to

find the representative value of customer expectations based on Fechner's Law.

2.4 The capital requirements of operation risk

In this study, we also apply the concept of operation risk on the expectation measurement model in order to fulfill customer expectations calculation systematically. According to Fechner's Law, the stimulus is the critical element to influence perceptions of a human. However, how to determine a representative value for the stimulus (i.e. the combinations of determinants) of managing customer expectations is extremely difficult in terms of limited past research. Thus, operation risk can be a theoretical support to transform determinants into a representative stimulus value.

Operation risk has been an important issue in traditional manufactories for a while. However, service industries gradually realized that operation risk would conspicuously affect their performance and profit, the bank industry especially. Banking businesses now become more and more complex and changeable in terms of high competitive environment, diverse customer needs and advanced technology, which would lead banks to face higher risks. Consequently, the Basel Committee defined the standard rules and norms for banks to reduce their operation risk. Furthermore, according to the New Basel Capital Accord [1], the definition of operation risk is "the risk of direct or indirect loss resulting from inadequate or failed internal processes, people and systems or from external events." The main concept of operation risk means that banks have to prepare additional capital beforehand to prevent operation risk. Accordingly, the capital charges of banks for risk measurement and management is an extremely essential matter.

According to the New Basel Capital Accord [1], the equation of Internal Models Approach is as follows,

$$\text{Required Capital} = \Sigma i\, \Sigma j\, [\gamma(i,j) * EI(i,j) * PE(i,j) * LGE(i,j) * RPI(i,j)],$$

where the γ represents each business line or loss type combination of banks, Exposure Indicator (***EI***) represents a parameter for the size of a particular business line's operational risk exposure, Probability of loss Event (***PE***) represents the possibility of occurrence of loss events, Loss Given Event (***LGE***) represents the ratio of transaction or exposure which would be disbursed as loss, given that event and Risk Profile Index (***RPI***) represents the bank specific risk profile which can be considered a capability of a bank for solving the risk problem. Besides, ***i*** is the business line and ***j*** represents the risk type.

In brief, operation risk is built by the concept of required capital (i.e. probability) which includes several indicators to calculate and represent the risk value. This study attempts to compute the representative value of the determinants of influencing customer expectations based on the concept of operation risk. Hence, this approach can enhance the integrity and rationality with using Fechner's Law of customer expectation management.

3. EXPECTATION MEASUREMENT MODEL

This section first delineates our design logic of customer service experiences in terms of a conceptual framework on which the requisite of customer expectations can be delivered. Subsequently, this study details the mathematical expectation measurement model grounded on the theories of Fechner's Law and operation risk.

3.1 Conceptual framework of designing service experiences

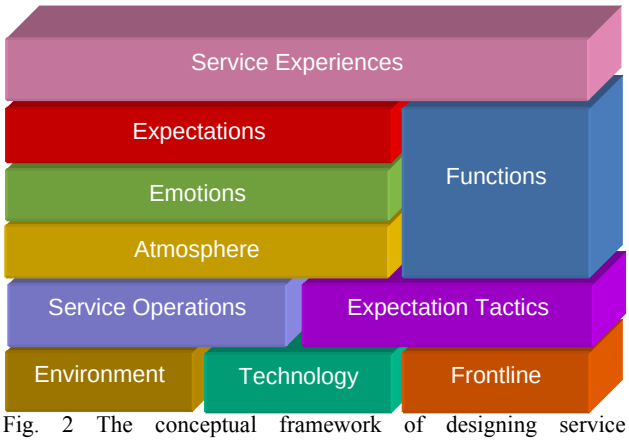

Fig. 2 The conceptual framework of designing service experiences

This study proposes the conceptual framework of designing customer service experiences (as depicted in Fig. 2) according to [33] and service operations concepts (as mentioned earlier in Section 2). This conceptual framework represents the relationship among service operation design, expectation tactics and customer expectations during service experience delivery.

Hence, it needs to use service operations and expectation tactics to implement the above two dimensions. The purpose of service operations is to build the positive emotion environments and using expectation tactics attempts to manage customer expectations. Besides, service providers should ensure the nature of service functionalities before delivering, because service operations and expectation tactics are all services. It is necessary to design flawlessly in the environment, technology and frontline for generating good service operations and expectation tactics.

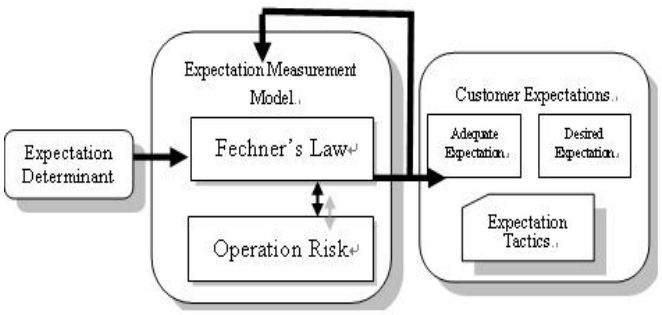

Fig. 3 The process of measuring expectation Measurement Model

3.2 The expectation measurement model

3.2.1 The process of measuring customer expectations

Fig. 3 represents the process of expectation measurement model which can be divided into three separate stages which include expectation determinants, expectation measurement model and customer expectations. Furthermore, the measurement model also contains the feedback which can continuously refresh the database for measuring customer expectations.

- Expectation determinants stage

The inputs of the expectation measurement model are the combinations of determinants which service providers would like to propose to influence customer expectations. According to Zeithaml et al. (1993), these determinants are including enduring service intensifiers, personal needs, transitory service intensifiers, perceived service alternatives, customer self-perceived service role, situational factors, predicted service, explicit service promises, implicit service promise and word-of-mouth communications. There are different combinations of determinants as inputs based on different situations (such like time, customer management objectives or provider capabilities).

- Expectation measurement model stage

This step attempts to calculate the values of the desired service level expectation and the adequate service level expectation, while the customer is in touch with the external stimuli. First, the objectives of managing customer expectation include adequate expectation raise, adequate expectation abatement, desired expectation raise, desired expectation abatement (as shown in Table 2). According to management objectives and the combinations of determinants (or the stimulus), applying stimulus intensity formula is to reckon the value of stimuli by four indicators (i.e. UDI, PEV, EV and CPI) based on the operation risk. Second, after acquiring the value of stimuli, applying the expectation measurement model is to compute the adequate or desired expectation value based on Fechner's Law.

- Customer expectations stage

Accordingly, the outputs of the expectation measurement model would contain the adequate expectation value, the desired expectation value and the expectation tactics list. Once service providers can realize the actual expectations of customers based on the outputs, they can propose suitable services to their customers for their business goals. In addition, the expectation tactics list, which is collected from the real time database, is for reference. Service providers can employ the appropriate expectation tactics to influence customer expectations according to this list. After service providers implement the expectation tactics, they should immediately store the values of expectation variation and their capabilities indicators in the real time database. Hence, owing to the feedback control the expectation measurement model can reflect the actual customer expectations in practice.

3.2.2 Applying Fechner's Law to expectation measurement model

According to [34], there are two customer expectation levels (desired expectation and adequate expectation) which can be influenced by determinants. This study describes the details of two expectation measurement models based on the theory of Fechner's Law.

3.2.2.1 Desired expectation measurement model

Desired services are the high level expectation of customers. It means that the service customers hope to receive [34]. Besides, the desired expectation is incredibly stable and changeless. For example, some customers always concern about the high quality of services or the lower prices, so, in other words, their basic needs can not change. Consequently, the desired expectation measurement model can be approximately applied by Fechner's Law, yet the difference between them is that the mental perceptions of customer would increase slowly in the desired expectation measurement model in terms of the stability of desired expectations.

Hence, the equation of the desired expectation measurement model can be modified in the form

$$\mathbf{E_D = K * \log_{\alpha} I,}$$

in which $\mathbf{E_D}$ is the desired expectation value of the customer affected by the external stimuli, and $\mathbf{I}$ is the stimulus magnitude of the expectation determinants that would be computed through the approach of operation risk. In addition, $\mathbf{K}$ is the constant which can represent the type of customers. According to the dissimilar type of customers, their mental perceptions must be quite different when they touch on the expectation determinants. $\boldsymbol{\alpha}$ is to represent the desired expectation of customers.

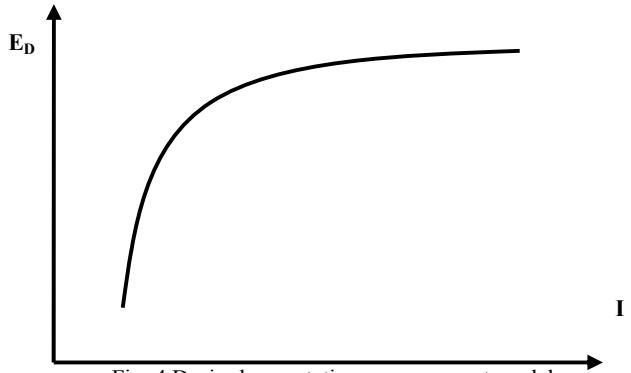

Fig. 4 Desired expectation measurement model

Fig. 4 clearly shows the curve of the desired expectation measurement model. When the intensity of stimuli enlarges with time, the desired expectation value of a customer also increases. Nevertheless, the desired expectation value would increase slowly, although the intensity of stimuli extremely heightens.

3.2.2.2 Adequate expectation measurement model

Adequate services are the low level expectation of customers, which means customers can accept this level of services [34]. The adequate expectation of a customer is often changeable and unstable in contrast to his/her desired expectation. In other words, the adequate expectation of a customer can be easily influenced by the determinants. The more determinants the providers use, the more mental effects customers have. Consequently, this study defines that the shape of the adequate expectation nearly belongs to the S curve (as depicted in Fig. 5).

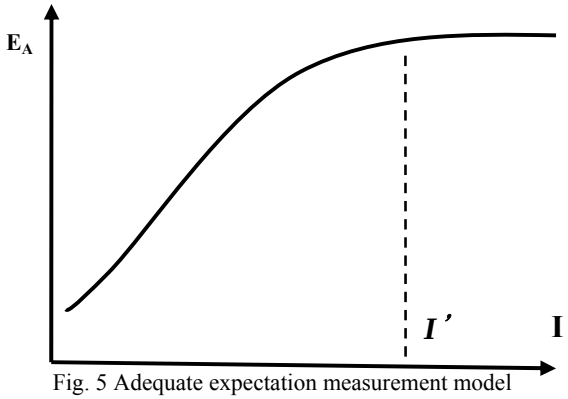

Fig. 5 Adequate expectation measurement model

The curve means that the adequate expectation value would increase continually, if the external stimuli enlarge with time. When the intensity of stimuli reaches a certain magnitude (**I'**), even though the intensity exceeds this magnitude, the adequate expectation value would nearly keep stable for a fixed value. The reason why the adequate expectation becomes steady ultimately is that the adequate expectation has attained the desired expectation based on the concept of the zone of tolerance [34]. Namely, the zone of tolerance becomes extremely narrow during this period in terms of the overlap between the adequate expectation and desired expectation.

According to Fechner's Law, the adequate expectation measurement model can be written in the form

$$E_A = K * \log_\beta I,$$

in which E_A is the adequate expectation value of the customer influenced by the external stimuli, I is the stimulus magnitude of the expectation determinants that would be computed through the approach of operation risk, and K is the constant which can represent the type of customers. $\beta$is to represent the adequate expectation of customers. Fig. 6 shows the expectation measurement model which combines the desired expectation measurement model and adequate expectation measurement model.

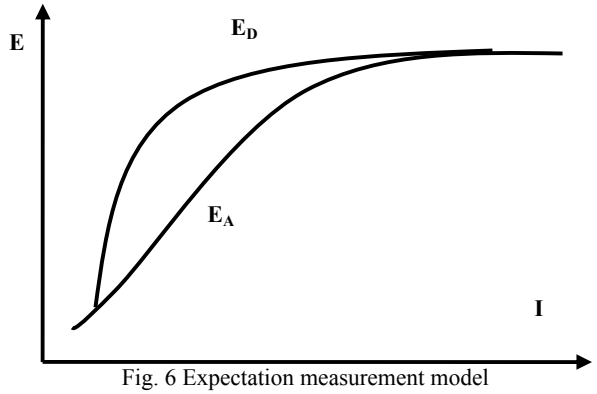

Fig. 6 Expectation measurement model

3.2.3 Applying operation risk to expectation measurement model

As mentioned above, the stimuli within the service delivery are the combinations of expectation determinants. It is different from the only single stimulus of Fechner's Law. Hence, this study tries to apply the concept of the operation risk to support what the stimuli are meticulously formed. The concept of required capital is the core though of operation risk. In order to confront the huge capital loss that operational risks could bring about, banks have to prepare appropriate money (i.e. required capital) ahead according to their capabilities, probabilities of loss events or exposure of risks.

This study refers to the formula of required capital and modifies the elements to form the new formula for calculating the magnitude of the stimuli. Accordingly, the formula of stimulus intensity can be written in the form

SI = UDI * PSE * AEV * CPI.

Table 2 shows the mapping relationship between the required capital and stimulus intensity formulas. There are four key elements in this equation, and the details are as follows.

Table 2 The mapping table of the required capital and stimulus intensity formulas

Required Capital		**Stimulus Intensity**
Exposure Indicator	**Mapping**	Usage of Determinant Indicator
Probability of Loss Event		Probability of Success Event
Loss Given Event		Average Expectation Variation
Risk Profile Indicator		Capability Profile Indicator
RC = EI * PE * LGE * RPI		**SI = UDI * PSE * AEV * CPI**

- **Usage of determinant indicator** (**UDI**): This indicator represents the effect of using expectation determinants for managing customer expectations. According to Fechner's Law, the stimulus intensity of a human would become large, if there are many irritants to influence him/her. Namely, the more determinants providers propose, the larger magnitude the stimulus procures. Let $D = \{D_1, D_2,\ldots, D_j\}$ be the set of all determinants for managing customer expectations during service delivery and $UDI = \{UDI_1, UDI_2,\ldots, UDI_n\}$ be the set of all combinations of determinants. Each combination *UDI* contains a subset of determinants chosen from *D*. Let $W= \{W_1, W_2,\ldots, W_l\}$ be the set of the weight, which can influence service providers' business goals, of each combination *UDI.* Each *D* has the exclusive weight. Hence, $UDI = \sum_{i=1}^{l} W_i$.
- **Average Expectation Variation** (**AEV**): Each combination UDI_d has its average expectation variation. The expectation variation which means the difference between the initial expectation and the terminal expectation while providers implement the determinants in each round. Then, accumulating and averaging the total expectation variations are to realize what significant effects the

determinants can provoke. Consequently, if the average expectation variation of an UDI_d is large, the magnitude of the stimulus would be great. Let $EV = \{EV_1, EV_2,\ldots, EV_j\}$ be the set of values of expectation variation of an UDI_d. Let $AEV = \{AEV_1, AEV_2,\ldots, AEV_j\}$ be the set of all values of average expectation variation. The equation of average expectation variation can be written as follows

$$AEV_i = \frac{\sum_{i=1}^{j} EV_i}{j}.$$

- **Probability of Success Event** (**PSE**): The definition of success event is that service providers attempt to utilize certain UDI_d to reach the average expectation variation. As mentioned above, the average expectation variation is accumulated by each calculation of customer expectation. Hence, this indicator is to calculate the probability of success event by capturing and updating the real time data. Different UDI_d would have its probability for achieving the average expectation average. Let $PSE = \{PSE_1, PSE_2,\ldots, PSE_n\}$ be the set of all values of probability of success event and $E_A = \{E_{A1}, E_{A2},\ldots, E_{Am}\}$ (or $E_D = \{E_{D1}, E_{D2},\ldots, E_{Dm}\}$) be the set of all values of adequate expectation (desired expectation). Accordingly, each probability of success event $PSEi = \sum_{i=1}^{k} \frac{E_{Ai}}{AEV_i}$.
- **Capability Profile Indicator** (**CPI**): According to the operation risk, the risk profile indicator is to evaluate the capabilities of a bank for dealing with the operation risks. In this expectation measurement model, we would like to use the capability profile indicator to assess the competence of service providers. The service provider, therefore, with high capabilities (such as many resources, high capitals or collaborative partnership) can lead to the high magnitude of the stimulus. The equation of capability profile indicator can be written as follows

$$CPI = \sum_{i=1}^{n} Wi * Ci,$$

where C_i represents the competence indicators of the provider and W_i represents the weights of each competence indicator. In addition, the capability profile indicator should be based on the domain-specific applications.

3.2.4 Scenario demonstration

This study employs a B2C scenario of the exhibition service system to demonstrate the utility of our expectation measurement model. In general, exhibitors with high capabilities can increase their visitors' expectation level for their customer franchise, and they will propose useful services with different weighting (such as recommendation service, advertisements, or warranty service) to visitors. An exhibitor (i.e. service provider) can deliver services to a visitor (i.e. customer) within one encounter through this exhibition service system. Hence, these services will be represented as the UDI_t. Besides, the exhibition service system can analyze the historical data of the successful probability of using specific services from the exhibition database and compute the PSE_t. According to these services, the exhibition service system can also compute the average expectation value AEV_t of using specific services in the past. The exhibition service system can also derive the value of the exhibitor's capability (CPI_t) based on its existent human resource, technology level, service category or capitals. The exhibition service system immediately transforms the four values into a value of stimulus intensity (SI_t) used to calculate the value of the visitor's expectation. Meanwhile, visitors can generally be divided into diverse classifications (based on age, gender, occupation, or consumption aims) representing K. Consequently, the service exhibition system can acquire the values of two expectation levels (i.e. E_D and E_A). When the exhibitor realizes the expectation values of visitors, it can flexibly modulate proper services in order to increase visitors' expectations. In other words, the expectation measurement model can enable exhibitors to deliver innovative service experience by closely grasping what visitors want in real time during the service delivery.

4. Discussion

4.1 Implications for service innovation

According to [34], customer expectation management is a critical factor for service providers to make the right service strategy. As mentioned earlier, it is necessary for service providers to manage customer expectation based on several considerations which include service quality, service operation and customer emotion. When service providers can take these aspects into account for managing customer expectation, the core values will be emerged from not only the provider side but also the customer side. Therefore, in order to fulfill good customer expectation management service providers should come up with creative notions which are integrated with these considerations. Thus, the new service innovation can be generated inherently.

Furthermore, customer expectation is extremely difficult for service providers to grasp and measure during service delivery, especially in the dynamic environment nowadays. This study attempts to propose a systematical and quantitative approach to enable service providers to measure customer expectation effectively. Consequently, customer expectation measurement can be regarded as an innovative service to immediately facilitate service providers to realize what customers actually want. According to the service of managing customer expectation, service providers can dynamically deliver different services to customers in terms of their expectation status. For instance, since a service firm with high capability (e.g. abundant resource, high technology oriented etc.) would like to occupy the market, it can increase the customer expectation level to set up a threshold for other competitors in order to achieve the customer franchise [23]. Hence, embedding the customer expectation measurement in service delivery can create pioneering concepts to attract customers for service innovation.

4.2 Implications for service delivery

Ojasalo (2001) noted that enterprises need to effectively manage customer expectations for their long-term business goals. Besides, service providers have to meet customer expectations in order to delight their customers and increase their performance [29]. This

expectation measurement model is built based on the expectation theory, Fechner' Law and the concept of operation risk attempts to be an innovative and theoretical mechanism for exactly realizing what customers want. Service providers can follow this model to not only have efficient service performance in terms of the intelligent control mechanism, but also reduce additional fees (such as the human cost, time cost or operational cost). Consequently, service providers can mainly pay attention to their services and draw up the business strategies.

Furthermore, the service experiences delivery system also needs to take account of service operations [28]. Although customer expectation management is extremely important to realize what customers want during service experiences delivery, there is no sufficient evidence that customers will have the purchasing behaviors owing to receiving the suitable services. In order to increase the efficiency of customer expectation management it is necessary to employ service operation design to support that. As mentioned earlier, service operation elements include the environment, technology and frontline that can generate atmospheric surroundings to enable customers to feel comfortable and pleasant. While service providers deliver proper services to influence their customer expectations, it is easy to meet customers' needs especially in the atmospheric surroundings. In other words, one of the business goals of service providers is mainly to increase the profits. Service providers should have good customer expectation management based on good service operations settings. Consequently, this study attempts to ensure the success of implementing customer expectation management through the consideration of service operations.

Thus, the empirical study, such as the survey method, is the important research way to investigate and understand how phenomenon is formed. However, Homer (1993) described that self-report surveys of respondents could procure some biases owing to incorrect reports. Hence, the expectation measurement model is the real time mechanism which means the customer data is continuous updated and collected during the service experiences delivery. Service providers can immediately acquire the latest information to decide what service strategies propose for customers. There is no doubt that service providers can deliver appropriate services to their customer in the real time circumstances. Moreover, customer experience management is the basic way to achieve customer relationship management [19]. The real time measurement model can facilitate service providers to find their target customers and maintain their relationships in order to attain their business and personal aims.

5. CONCLUSIONS

Service experience innovation is the key for service providers to design what services customers really want. In past research, how to deeply understand customers' needs has been still an important issue; however there has been no effective and useful mechanism to solve this problem. Most previous research used empirical methods to analyze the customer behaviors, yet the processes of delivering service experiences are dynamic that customers needs or feelings become unstable and changeable. Accordingly, this study aims to propose a systematical and quantitative model to measure customer expectations during service experience delivery according to theoretical supports (e.g. expectation theory, Fechner's Law and operation risk). This study tries to employ this mechanism to investigate the customer expectations and behaviors in real time. Therefore, the customer expectation measurement model can be implemented as a creative service for service innovation which enables providers to realize customers' mental status.

There are some contributions of this study as follows. First, service providers can employ the mathematical expectation measurement model to manage their customers' mental status based on the theoretical support. Service providers can clearly realize the customer expectation and deliver appropriate services to them immediately in order to increase the probability of purchasing. Second, the status of customer expectation is difficult to be quantitative represented in terms of diverse human psychology. This study tries to create a computable model which composes key indicators and theories (e.g. expectation theory, Fechner's Law and operation risk) to be the foundation for the future research. Last, this expectation measurement model can be applied in the real time situations, which enables service providers immediately to realize and meet customers' needs during service experiences delivery. However, our expectation measurement model still needs to be empirically evaluated and verified in the future, and a simulation method can also be a worktable approach to test the validity and reliability of this expectation measurement model.

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