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*Full Length Research Paper*

# Service failures identification: The involvement of the interrelation effect in service practices

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**The emergence of new information technologies (IT) changed the way organizations carried out their day-to-day operations. In view of the significant capital investments and expenditures with the IT service, organizations were concerned about what the impact of investment will be on the performance. Thus, drawing up a service failure recovery program with the consideration of cost-effectiveness was the primary concern in order to maintain a sustainable competition. In response, the purpose of this study was to develop a new decision-making model by integrating the Importance-Performance-Gap model and DEMATEL approach to understand the customers'/managers' perceptions and clarify the interrelationship on service practices to help identify the critical service failures. The study validated the model by using data collected from an online tax declaration service in Taiwan. The results indicated that considering interrelationship effects of service practices based on the managers' perceptions was beneficial for extracting more critical service failures. Some practical implications from the empirical case were also discussed.**

**Key words:** Service failures, Customer's/Manager's perception, interrelationship effect, DEMATEL, Importance-performance-gap analysis, IT/IS service.

## INTRODUCTION

Service quality is a critical driver of business performance. Most researchers indicated that service quality increases customer satisfaction and customer loyalty (Bruhn and Grund, 2000; Cassel and Eklof, 2001; Gronholdt et al., 2000; Martensen et al., 2000). Accordingly, in today's customer-oriented market, most decision-making approaches developed for drawing service quality improvement strategies extremely depend on customer's perception (Bei and Shang, 2006; Lin et al., 2009; Martilla and James, 1977; Reichheld, 1993). However, the emergence of new information technologies (IT) in the last few decades has changed the way organizations carry out their day-to-day operations (Kang and Bradley, 2002). This demonstrates that the improvement of the quality of services is one of the primary reasons that organizations are investing in Information Systems (IS) (Roses et al., 2009). While IT has greatly improved the way organizations interact with customers, the enormous capital investments and expenditures have raised serious managerial concerns (Jiang et al., 2002). In other words, it remains a question whether the organization needs to adjust all service practices which are regarded by customers as needing improvement in practical operation underline the target of cost effective.

According to Resource-Based View (RBV), firms gain sustainable competitive advantages by ensuring appropriate access to a bundle of idiosyncratic resources or capabilities having four characteristics, such as valuable, rare, inimitable, and non-substitutable (Barney, 1991; Eisenhardt and Martin, 2000; Wernerfelt, 1984). Furthermore, Mowery et al. (1998) indicated that such resources/capabilities often are based on tacit knowledge and are subject to considerable uncertainty concerning their quality and performance. In other words, the same strategies that enable a firm to extract a sustainable advantage from its resources may become difficult for the other firm to transfer or apply them in their market

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transactions. This such as Zhuang and Lederer (2006) stated that RBV may be used to explain why firms might use the same technologies with different results. Referring to the RBV, the research question here is that how the firm uses appropriate resources or capabilities for global adjustment? Or is the global adjustment bringing the sustainable advantage? Especially in a market environment with limited resources, it is difficult for firms to meet all the needs with the same level of completeness (Ba and Johansson, 2008; Panizzolo, 2008). Therefore, how the decision maker can find critical practices which have the greatest influences on improving customer satisfaction among many customer demands becomes a central issue of concern (Stan et al., 2007).

In other words, the decision maker's management experiences and judgment (manager's opinions) which regarded as the critical resource in a firm have to be included in the decision-making processes to gain the long-term advantage (Cacioppe et al., 2008; Santos and Garcı´a, 2006). Moreover, several studies recently indicated that IT/IS systems are highly professional and complicated (Jayachandran et al., 2005; Trainor et al., 2010), presenting that not all the subjects will be able to completely understand the interrelationship between variables of IT/IS system. In other words, when some variables do not meet the independent assumption, decision makers will not be able to correctly analyze the service failures and their impacts on customer satisfaction improvement, which results in the wrong conclusion. Fortunately, Battelle Geneva Institute developed the Decision-Making Trial and Evaluation Laboratory (DEMATEL) approach based on expert's/manager's perception to help look for critical practices, and this approach has been widely used in various fields (Huang et al., 2007; Seyed-Hosseini et al., 2006). Accordingly, the main purpose of this study is to develop a two-phase decision-making model by including manager's opinion to reach the customer's requirement to help the latter frame a comprehensive project on improving customer satisfaction effectively. In this model, the customer's perception is firstly presented by the IPGA model, which proposed by integrating Importance-Performance Analysis and Gap Theory, to understand primarily the customer's demands. Second, the manager's opinion is analyzed through the DEMATEL to assist him/her in further looking for critical practices among many customer demands. Moreover, in view of the critical role of IT in service success, a IT service case is chosen to confirm the suitability and practicality of this new proposed decision-making model.

## The impacts and measurement of IT/IS

Recently, there has been a shift in focus towards information technology (IT) or information system (IS) applications of service management due to its impact on productivity, innovation, quality of services, and so on. Based on the operational perspective, Byrd et al. (2006) combined primary and secondary measures to examine the influence of intangible IS and information technology IT benefits on financial measures. The results supported a process-oriented view of the benefits from IS and showed how the effects of high system quality and information quality along a path can lead to better organizational performance. Moreover, Trainor et al. (2010) indicated that marketing managers have turned to adopted IT to cope with the ongoing challenge while simultaneously meeting greater expectations to establish durable relationships with customers. In fact, the main trend of IT/IS application can be found from the situation that IT/IS executives are increasingly required to justify technology investment. However, in their study, Torkzadeh et al. (2005) indicated that organizations with significant investments in IT/IS concerned about how this impact can be measured and what the impact of their investment will be on the organization performance.

After an extensive review of more than 180 relevant articles, DeLone and McLean (1992) proposed six measures of information success: system quality, information quality, user satisfaction, use, individual impact, and organizational impact. Their study shows that both system quality and information quality are the antecedents of use and user satisfaction, which in turn influence the impact of the system on the individual user and the organization. In their study, Zhang et al. (2005) develops an ERP implementation success framework by adapting the Ives et al.'s (1980) IS research model and DeLone and McLean's IS success model to identify both critical success factors and success measures. In addition to system quality and information quality, a number of information science researchers contend that service quality is an important variable that affects IS success. Recently, Landrum and Prybutok (2004) tested how effectively system quality, information quality, and service quality measure success in the library system application. By collecting responses from 385 end users at two US Army Corps of Engineers libraries, they found that service quality has significant influence on measuring information supporting system success. Overall, system quality, information quality, and service quality have been proven to be main measures of IT/IS performance, and customer satisfaction has regarded as one of the most important indicators of IT/IS success, especially as the IT/IS applying in service market. Therefore, in the next section, the IPGA model which has been widely used in customer satisfaction issue is presented.

## IPGA model

Determining the critical service practices has been regarded as the basis while making decisions for improving customer satisfaction (CS) (Bei and Shang, 2006; Lin et al., 2009; Stan et al., 2007). Although there are numerous decision-making models proposed for critical practices identification, different implications may be

**Table 1.** Rules of calculating relative performance.

| Contingency | t-test | Relative Performance (RP) |
|---|---|---|
| $\overline{P}_j > \overline{I}_j$ | Significant | $\overline{P}_j / \overline{P}$ |
| $\overline{P}_j < \overline{I}_j$ | Significant | $-(\overline{P}_j / \overline{P})^{-1}$ |
| $\overline{P}_j > \overline{I}_j$ or $\overline{P}_j < \overline{I}_j$ | Non-significant | 0 |

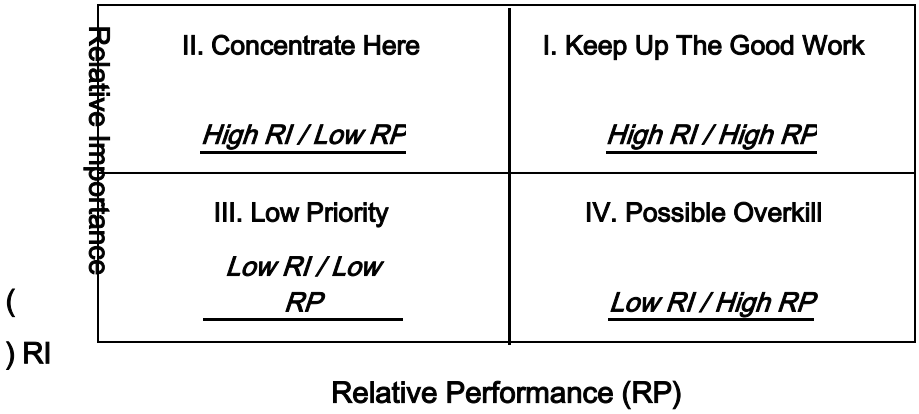


**Figure 1.** Importance-Performance-Gap Matrix (IPGM).

be produced due to their inherent considerations. This makes the following researches to revise the original model by integrating other theories based on their management issue (e.g., Lin et al., 2009; Matzler et al., 2004; Shee et al., 2003; Wu, 2008; Wu and Lee, 2007). Recently, Lin et al. (2009) proposed the IPGA model by integrating Gap Analysis (GA) with Importance-Performance Analysis (IPA) in their research, and this model has been confirmed in making more comprehensive CS decisions due to the combination of statistic testing technique and two-dimensional strategy matrix. Therefore, this study determines to use the IPGA model to understand the customer's demands. The following are the application processes of the IPGA model.

**Step 1:** Evaluating each practice's importance ( $I_{ij}$ ) and performance ( $P_{ij}$ ).

**Step 2:** Calculating each practice's relative importance (RI). Suppose $\overline{I}_j$ indicates the average importance of the jth practice, then $\overline{I}$ indicates the total average importance of p practices. The *RI* of the jth practice is obtained by dividing $\overline{I}_j$ by $\overline{I}$.

**Step 3:** Calculating each practice's relative performance (RP). Suppose $\overline{P}_j$ indicates the average performance of the jth practice, then $\overline{P}$ indicates the total average performance of p practices. The *RP* of the jth practice is obtained by the rules shown in Table 1.

**Step 4:** Depicting the Importance-Performance-Gap Matrix (IPGM).

IPGM is a two-dimensional matrix (Figure 1) in which each practice can be shown in one of four different quadrants according to the *RI* and *RP* values. The strategic implications indicated by each quadrant of the IPGM are described respectively as follows.

**Quadrant I:** It indicates that a positive gap existed in this practice, but in view of its higher importance, it should be labeled as "Keep up the Good Work."

**Quadrant II:** It indicates that a negative gap existed in this practice, and in view of its higher importance, it should be labeled as "Concentrate Here."

**Quadrant III:** It indicates that a negative gap existed in this practice, but in view of its lower importance, it should be labeled as "Low Priority."

Quadrant IV: It indicates that a positive gap existed in this practice, and in view of its lower importance, it should be labeled as "Possible Overkill."

**DEMATEL method**

After understanding customer demands, the decision maker cannot usually make a global investment on all service failures. Such as the RBV stated that, for the

decision maker, identifying critical practices that have the greatest influences on improving customer satisfaction is extremely important in order to obtain the long-term competitive advantage (Mowery et al., 1998; Stan et al., 2007). This means that an effective resource deployed strategy which may probably include some trade-off is more necessary for the organization than the global investment. Moreover, in practice, some service practices are influenced by one another directly or indirectly to some extent (Leung et al., 2003; Shee et al., 2003; Wu, 2008). Therefore, judging the priorities of service practices on improving overall customer satisfaction under the assumption of independent relationship will decrease the validity of the decision making. To response to these issues, the DEMATEL method, which can demonstrate the causality between practices in a system by applying the expert's/manager's perception (Chiu et al., 2006; Wu, 2008; Wu and Lee, 2007), is used to identify the critical practices from the pool of customer demands in this study. Its application procedure is introduced as follows:

**Step 1:** Building the initial average direct-relation matrix.
Suppose *n* is the number of experts consulted, and p is the number of practices that each expert considers. The integer score $x_{ij}^{k}$ refers to the degree that practice *i* affects practice *j* for the *k*th expert. The *p*×*p* average matrix *A* is realized by averaging all the experts' scores and can be represented mathematically by the following equation:

$$A = \left[ a_{ij} \right]_{p \cdot p} = \frac{1}{n} \sum_{k=1}^{n} x_{ij}^{k}_{p \cdot p} \quad (1)$$

**Step 2:** Calculating the normalized direct-relation matrix.
The normalized direct-relation matrix *Z* is obtained by normalizing the direct-relation matrix *A* and can be represented mathematically by the following equation:

$$Z = \lambda^{-1} A \text{, where } \lambda = \mathrm{MAX}(\mathrm{MAX}\sum_{1 \le i \le p} \sum_{j=1}^{p} a_{ij} \text{ , } \mathrm{MAX}\sum_{1 \le j \le p} \sum_{i=1}^{p} a_{ij}) \quad (2)$$

Since the sum of each row *i* of matrix *A* represents the direct effects that practice *i* gives to the other practices, and the sum of each column *j* of matrix *A* represents the *direct effects* that practice *i* receives from the other practices,therefore, $\mathrm{MAX}(\mathrm{MAX}_{1 \le i \le p} \sum_{j=1}^{p} a_{ij} , \mathrm{MAX}_{1 \le j \le p} \sum_{i=1}^{p} a_{ij})$ represents the direct effects of the practice with the most direct given and received effects on others.

**Step 3:** Deriving the total relation matrix.
The total relation effects include both the indirect effects and direct effects. Since there is a continuous decrease of the indirect effects of problems along the powers of matrix *Z*, the total relation matrix, *T*, is defined as a *p*×*p* matrix, and *I* is the *p*×*p* identity matrix. The mathematical equation can be represented as follows:

$$T = \lim_{k \to \infty} (Z + Z^{2} + \mathrm{L} + Z^{k}) = Z(I - Z)^{-1} \quad (3)$$

**Step 4:** Calculating the total effects and net effects to depict the Impact-Direct Map (IDM).
Define *r* and *c'* as *p*×*1* vectors as the sum of rows and the sum of columns, respectively, of the total relation matrix *T*. The mathematical equations can be represented as follows:

$$r = \left[ r_i \right]_{p \cdot 1} = \sum_{j=1}^{p} t_{ij}_{p \cdot 1} \quad (4)$$

$$c = \left[ c_j \right]_{1 \cdot p} = \sum_{i=1}^{p} t_{ij}_{1 \cdot p} \quad (5)$$

The sum $r_i$ shows the *total given effects*, both directly and indirectly, that practice *i* has on the other practices. The sum $c_j$ shows the *total received effects*, both directly and indirectly, that all the other practices have on practice *j*. Thus, the sum $(r_i + c_i)$ gives us an index representing the *total effects* both given and received by practice *i*. In addition, the difference $(r_i - c_i)$ shows the *net effects* or the net contribution by practice *i* on the system. When $(r_i + c_i)$ is graphed on the *x*-axis and $(r_i - c_i)$ is graphed on the *y*-axis, the IDM can then be produced.

**Step 5:** Set a threshold value to obtain the Impact-Relations Map (IRM).
To explain the structural relation among practices while keeping the complexity of the whole system to a manageable level, it is necessary to set a threshold value *m* to filter out the negligible effects in matrix *T*. Only the practices whose effect in matrix *T* is greater than the threshold value *m* will be shown in the IRM. Here, the threshold value *m* has been chosen according to the experts' experience.

**Development of service failure identification model**

In view of most previous decision-making model focusing on understanding customer's demands to draw up improvement strategies, we perceived that the involvement of manager's experiences and judgment is critical for extracting the most critical service practices in order to sustain the long-term advantage, especially for the IT/IS service with numerous investments. Referring to RBV, this study defines the *critical practices* as those having

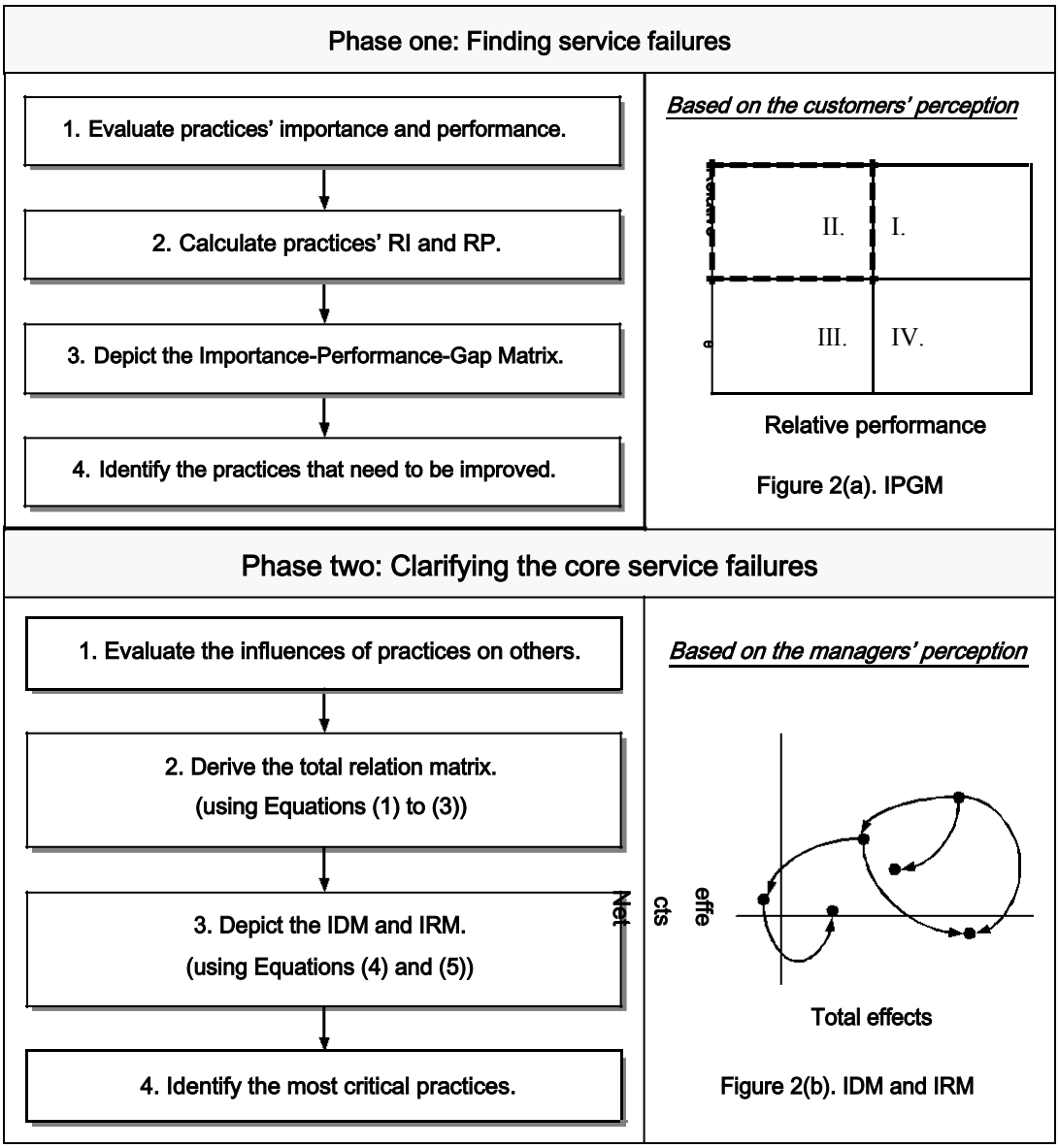


**Figure 2.** SFI Model

having the higher return (i.e., the improvement of overall customer satisfaction) on resource investment. To this end, this study integrates DEMATEL with IPGA to develop a novel decision-making model for service failure identification (SFI).

As shown in Figure 2, the SFI Model is a two-phase model which can help make more comprehensive CS decisions by considering customer's demands and manager's opinions. The main purpose of Phase one is to use the IPGA model to discover the service failures based on the customer's perceptions. Briefly, if the service practices are drawn in Quadrant two of the IPGM (Figure 2(a)), these practices are then taken as the service failures because of their higher perceived importance and the existence of negative service gaps.

After identifying service failures through customer's perception, managers have to further identify the critical ones from these practices based on their practical experiences and judgment to reach the cost effective target. The DEMATEL method is thus used in Phase two to this end. As shown in Figure 2(b), both the interrelations among service failures and the influences of each one on others can be easily recognized by depicting the IDM and IRM, which are valuable for making cost-oriented CS improvement decisions. Two implications may be produced from the SFI model are as follows: (1)

A service practice may be considered as a cause of a

service failure system while it has a positive and higher *net effect*. This implies that this practice may become a priority when managers want to improve customer satisfaction effectively.

(2) A service practice with higher *total effect* demonstrates that it plays a critical role in monitoring the operational performance of the service failure system. Therefore, managers can take the improvement of this service practice as the criterion of judging whether the resources invested in service failures recovery have gains.

### Empirical case

The Taiwanese Online Tax Declaration System provides services to taxpayers by means of the Electronic Tax Declaration and Payment Service Web site. It is an electronic system which validates the ID through the person's certificate, financial certificate, ID number, and household number, then transmits and declares the information through the Internet. Since the Online Tax Declaration System is the first e-government policy promoted by the Taiwanese government, the government has been working hard to improve the system's service quality since its trial operation in 1998. Therefore, the Online Tax Declaration service in Taiwan was selected as the case to demonstrate the application of the proposed SFI Model. The results will then be provided as reference for the tax authority to improve the service quality of the online tax declaration system in the future.

## METHODOLOGY

Based on previous studies (Chang et al., 2005; DeLone and McLean, 2003; Jiang et al., 2002), this study evaluated the service quality of the online tax declaration service by three dimensions with totally 29 items (Table 2). The first is *System Service Quality (SSQ)* that focuses on evaluating the processing capability of the online tax declaration system, such as ease of use, responsibility, access capability, and so on. Next is the *Information Service Quality (ISQ)* that focused on evaluating the output quality of the online tax declaration system, such as information timeliness, accuracy, availability, and so on. Meanwhile, the *General Service Quality (GSQ)* is used to evaluate the received service level during the interactive processes, such as reliability, assurance, empathy, and so on. All these service practices were used to understand both user's perception and expectation with a five-point Likert scale.

A pre-test was employed by 30 experts from accounting firms and marketing faculty to validate the usage of the hybrid scale, and the results suggested that there were no items to be deleted and that the Cronbach's $\alpha$ of each dimension was higher than 0.9, indicating accepted internal consistency. For the data collection, this study first conducted face-to-face interviews in Hsin-Chu (Taiwan) National Tax Administration Office and 246 questionnaires were completed. To increase the sample size, the online questionnaires were sent out and 110 additional questionnaires were returned. After deleting invalid questionnaires, there were a total of 268 usable questionnaires returned. The Cronbach's $\alpha$ were between 0.9160 and 0.9302 for all service quality dimensions, indicating high internal consistency and good reliability. Then the IPGA model can be used to determine the service failures from the user's perception. Next, the DEMATEL questionnaire was then designed based on the findings obtaining from IPGA results. Three tax authority directors and three directors of faculties who have a background in financial management in universities were chosen as the experts to identify the casualty between service failures.

## RESULTS AND DISCUSSION

According to the two-phase model proposed in this study, the IPGA and DEMATEL were employed in turn to help make a cost-oriented decision on service failures recovery. The results of each phase are stated as follows:

### IPGA results: Finding service failures based on user's perception

According to the descriptive statistic results shown in Table 2, the service quality of the online tax declaration service was common with the level of perceived performance ranging between 3.70 and 3.96 on a five-point scale (1 = extremely low performance). However, this study believed that the service quality of the online tax declaration service has to be improved due to the higher level of perceived importance, ranging between 4.30 and 4.52 on a five-point scale (1 = extremely low importance), than perceived performance.

This study used paired t-test to understand the existence of a service gap for each practice. According to Table 2, there are significant differences between the user's perception and the expectation (negative gaps) for all practices, suggesting that the provided service of the Taiwanese online declaration system cannot satisfy users. Therefore, the IPGA model is adopted to further explore the service failures from the users' perception.

According to the procedure stated in the IPGA model, this study transformed the performance and importance values into *RP* and *RI*, respectively (Table 2). Next, the IPGM can be depicted by taking *RP* as the *x*-axis and *RI* as the *y*-axis. As shown in Figure 3, ten service practices (situated at the upper left area) having higher relative importance are the top priorities in service failures recovery. In which, two practices relevant to SSQ are such as "the functions provided are completed" and "the system can save a lot of time"; five practices, namely, "the information provided is correct," "the information provided can meet users' needs," "the trial balance and return receipt provided are complete," "the information delivery process is safe," and "personnel information is kept confidential," are relevant to ISQ; meanwhile, three practices, namely, "the usage time is free," "the system can provide the best calculation reference," and "the system always provides timely service," are relevant to GSQ. As a summary, according to user's perception, the functional integrity of the online tax declaration system needs to be strengthened to save the tax declaration time as much as possible and to improve efficiency for the

**Table 2.** Results of descriptive statistics, t-test, and transformed values.

| Dimensions and Items | | Performance | Important | t-test | RI | RP |
|---|---|---|---|---|---|---|
| System Service Quality | | 3.9590 | 4.4015 | | | |
| SSQ1 | Program for using online tax declaration system is easy to get | 4.0513 | 4.3663 | -5.699* | 0.99 | -0.95 |
| SSQ2 | Download speed is fast | 4.0037 | 4.2637 | -4.172* | 0.97 | -0.96 |
| SSQ3 | Processes of program installation, setup, and operation are easy | 3.9670 | 4.4139 | -7.311* | 1.00 | -0.97 |
| SSQ4 | Tax declaration online system is easy to understand | 3.8828 | 4.4103 | -8.243* | 1.00 | -0.99 |
| SSQ5 | The pictures provided by the system are clear and easy to understand | 3.8974 | 4.4322 | -8.443* | 1.01 | -0.99 |
| SSQ6 | The system provides complete functions | 3.8974 | 4.4798 | -8.602* | 1.02 | -0.99 |
| SSQ7 | The system can save lots of time versus alternative tax filing systems | 4.2930 | 4.5458 | -4.275* | 1.03 | -0.90 |
| SSQ8 | Download of income data is fast | 3.9670 | 4.3919 | -6.527* | 1.00 | -0.97 |
| SSQ9 | Instant windows offer clear assistance and warnings | 3.6996 | 4.3516 | -10.060* | 0.99 | -1.04 |
| SSQ10 | Upload speed is fast | 3.9304 | 4.3590 | -7.044* | 0.99 | -0.98 |
| Information Service Quality | | 3.8685 | 4.5189 | | | |
| ISQ1 | The system provides correct information regarding income data | 3.8059 | 4.4872 | -11.712* | 1.06 | -1.01 |
| ISQ2 | The information provided by the system meets user's needs | 3.8022 | 4.4286 | -11.067* | 1.08 | -1.01 |
| ISQ3 | The information provided by the system is helpful for completing a Tax declaration | 3.8498 | 4.4396 | -9.708* | 1.02 | -1.01 |
| ISQ4 | The information provided by the system is clear and easy to understand | 3.8132 | 4.4139 | -10.009* | 1.01 | -1.01 |
| ISQ5 | The downloaded information is relevant | 3.9194 | 4.3846 | -8.150* | 1.01 | -1.00 |
| ISQ6 | The system acknowledges the submission of the tax declaration | 3.9744 | 4.4835 | -9.307* | 1.00 | -1.01 |
| ISQ7 | The results are accurate | 4.0256 | 4.6154 | -10.736* | 1.00 | -0.98 |
| ISQ8 | The delivery of information is safe | 3.8132 | 4.6777 | -13.930* | 1.02 | -0.97 |
| ISQ9 | Secrecy of personal information is maintained | 3.8132 | 4.7399 | -14.377* | 1.05 | -0.96 |
| General Service Quality | | 3.7077 | 4.3040 | | | |
| GSQ1 | The system provides a detailed guide to help solve problems | 3.6044 | 4.3553 | -12.863* | 0.99 | -1.07 |
| GSQ2 | Open hour are very convenient | 4.0586 | 4.4725 | -7.277* | 1.02 | -0.95 |
| GSQ3 | The system provides calculation references in the best interests of the tax filer | 3.9927 | 4.5311 | -8.803* | 1.03 | -0.96 |
| GSQ4 | The system can be customized | 3.6337 | 4.2015 | -9.330* | 0.95 | -1.06 |
| GSQ5 | Government provides lots of advertisement to introduce this system | 3.7875 | 4.1538 | -5.534* | 0.94 | -1.02 |
| GSQ6 | The system informs about the declaration date and provides free consulting lines | 3.6227 | 4.1941 | -9.007* | 0.95 | -1.06 |
| GSQ7 | It is easy to make contact using the customer service line | 3.5018 | 4.1575 | -10.025* | 0.94 | -1.10 |
| GSQ8 | People in customer service have the knowledge and capability to solve people's problems immediately | 3.5421 | 4.3040 | -12.077* | 0.98 | -1.09 |
| GSQ9 | People in customer service can provide specific service to meet customer needs | 3.5385 | 4.1905 | -10.028* | 0.95 | -1.09 |
| GSQ10 | The system always provides service during promised times | 3.7949 | 4.4799 | -10.387* | 1.02 | -1.01 |
| Total mean | | 4.4043 | 3.8442 | | | |

* means $p < 0.05$.

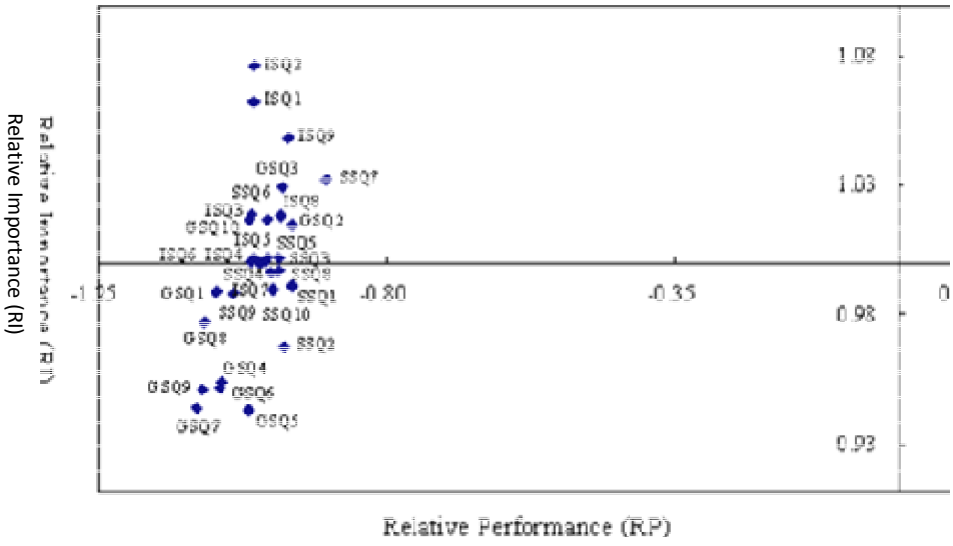


**Figure 3.** IPGM of the online tax declaration system

aspect of system service. As for information service, providing the users with correct, necessary, and adequate information, strengthening information safety and users' privacy, providing adequate and valid data, and preventing information leakage are the feasible ways. Meanwhile, the key to improve the general service quality is to ensure convenience in terms of service time, best formula, and service stability, to provide users with convenient and efficient services, and to avoid users' wastage of time due to service interruptions.

According to these results presented, the users considered that there were ten practices should be improved immediately. In order to determine the critical practices having the higher return on investment among these ten practices, the DEMATEL method was then adopted based on the manager's opinion.

## DEMATEL results: Extracting the most critical practices

Ten service failures obtained in Phase one became the bases for designing the DEMATEL questionnaire. Six experts chosen for this study were asked to fill out the questionnaire according to their working experiences by indicating the degree of influence they believe each service practice has on others. This was done for all ten practices. The degree of influence was assessed by scores ranging from 0 to 4, which represent "No influence" to "Very high influence." After averaging these six experts' scores, the initial average direct-relation matrix was obtained.

According to Equation (3), this study transformed the initial average direct-relation matrix into a total direct-relation matrix, *T* in order to present the interrelations among ten service failures within the online tax declaration system and to map out the IRM. To simplify the IRM, only the practices whose effect in matrix *T* is greater than the threshold value of 0.35 are shown in an IRM (Figure 4).

To determine the critical practices that have the higher return on investment, this study adopted Equation (4) and Equation (5) to obtain the sum of both given and received influences for each service failure and to produce their net effect and total effect (Table 3). Finally, $(r_i - c_i)$ is graphed on the *y*-axis, and $(r_i + c_i)$ is graphed on the *x*-axis. The IDM can be produced as shown in Figure 4.

According to the results presented in Table 3, ISQ1 has the highest positive *net effects*, followed by ISQ2, ISQ8, GSQ3, GSQ10, and ISQ3, respectively. This demonstrates that these six practices are the main cause factors which have the highest return on investment of the online tax declaration system. For example, the improvement on ISQ1 may affect the operational performance of SSQ6, SSQ7, and GSQ2, therefore when the authority regards "maximizing the benefits of improvement" as the main target, taking this practice as the top priority for improvement may be feasible. Therefore, the provision of valid data (correct, necessary, and adequate) in this online tax declaration system is the priority in strengthening the system. Second, information safety is also a key concern of the public when using the online tax declaration system. Increasing the public's use of the system shall start from information safety. Moreover, if the users understand that the system can provide the most beneficial formula, the users may be willing to use this system in the long-term and their satisfaction in using it can be enhanced. Finally, heavy traffic in the online tax declaration system will cause collapse of this online system and delay of completing the necessary processes of tax declaration. Therefore, strengthening the stability of the service system is also a necessary effort for the

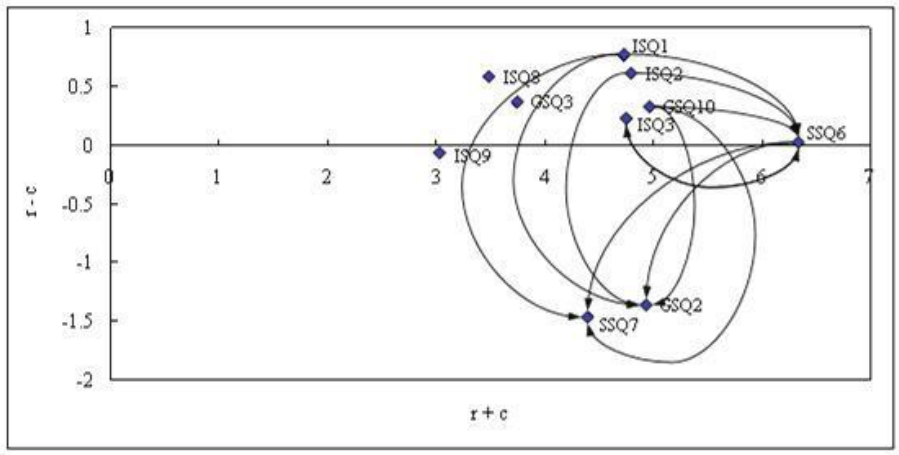


**Figure 4.** The IDM and IRM of ten service practices.

**Table 3.** Total effects and net effects of the 10 practices.

| Service practice | | Total effect $(r_i + c_i)$ | Rank | Net effect $(r_i - c_i)$ | Rank |
|---|---|---|---|---|---|
| SSQ6 | The system provides complete functions | 6.336 | 1 | 0.023 | 7 |
| SSQ7 | The system can save lots of time versus alternative tax filing systems | 4.412 | 7 | -1.452 | 10 |
| ISQ1 | The system provides correct information regarding income data | 4.717 | 6 | 0.751 | 1 |
| ISQ2 | The information provided by the system meets user's needs | 4.796 | 4 | 0.612 | 2 |
| ISQ3 | The information provided by the system is helpful for completing a tax declaration | 4.747 | 5 | 0.221 | 6 |
| ISQ8 | The delivery of information is safe | 3.487 | 9 | 0.584 | 3 |
| ISQ9 | Secrecy of personal information is maintained | 3.029 | 10 | -0.060 | 8 |
| GSQ2 | Open hour are very convenient | 4.933 | 3 | -1.365 | 9 |
| GSQ3 | The system provides calculation references in the best interests of the tax filer | 3.746 | 8 | 0.366 | 4 |
| GSQ10 | The system always provides service during promised times | 4.960 | 2 | 0.320 | 5 |

online tax declaration system.

With regard to the *total effects*, SSQ6 is top priority, followed by GSQ10, GSQ2, ISQ2, and ISQ3, suggesting that these practices play an important role in monitoring the improvement of the overall service failure system. Actually, continuous improvement is a very important task for sustaining a long-term competition, thus identifying the criteria for monitoring the effectiveness of resource investment is necessary. The results necessary. The results show that the authority can understand the operations of service failure recovery plan by examining whether the functional integrity and the stability of the online system are improved, the service delivery has been timeliness,

or the data provided are now correct, necessary, and adequate.

## Conclusion

Service failure recovery is the primary concern in maintaining a sustainable competition for organizations. Given a firm's limited resources, however, how could the decision maker properly draw up the resource deployed strategy has become the most important issue, especially for the IT/IS service needing numerous investments. The purpose of this study is therefore to propose a novel decision-making model to identify the critical service failures based on RBV. This novel decision-making model includes two major concepts; Firstly, the customer's perception of service practices are analyzed by using the IPGA model, this can help identify the service failures for the organizations; Secondly, considering that the potential causality between service failures may influence the effectiveness of CS strategies, DEMATEL approach is then used on understanding manager's opinions in order to judge the service practice with the higher effect on CS improvement.

Briefly, the two-phase model proposed in this study has some theoretical contributions: (1) Integration of multiple perceptions: For customer-oriented market, all service practices are designed and provided to meet customers' needs. This means that understanding customer's perception of the service quality is extremely important. However, the practical managers are directly responsible for determining which practices need extreme improvement. As indicated by Cacioppe et al. (2008), managers have clear views about the companies and this affects their attitudes which in turn have an impact on their intended behavior towards resources allocation. Therefore, considering both customer's perceptions and manager's opinions may be helpful for drawing up a more effective CS strategy to sustain a long-term competition.

(2) Clarification of the possible causality between practices: Previously, several studies judged the service failures based on the assumption of mutually independent relationship between practices which may influence the effectiveness of CS strategy. To response to this issue, this study adopts the DEMATEL approach to identify the causality between practices to priory the service failures for the better use of limited resources.

To valid this new proposed model to practical management, an empirical case of Taiwanese online tax declaration service was performed, and some practical implications are found. For example, the results of Phase one show that there are ten service failures existed in the case of Taiwanese online tax declaration service. Previously, these service failures were regarded as the necessity for CS improvement, thus the immediate resource investment may become the best choice. However, by adopting the DEMATEL approach, this study finds that only six practices are the main cause factors which have the highest impacts on CS improvement of the online tax declaration system, on the contrary, the other practices (that is, ISQ8, ISQ9, and GSQ3) cannot result in the expected benefits. This demonstrates that considering multiple assessments and potential causality between practices are necessary for making more effective decisions. In this study, we focus on adopting the practical experts' opinions to extract the critical service failures due to the consideration of cost-effectiveness. Further researches can apply this model in other subjects based on the specific requirement. For example, several studies pointed that understanding the perceptions of front-line employees who directly contact with customers may be beneficial for providing customer-oriented strategy (Bitner et al., 1994; Chen and Chang, 2005; Luk and Layton, 2002). Finally, using a single case to verify the validity of the novel model may be failed to broaden the scope to other IT/IS service industries. Consequently, more empirical studies may be needed.

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