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# INTEGRATING PERFORMANCE INDEX AND ADJUSTED IMPORTANCE IN AN IMPORTANCE-PERFORMANCE ANALYSIS: A STUDY OF TOURIST HOTELS

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**Abstract**

*This paper aims to propose a new revised importance-performance analysis (IPA) grid that integrates the service performance index and adjusted importance to address the weaknesses of traditional IPA. Because the service performance index takes into account the tolerable lower limit, mean, and standard deviation of service performance simultaneously, it may be more appropriate than self-stated performance. The adjusted importance not only overcomes the two incorrect assumptions in traditional IPA but also solves the problem that the attribute importance fails to consider the satisfaction gap. A case study of tourist hotels was presented to demonstrate the application of the new revised IPA. This study adopted a self-reported questionnaire with good reliability and validity and used a convenience sampling method to collect data. A total of 496 valid questionnaires were obtained from hotel guests. The results show that the rankings of self-stated performance and service performance index have no significant difference. However, the rankings of self-stated importance and adjusted importance have significant differences. It may mean that the traditional IPA is sensitive to the important measure used and it could be misleading with fatal consequences for a firm's customer satisfaction. This paper offers new insights into the measurement of importance and performance in IPA solves the weaknesses of the IPA grid and provides a simple and useful management tool for industries. It can remedy the research gap in IPA.*

*Keywords: Service quality, service performance, derived importance, importance performance analysis, partial correlation analysis, satisfaction gap*

## INTRODUCTION

Customer satisfaction is a leading indicator of purchasing behavior. The higher the satisfaction is, the better the loyalty, business performance, and profits (Golder, Mitra, & Moorman, 2012; Kumar, Dalla Pozza, & Ganesh, 2013). Clarifying antecedent factors that affect customer satisfaction helps managers design and deliver appropriate products/services to customers and meet market requirements (Wu & Liang, 2009; El-Adly, 2019). Many studies have confirmed that service quality is one of the critical factors that increase customer satisfaction (e.g., Chen & Chen, 2010; Kim, Ng, & Kim, 2009; Nunkoo, Teeroovengadum, Ringle, & Sunnassee, 2019; Ryu. Lee, & Kim, 2012). Service quality has become a critical success factor in business management (Heung & Lam, 2003). How to assess and manage service quality and performance is a valuable issue for an enterprise.

Importance-performance analysis (IPA) grid first introduced by Martilla and James (1977) is a well-known and effective tool to evaluate the service performance or market segmentation, which can confirm the improvement order of key attributes in academic and industries (Huan, Beaman, & Shelby, 2002; Koh, Jung-Eun Yoo, & Boger Jr, 2010; Pan, 2015; Ying, Wen, & Wang, 2018). Some scholars later reported the weaknesses of the IPA method and put forward suggestions for improvement (e.g., Jou & Day, 2021; Kim, Lee, & Han, 2019; Matzler, Bailom, Hinterhuber, Renzl, & Pichler, 2004; Rašovská, Kubickova, & Ryglová, 2021; Ting & Chen, 2002). Oh (2001) mentioned the causal relationship between attribute importance and performance should be addressed. Kano, Seraku, Takahashi, and Tsuji (1984) and Matzler and Sauerwein (2002) claimed that different service attributes (e.g., basic, performance, or excitement factors) have a different influence on overall satisfaction. Hence, there are two wrong assumptions in traditional IPA (Matzler et al., 2004): (1) attribute importance and performance are mutually independent variables; (2) the relationship between attribute performance and overall satisfaction is linear and symmetric.

Related studies have proved that attribute importance and performance are correlated (Deng, 2007; Matzler et al., 2004; Oh, 2001) and the relationship between attribute performance and overall satisfaction is not symmetric (Deng, 2007; Matzler & Sauerwein, 2002; Matzler, Sauerwein, & Heischmidt, 2003; Matzler et al., 2004; Slevitch & Oh, 2010; Ting & Chen, 2002; Chen & Chen, 2014). Matzler et al. (2003) made use of the partial correlation analysis between attribute performance and overall satisfaction to derive the attribute importance, proposing a revised IPA grid. Deng (2007) developed a revised IPA grid by adopting the partial correlation coefficient and taking the three-factor theory into consideration. These researches mainly focused on deriving the attribute importance and solving linear and symmetric relationships between attribute performance and overall satisfaction to correct the two wrong assumptions in IPA. Deng and Li (2019) compared three statistical methods (i.e. multiple regression, partial correlation, and simple regression) in IPA to judge the appropriateness of these derived importance. They claimed that simple regression is the best to infer attribute importance.

The aforementioned correction methods of IPA pay little attention to the problem that the measurement scales of attribute importance and performance may be different. For example, the meaning of an average of 3.5 points for a 5-point or 7-point Likert scale is different (Hung, Huang, & Chen, 2003). The measurement units of self-stated attribute importance (e.g., 1-7 in a 7-point Likert scale) in traditional IPA are also different from those of derived attribute importance (e.g., 0-1 in partial correlation analysis) in a revised IPA. This may lead to errors or difficulties in interpreting, judging, and comparing service attributes located in an IPA grid. In addition, the evaluation of the importance of traditional IPA typically failed to consider the customer dissatisfaction degree (i.e., satisfaction gap) of the service attributes. The current study thinks that pursuing the goal of complete customer satisfaction is endless and how to shrink the satisfaction gap is a critical issue for enterprises. Thus, the attribute importance of the IPA should take the satisfaction gap into account according to the difference between attribute performance and full satisfaction (referring to Figure 1). Unfortunately, this concept has not been used in previous IPA studies.

To overcome the inconsistencies among different measurement scales or units in the IPA grid, the current study proposes a service performance index (*SPI*) according to the process capability index (PCI) introduced by Kane (1986). The *SPI* can transform the attribute performance (*P*) into an *SPI* value. At the same time, it can replace *P* value in IPA. Based on Deng (2007), the current study transforms the *SPI* values of all attributes into natural logarithm *SPI* values and conducts a partial correlation analysis in which the natural logarithm *SPI* values are used as independent variables, and overall satisfaction is used as a dependent variable in order to calculate derived importance (*DI*) of all attributes. After that, the *DI* was used to multiply the standardized satisfaction gap to obtain an adjusted importance (*AI*) index. The *AI* then was used to replace the importance (*I*) in IPA. Finally, a new revised IPA (RIPA) grid can be constructed. This method not only consists of the concept of three-factor theory, a partial correlation analysis, and a natural logarithm transformation to overcome the two incorrect assumptions in traditional IPA, but also improves the standardization and inconsistencies among different measurement scales and units, and solves the problem whereby the attribute importance failed to take the satisfaction gap into consideration.

The rest of the paper is organized as follows. Section 2 reviews pertinent literature particularly those about IPA theories and performance evaluation indices. Section 3 introduces research methodology including the construction of a new RIPA, instrument development, and questionnaire investigation. Section 4 provides an illustrative example of tourist hotels to demonstrate the implementation of the new RIPA. Conclusions are finally drawn in Section 5.

## RELATED THEORIES OF IPA

### Development and Application of IPA

Matzler et al. (2004) indicated that the IPA can assist managers in confirming those service attributes that are conducive to the achievement of high degrees of customer satisfaction. During the construction of IPA, data from customer satisfaction surveys or service quality surveys are typically conducted to acquire the attribute performance and importance, which represent the X-axis and Y-axis, respectively. The SERVPERF model is more time-saving and efficient than the SERVQUAL model in terms of the conduction of service quality questionnaires (Cronin & Taylor, 1992; Parasuraman, Zeithaml, & Berry, 1994). Some studies applied the SERVPERF to conduct IPA and derived the importance based on the causal relationship between attribute performance and overall satisfaction (Deng, 2007; Matzler et al., 2003). Hollenhorst, Olson, and Forteny (1992) argued that using total averages of the attribute performance and importance as the cutting points of the X-axis and Y-axis, respectively, is better than using the median cutting points in an IPA. The cutting points of the X-axis and Y-axis divide the IPA into four quadrants for management strategy shown in Figure 1. Managers can identify the major or minor strengths and weaknesses of the service attributes based on the location of service attributes in the quadrants.

Attributes located in Quadrant I indicate high importance and high performance. They are the major strengths and opportunities for the enterprise to acquire or maintain competitive advantages. The management strategy for this quadrant is ‘Keep up the good work.’ Attributes located in Quadrant II indicate high importance and low performance, indicating the major weaknesses of the enterprise. The attributes in this quadrant should be improved immediately and the enterprise should focus on this area. The management strategy for this quadrant is ‘Concentrate here.’ Attributes located in Quadrant III indicate low importance and low performance, indicating the minor weaknesses of the enterprise. There is no need for the enterprise to invest any more effort or resources in the attributes of this quadrant, known as ‘Low priority.’ Attributes located in Quadrant IV indicate low importance and high performance, indicating the minor strengths of the enterprise. The enterprise has probably invested excessive resources in the attributes in this quadrant and should reconsider the allocation of resources, titled ‘Possible overkill’ (Chu & Choi, 2000; Deng, 2007).

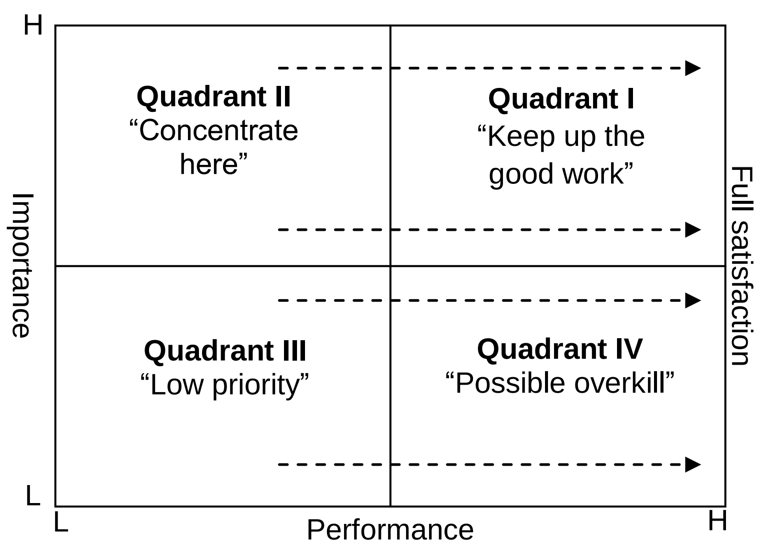


Figure 1. IPA grid

 

The management strategies produced by this grid can assist industry practitioners in understanding the strengths and weaknesses of their products or services. It can confirm which service attributes should be allocated additional resources and those that should be reduced. It can also identify which service attributes should be concentrated on to maintain or promote competitive advantages, thereby forming strategic guidance for the enterprise. IPA has been widely applied in the recreation, hotel, air transportation, and tourism industries (e.g. Chen, Murphy, & Knecht, 2016; Deng, 2007; Koh et al., 2010; Lin & Vlachos, 2018; Pan, 2015; Wang, Li, Zhen, & Zhang, 2016; Zhang & Chow, 2004; Ziegler, Dearden, & Rollins, 2012).

Some studies revised or expanded the IPA. Easingwood and Arnott (1991) adopted the dimension 'current effect on performance' rather than importance and used the dimension 'scope of improvement' rather than performance. Slack (1994) presented a modified IPA model to consider the relationship between importance and performance. Matzler et al. (2003) used the importance derived from partial correlation analysis to address the causal relationship between attribute performance and importance. Matzler et al. (2004) employed a regression analysis with dummy variables to confirm the asymmetric relationship between attribute performance and overall satisfaction. Deng (2007) integrated the three-factor theory, partial correlation coefficient, and natural logarithm transformation to overcome the two incorrect assumptions in IPA. Although the aforementioned studies revised IPA, its basic framework roughly remains consistent.

**Measurement of the Importance of IPA**

There are two major measurement types of the importance in IPA: one measures the importance of service attributes through a self-stated questionnaire and the other is implicitly derived importance. There are several shortcomings in the first type, shown as follows: (1) each attribute consists of both importance and performance items and too many items may easily result in the interviewee's impatient; (2) the self-stated importance (*SI*) of service attributes is an absolute value and does not embody the influence degree of individual self-stated performance (*SP*) on overall satisfaction (Oh, 2001; Matzler et al., 2004); (3) the relative importance of quality attributes probably has better predictive validity than absolute importance (Neslin, 1981); (4) based on the three-factor theory, Matzler et al. (2003) claimed that *SI* cannot reflect the relationship between *SP* and overall satisfaction. Due to the shortcomings of *SI*, some research highlighted the *DI*, such as multiple regression coefficients (Matzler & Sauerwein, 2002; Matzler et al., 2004) and partial correlation coefficients (Matzler et al., 2003; Deng, 2007) derived from the multiple regression models. *DI* is a relative importance that omits the items of importance in the self-stated questionnaire. It effectively overcomes the shortcomings of the first type. Hair, Black, Babin, Anderson, and Tatham (2006) stated that partial correlation analysis is more suitable for evaluating the influence of independent variables on dependent variables because it can overcome the problem of collinearity among independent variables in multiple regression analysis.

Some studies adopted partial correlation coefficients to estimate the influence of *SP* on overall satisfaction. Deng (2007) proposed a revised IPA that integrates the concepts of three-factor theory, partial correlation coefficient, and natural logarithmic transformation to evaluate the service performance of hot spring hotels. This approach transformed *SP* into natural logarithms and adopted the natural logarithms as independent variables and overall satisfaction as a dependent variable, establishing a multiple regression model. A partial correlation analysis then was conducted. This transformation will make the variables in the correlation model much more sensitive and conducive to improving the asymmetric influence of service attributes on overall satisfaction (Anderson & Sullivan, 1993; Ting & Chen, 2002). Because partial correlation coefficients are derived from the transformed attribute performance (i.e., natural logarithms) and overall satisfaction, they consist of the features of the attribute categories from the three-factor theory so as to improve the potential problems of linearity and symmetry in the original IPA.

To improve the discrimination of the importance of service attributes, Lyman (1990) proposed an indicator that multiplies the importance and the difference between the importance and satisfaction (i.e., performance gap). He reported that this method effectively determines the importance of service attributes. The current study quoted this concept and revised it accordingly to propose a standardized satisfaction gap. Meanwhile, this paper integrates the concepts of standardized satisfaction gap and *DI* derived from partial correlation analysis to propose an *AI* of service attribute as the y-axis in a new RIPA. The development of *AI* is presented "Research Methodology" section.

**Measurement of the Performance in New RIPA**

The process capability index (PCI) introduced by Kane (1986) is a simple, effective, and unitless tool that has been widely applied to assess whether the process performance meets the requirements set by the customers or designers in advance. Previous PCI studies were mainly applied in the manufacturing industry, such as Chan, Chang, and Spiring. (1988), Chen, Huang and Li (2001), and Jeang (2010). PCIs have been rarely applied in the service industry. The current study refers to the PCIs, proposing a service performance index (*SPI*) to evaluate the attribute performance. Quality characteristics can be classified into target-the-best, larger-the-better, and smaller-the-better types. Regarding the target-the-best type, the more the quality characteristic value to the target within the specification limits, the more it can meet the product design or customer requirements. Regarding the larger-the-better type, the larger the quality characteristic value, the better the process capability. The lower specification limit (*LSL*) should be specified. When the quality characteristic value is lower than the *LSL*, meaning the products are not qualified. Regarding the smaller-the-better type, the smaller the quality characteristic value, the better the process capability. Usually, the upper specification limit (*USL*) is specified. When the quality characteristic value is higher than the *USL*, the products are not qualified.

The larger-the-better capability index proposed by Kane (1986) (i.e., $C_{pl} = (\mu - LSL)/3\sigma$) was referenced and revised as a service performance index (*SPI*) to assess attribute performance. This formula indicates that $C_{pl}$ is a function of the performance parameters (i.e., mean $\mu$ and standard deviation $\sigma$) and the *LSL*. This paper used *SPI* to standardize the service performance to solve the inconsistencies of the service performance units. Before conducting a performance analysis, this paper assumes that the service performance is stable and normally distributed. The *SPI* value was used to replace the attribute performance as the *X*-axis of the new RIPA. The definition and derivation of the best estimator of *SPI* are presented in "Research Methodology" section.

## RESEARCH METHODOLOGY

### Construction of New RIPA

**Development of the Performance in New RIPA Grid.** This paper takes tourist hotels as an example to assess service performance. Assuming that there are *s* service attributes and a total of *n* respondents of the tourist hotels, in which $X_1$, $X_2$,…, $X_s$, respectively, represent the satisfaction (or performance) of *s* service attributes, $X_T$ refers to the overall satisfaction of the respondents toward the tourist hotels. Random variable $X_i$ ($i$ = 1, 2…, $s$, $T$) typically conforms to a normal distribution with mean $\mu_i$ and standard deviation $\sigma_i$, i.e., $X_i \sim N(\mu_i, \sigma_i)$. Because attribute performance is larger-the-better type, *SPI* of *i*th attribute is defined as follows:

$$SPI = C_{pli} = \frac{\mu_i - L_i}{\sigma_i}, \quad i = 1, 2, \ldots, s, T, \qquad \text{….(1)}$$

where $L_i$ denotes the tolerable lower limit of service performance for *i*th attribute. The larger the mean $\mu_i$ or the smaller the standard deviation $\sigma_i$, the larger the $C_{pli}$ is. As $C_{pli} < 0$, the average performance of *i*th service attribute is lower than $L_i$ (i.e., $\mu_i < L_i$). It represents poor service performance. As $C_{pli} = 0$, the average performance of *i*th service attribute is equal to $L_i$ (i.e., $\mu_i = L_i$). As $C_{pli} > 0$, the average performance of *i*th service attribute is larger than $L_i$ (i.e., $\mu_i > L_i$). It represents that the service performance exceeds the requirement. As a result, the larger the $C_{pli}$, the better the attribute performance is.

Based on the aforementioned inferences, the conforming rate of service performance of *i*th attribute is defined as $p_i = P(X_i > L_i)$. The relationship between conforming rate ($p_i$) and *SPI* ($C_{pli}$) under normal distribution can be derived as:

$$p_i = P(X_i > L_i) = P\left(\frac{X_i - \mu_i}{\sigma_i} > \frac{L_i - \mu_i}{\sigma_i}\right)$$

$$= P\left(Z_i > -\frac{\mu_i - L_i}{\sigma_i}\right) = P\left(Z_i < \frac{\mu_i - L_i}{\sigma_i}\right) = \Phi(C_{pli}), \qquad \text{….(2)}$$

where Φ denotes the standard normal cumulative distribution function, $i$ = 1, 2,…, $s$, $T$. Equation (2) shows a one-to-one functional relationship between conforming rate ($p_i$) and *SPI* ($C_{pli}$). The larger the *SPI* value, the higher the conforming rate ($p_i$) is. For instance, as $C_{pli}$ = 2.0, $p_i$ is approximately 97.725%. The *SPI*s can adequately respond to the conforming rates of service attributes. Hence, the *SPI* can be used as a simple and effective tool to assess the performance of *i*th attribute.

Because the real values of *SPI* ($C_{pli}$) of *i*th attribute are generally unknown, this paper must estimate $\mu_i$ and $\sigma_i$ based on the sample data. Assume that $X_{ij}$ represents *j*th service performance of *i*th attribute, then $X_{i1}, X_{i2}, \ldots, X_{in}$ ($i$ =1,2,…$s$) are $n$ sets of random variables collected from a normal distribution with $\mu_i$ and $\sigma_i$. Hence, an unbiased estimator of *SPI* ($C_{pli}$) denoted by $\hat{C}_{pli}$ can be derived as follows:

$$\hat{C}_{pli} = \frac{\bar{X}_i - L_i}{k_n S_i}, \quad i = 1, 2, \ldots, s, T, \qquad \text{….(3)}$$

where $\bar{X}_i = \frac{1}{n}\sum_{j=1}^{n} X_{ij}$ is an unbiased estimator of $\mu_i$, $S_i^2 = \frac{1}{n-1}\sum_{j=1}^{n}(X_{ij} - \bar{X}_i)^2$ is an unbiased estimator of σ, and $k_n = \sqrt{\frac{n-1}{2}} \cdot \frac{\Gamma\left(\frac{n-2}{2}\right)}{\Gamma\left(\frac{n-1}{2}\right)}$ is an adjusted factor of unbiased estimator.

Because $\hat{C}_{pli}$ is an unbiased estimator of *SPI* ($C_{pli}$) (i.e., $E(\hat{C}_{pli}) = C_{pli}$) and depends merely on the complete and sufficient statistic ($\bar{X}_i$, $S_i$) of ($\mu_i$, $\sigma_i$), it presents that $\hat{C}_{pli}$ is a uniformly minimum variance unbiased (UMVU) estimator of *SPI*. This paper can use $\hat{C}_{pli}$ to assess the performance (i.e., representing *X*-axes) of *j*th attributes in the new RIPA.

**Development of the Importance in New RIPA Grid.** According to Equation (3), $\hat{C}_{pli}$ (*SPI*) can be used to transform the *SP* of *i*th attribute into a unitless performance value. The current study sets the overall satisfaction as a dependent variable and the natural logarithm *SPI* values, ln($\hat{C}_{pli}$) ($i$ = 1, 2…,$s$), as the independent variables in the partial correlation analysis to acquire the partial correlation coefficients ($b_i$) of service attributes. Based on the concept of performance gap developed by Lyman (1990), this paper revised it and proposed a unitless *AI* index, $b_i' = b_i \times (k - \overline{X}_i)/k$, to assess the importance of the new RIPA in which $b_i$ is a partial correlation coefficient (i.e. *DI*), $k$ denotes the maximum value of a $k$-point Likert scale (i.e., full satisfaction), $k - \overline{X}_i$ represents the satisfaction gap, and $(k - \overline{X}_i)/k$ stands for the standardized satisfaction gap.

**Construction of the New RIPA Grid.** As previously mentioned, the current study acquires the average performance ($\hat{C}_{pli}$) and the average importance ($b_i'$). They represent the *X*-axis and *Y*-axis in new RIPA grid, respectively. This grid is divided into four quadrants based on the total average performance ($\hat{C}_{plT}$ = $\sum_{i=1}^{s} \hat{C}_{pli} \big/ s$) and the total average importance ($b_T'$ = $\sum_{i=1}^{s} b_i' \big/ s$). $\hat{C}_{pli}$ and $b_i'$ coordinates are depicted on the two-dimensional grid. A new RIPA grid is constructed. The strategic implications of the four quadrants in the new RIPA are in line with Figure 1 of the original IPA grid. The improvement goals and direction are shown as the arrows in Figure 1.

Based on the 80/20 principle, enterprises should invest their limited resources into critical-to-quality service attributes that can create maximum benefits. After plotting the coordinates of all attributes on the grid, the managers can conduct a strategic analysis of the quadrant location. Particular attention should be given to the attributes located in 'Concentrate here' and enterprises should formulate their improvement plans and resource allocation strategies based on the improvement priority. If there is more than one attribute located in 'Concentrate here', it is critical for enterprises to decide on the improvement priority of these attributes. *AI* ($b_i'$) can be used to judge the improvement priority of the attributes. Similarly, the attributes located in 'Lower priority' can be analyzed based on this principle.

### Instrument Development and Questionnaire Design

Based on the five dimensions with 22 items proposed by Parasuraman, Zeithaml, and Berry (1988), the current study referenced the scales of hotel service quality literature (Cadotte & Turgeon, 1988; Saleh & Ryan, 1991; Lau, Akbar, & Fie, 2005; Akbaba, 2006; Deng, 2007) with good reliability and validity, the features of the tourist hotel industry, and the suggestions from five professional scholars with plentifully practical experience, to generate an instrument of five dimensions with 24 attributes (see Appendix A). The current study has referenced original English literature and scales and hired an English language teacher to complete the back translation for the questionnaire in Chinese to avoid translation errors and ensure the original meaning is expressed. To compare the difference between *SI* and *AI*, an importance survey of 24 attributes for tourist hotels was designed in the first section of a satisfaction questionnaire. The second section includes a satisfaction survey of 24 attributes and an item on overall satisfaction for tourist hotels. The measurement scale is a 7-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (7). The third section includes demographic variables, such as gender, age, occupation, and education level. The questionnaire should have a high level of content validity and expert validity.

### Research Samples and Data Collection

To ensure questionnaire design accuracy and avoid errors and vague questions, a pretest of 118 hotel customers was conducted before the formal questionnaire investigation. The reliability analysis of customer satisfaction showed that Cronbach's α values of five dimensions (Tangibility, Reliability, Responsiveness, Assurance, and Empathy) are 0.833, 0.895, 0.926, 0.902, and 0.890, respectively, indicating that the scale has high reliability (Nunnally, 1978). The questionnaire is suitable for formal investigation.

The sample of hotel guests was collected from tourist hotels in Taichung. This paper used a convenience sampling method to collect data. Six trained interviewers issued the questionnaires to respondents at the entrances or parking lots of tourist hotels. Respondents are customers who have visited the selected hotels and were asked to participate in the study before they left for home. The respondents received a gift from interviewers to increase their willingness of completing questionnaires. The investigation period lasted for six weeks. A total of 526 questionnaires were distributed and 496 valid questionnaires were returned. The valid return rate of the questionnaires is 94.30%. An item analysis was used to test normal distribution of returned questionnaires. The skewness and the kurtosis of data are respectively −1.38~0.97 and −1.09~1.51, which conforms to the research result of Bollen and Long (1993) that skewness and kurtosis values are between −2 and 2.

## ILLUSTRATIVE EXAMPLE AND DISCUSSION

### Demographic Profile

Of these 496 questionnaires, 47.2% of the responses were by male respondents, while 52.8% were by females. Most respondents were between the ages of 21 and 50 (68.6%), while those over the age of 51 accounted for 19.8%. It indicates that the elderly should not be ignored in the market of tourist hotels. Respondents were well educated, with 73% having earned a college, or university degree or above. Regarding the occupational distribution, 34.1% of respondents worked in the service industry. The remaining respondents were: students (17.7%), manufacturing industry workers (17.3%), workers from other sectors (12.9%), public officers (9.5%), and housewife (8.5%). 23.4% of respondents were staying at hotel N, with the remaining respondents distributed in hotels P (18.8%), G (18.3%), S (17.1%), W (11.9%), and H (10.5%). Most respondents were traveling as sightseeing tourists (52.2%). Other travel purposes were commercial affairs (34.5%), visiting friends and relatives (10.9%), and others (2.4%).

### Reliability and Validity Analysis

Because the five dimensions of service quality were adopted and referenced from theoretically grounded literature, the confirmation factor analysis (CFA) was employed to conduct the validation and reliability of the satisfaction of 24 service attributes. This paper used the Goodness of Fit Indices (GFIs) to assess whether the data fit the model or not (Bagozzi & Yi, 1988; Hair et al., 2006). The CFA demonstrated that $\chi^2$=835.338 ($p$<0.001), $\chi^2/df$=3.452 ($df$=242), GFI =0.869, AGFI =0.838, NFI =0.913, CFI =0.936, IFI =0.936, RMR=0.053, and RMSEA=0.070. The results revealed that $\chi^2$ value is very significant. The $\chi^2/df$ value is slightly larger than 3 and barely meets the requirements (Hair et al., 2006). Besides GFI and AGFI, the remaining indices meet the requirement level. MacCallum and Hong (1997) suggested that GFI and AGFI can be modestly broadened to 0.8. The fitness between the proposed model and collected data should be acceptable.

Table 1 shows that the factor loadings of all variables are quite significant ($p$<0.001). Apart from items T4 (0.563), T5 (0.472), T6 (0.617), E23 (0.667), and E24 (0.659), other 19 factor loadings are greater than 0.7. The composite reliability (CR) values of five dimensions are greater than 0.7 and appear to have good composite reliabilities (Hair et al., 2006). The average variance extraction (AVE) values of the five dimensions are greater than 0.5. This reveals each dimension has a significant explanation ability on measurement validity.

These results reported that the reliability and convergent validity of each scale are quite good (Bagozzi & Yi, 1988; Fornell & Larcker, 1981). Because the square roots of all AVE values of five dimensions are larger than correlation coefficients among dimensions, all dimensions have acceptable discriminant validity (Fornell & Larcker, 1981).

Table 1. CFA of measurement model

| Dimensions | Attributes | Factor loadings | AVE | CR | Cronbach's $\alpha$ |
|---|---|---|---|---|---|
| Tangibility | T1 | 0.764*** | 0.510 | 0.865 | 0.824 |
| | T2 | 0.844*** | | | |
| | T3 | 0.800*** | | | |
| | T4 | 0.563*** | | | |
| | T5 | 0.472*** | | | |
| | T6 | 0.617*** | | | |
| Reliability | RL7 | 0.841*** | 0.690 | 0.918 | 0.917 |
| | RL8 | 0.821*** | | | |
| | RL9 | 0.872*** | | | |
| | RL10 | 0.821*** | | | |
| | RL11 | 0.794*** | | | |
| Responsiveness | RS12 | 0.846*** | 0.689 | 0.917 | 0.916 |
| | RS13 | 0.837*** | | | |
| | RS14 | 0.835*** | | | |
| | RS15 | 0.827*** | | | |
| | RS16 | 0.805*** | | | |
| Assurance | A17 | 0.854*** | 0.703 | 0.905 | 0.904 |
| | A18 | 0.835*** | | | |
| | A19 | 0.837*** | | | |
| | A20 | 0.828*** | | | |
| Empathy | E21 | 0.808*** | 0.570 | 0.839 | 0.834 |
| | E22 | 0.864*** | | | |
| | E23 | 0.667*** | | | |
| | E24 | 0.659*** | | | |

Note: *** $p$<0.001

**Importance and Performance of Service Attributes**

Table 2 shows the average values and rankings of *SI*s, *SP*s, *SPI*s, *DI*s, and *AI*s of all attributes. The *SI*s of service attributes were rated from lowest (5.859) to highest (6.226), with standard deviations less than 1.0. The *SP*s of service attributes were rated from lowest (5.421) to highest (6.020), with standard deviations less than 1.02. The *SPs* of service attributes were almost between *slightly satisfactory* (5) and *satisfactory* (6). Apart from *Well dressed and neat appearance of staff*, all *SIs* are larger than the corresponding *SPs*. *Well dressed and neat appearance of staff* exceeded respondent expectation. Three attributes with the lowest performance were *Serve individual need*, *Reasonable prices*, and *Have customers' best interest at heart*. They may potentially require improvement to enhance tourist satisfaction. The mean and standard deviation of overall customer satisfaction were 5.800 and 0.859, respectively.

To measure $SPI_i$ value ($\hat{C}_{pli}$) of *i*th attribute, the tolerable lower limit of performance of *i*th attribute was set as 5 (i.e., $L_i = 5$). As the performance of *i*th attribute is smaller than 5, *i*th attribute is unqualified. The *SPI*s were calculated and rated from lowest (0.457) to highest (1.408), with an average of 0.899. The conforming rates of all attributes ($p_i$) were also presented in Table 2. Three attributes with the lowest conforming rates were *Serving individual needs (E24)*, *Reasonable prices (T5)*, and *Having customers' best interests at heart (E21)*. This paper compared the difference between rankings of *SPs* (column 6) and *SPIs* (column 9) according to Spearman-rho rank order correlation analysis. The results showed a strong correlation (Spearman-rho coefficient is 0.939 with two tail sign. < 0.001). They indicated that the rankings of *SPs* and *SPIs* are not the same but have no significant difference. Because *SPI* takes into account the tolerable lower limit, mean, and standard deviation of service performance simultaneously as well as it is unitless, it may be more appropriate than *SP* in the new RIPA.

Before conducting partial correlation analysis, the multi-collinearity of the regression model must be identified. Echambadi and Hess (2007) stated that variance inflation factors (VIFs) are the most commonly used tools to diagnose multi-collinearity. Because all VIFs are less than 5.0 in this regression model, serious multi-collinearity does not exist. Therefore, *DI*s and *AI*s of all attributes were obtained, as shown in Table 2. The results revealed that the range of *AI*s lies between 0.0002 and 0.0562, with an average of 0.011. Three attributes with the most importance were *Serve individual need (E24)*, *Actively care for customers (E23)*, and *Employees are always willing to serve customers (RS14)*.

This paper compared the difference between rankings of *DI*s (column 12) and *AI*s (column 14). The results showed a strong correlation (Spearman-rho coefficient is 0.995 with two tail sign. < 0.001) and revealed a low sensitivity of *DIs* to the measures of *AIs* used in this paper. They indicated that the rankings of *DIs* and *AIs* are not the same but have no significant difference. Next, this paper compared the difference between rankings of *SIs* (column 3) and *AIs*. The results showed no significant correlation (Spearman-rho coefficient is 0.173 with two tail sign. = 0.419 > 0.05) and suggested a high sensitivity of *SIs* to the measures of *AIs* proposed in this paper. They indicated that the rankings of *SIs* and *AIs* have significant differences. This result shows that the traditional IPA is sensitive to the importance measure used and it could be very misleading with fatal consequences for a firm's customer satisfaction (Matzler et al., 2003).

Table 2. Analysis of importance and performance of service attributes

| Service attributes | *SI*s | | | *SP*s | | | *SPI*s | | | *DI*s | | *AI*s | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | Rank | S.D. | Mean | Rank | S.D. | $\hat{C}_{pli}$ | Rank | $p_i$ | $b_i$ | Rank | $b_i'$ | Rank |
| | | | | | | | ***Tangibility*** | | | | | | |
| T1 | 5.859 | 24 | 0.809 | 5.847 | 7 | 0.836 | 1.012 | 5 | 84.4% | 0.002 | 23 | 0.0003 | 23 |
| T2 | 6.075 | 5 | 0.758 | 5.867 | 4 | 0.838 | 1.035 | 4 | 85.0% | 0.078 | 7 | 0.0126 | 7 |
| T3 | 6.226 | 1 | 0.774 | 5.942 | 3 | 0.857 | 1.099 | 3 | 86.4% | 0.001 | 24 | 0.0002 | 24 |
| T4 | 5.915 | 22 | 0.928 | 6.020 | 1 | 0.724 | 1.408 | 1 | 92.0% | 0.005 | 22 | 0.0007 | 22 |
| T5 | 5.964 | 19 | 0.859 | 5.472 | 23 | 1.013 | 0.466 | 23 | 67.9% | 0.026 | 16 | 0.0057 | 16 |
| T6 | 6.063 | 6 | 0.729 | 5.819 | 13 | 0.885 | 0.925 | 11 | 82.3% | 0.083 | 6 | 0.0140 | 5 |
| | | | | | | | ***Reliability*** | | | | | | |
| RL7 | 5.966 | 18 | 0.734 | 5.786 | 16 | 0.891 | 0.882 | 15 | 81.1% | 0.061 | 8 | 0.0106 | 8 |
| RL8 | 6.058 | 8 | 0.788 | 5.778 | 18 | 0.936 | 0.831 | 19 | 79.7% | 0.020 | 18 | 0.0035 | 18 |
| RL9 | 6.060 | 7 | 0.812 | 5.776 | 19 | 0.890 | 0.872 | 16 | 80.8% | 0.051 | 10 | 0.0089 | 10 |
| RL10 | 6.006 | 15 | 0.810 | 5.837 | 11 | 0.892 | 0.938 | 9 | 82.6% | 0.010 | 19 | 0.0017 | 20 |
| RL11 | 5.929 | 20 | 0.779 | 5.845 | 9 | 0.948 | 0.891 | 14 | 81.4% | 0.084 | 5 | 0.0139 | 6 |
| | | | | | | | ***Responsiveness*** | | | | | | |
| RS12 | 6.040 | 10 | 0.751 | 5.815 | 14 | 0.891 | 0.914 | 12 | 82.0% | 0.051 | 10 | 0.0086 | 11 |
| RS13 | 6.028 | 13 | 0.773 | 5.784 | 17 | 0.970 | 0.808 | 21 | 79.0% | 0.025 | 17 | 0.0043 | 17 |
| RS14 | 6.050 | 9 | 0.794 | 5.808 | 15 | 0.891 | 0.908 | 13 | 81.8% | 0.115 | 3 | 0.0196 | 3 |
| RS15 | 5.899 | 23 | 0.854 | 5.847 | 8 | 0.863 | 0.982 | 6 | 83.7% | 0.010 | 19 | 0.0016 | 21 |
| RS16 | 6.016 | 14 | 0.809 | 5.754 | 21 | 0.894 | 0.843 | 18 | 80.0% | 0.040 | 13 | 0.0071 | 12 |
| | | | | | | | ***Assurance*** | | | | | | |
| A17 | 6.091 | 3 | 0.787 | 5.845 | 10 | 0.889 | 0.950 | 8 | 82.9% | 0.042 | 12 | 0.0069 | 13 |
| A18 | 6.125 | 2 | 0.766 | 5.980 | 2 | 0.857 | 1.143 | 2 | 87.3% | 0.039 | 14 | 0.0057 | 15 |
| A19 | 6.032 | 11 | 0.840 | 5.849 | 6 | 0.887 | 0.957 | 7 | 83.1% | 0.103 | 4 | 0.0169 | 4 |
| A20 | 6.085 | 4 | 0.789 | 5.855 | 5 | 0.912 | 0.938 | 10 | 82.6% | 0.060 | 9 | 0.0098 | 9 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Empathy*** | | | | | | | | | | | | | |
| E21 | 5.988 | 16 | 0.834 | 5.617 | 22 | 0.938 | 0.658 | 22 | 74.5% | 0.030 | 15 | 0.0059 | 14 |
| E22 | 5.968 | 17 | 0.871 | 5.762 | 20 | 0.938 | 0.812 | 20 | 79.2% | 0.010 | 19 | 0.0018 | 19 |
| E23 | 6.030 | 12 | 0.851 | 5.825 | 12 | 0.970 | 0.850 | 17 | 80.2% | 0.277 | 1 | 0.0465 | 2 |
| E24 | 5.917 | 21 | 0.848 | 5.421 | 24 | 0.922 | 0.457 | 24 | 67.6% | 0.249 | 2 | 0.0562 | 1 |
| ***TA*** | ***6.016*** | | | ***5.798*** | | | ***0.899*** | | ***81.6%*** | | | ***0.011*** | |
| ***OCS*** | | | | ***5.800*** | | ***0.859*** | | | | | | | |

Based on the aforementioned findings and researchers such as Matzler et al. (2003) and Deng (2007) reported that *DI* is better than *SI* in developing IPA, *AI* is better than *SI* for developing a new RIPA grid. Although the rankings of *DIs* and *AIs* have no significant difference, *AI* in the new RIPA takes into account the standardized satisfaction gap and *DI* of service attributes simultaneously. *AI* should be more appropriate and effective than *DI*. Therefore, *SPI*s and *AI*s of service attributes are unitless and suitable for representing X-axes and Y-axes, respectively, in a new RIPA. In fact, the results also proved that the items of *SIs* in the questionnaire can be omitted to reduce the survey time and enhance the effectiveness of the IPA approach.

**Analysis of New RIPA Grid**

The total averages of *AI*s (0.011) and *SPI*s (0.899) were used to divide the new RIPA grid into four quadrants. The *AIs* and *SPIs* of all attributes were plotted on this grid shown as in Figure 2. The results show that three attributes were identified in the 'Concentrate here' quadrant, four in 'Keep up the good work' quadrant, eight in 'Low priority' quadrant, and nine in 'Possible overkill' quadrant.

The *AIs* were used to prioritize the improvement of the attributes located in the 'Concentrate here' quadrant. Because *Serve individual needs* (E24) and *Actively care for customers* (E23) are two critical-to-quality attributes with the highest importance which belong to the *Empathy* dimension, hotel managers should put more effort and resources into improving these two attributes. They could be caused by service system design problems and a lack of sensitive observation and staff compassion, resulting in failing to provide timely and attentive service for customers, and ultimately leading to customer dissatisfaction. To overcome these problems, tourist hotels could select staff with more suitable personal characteristics during staff recruitment and enhance staff service consciousness, insight, and professional abilities with training. Staff should be constantly reminded to focus on customer interests and details. They should also be encouraged to actively care for customers. Service information systems, such as customer relationship management, could be used to record customer consumption habits and preferences to remind staff. It is important to maintain staff empathy and flexibility of customized service in the standard operation process, eventually incorporating it into the company culture.

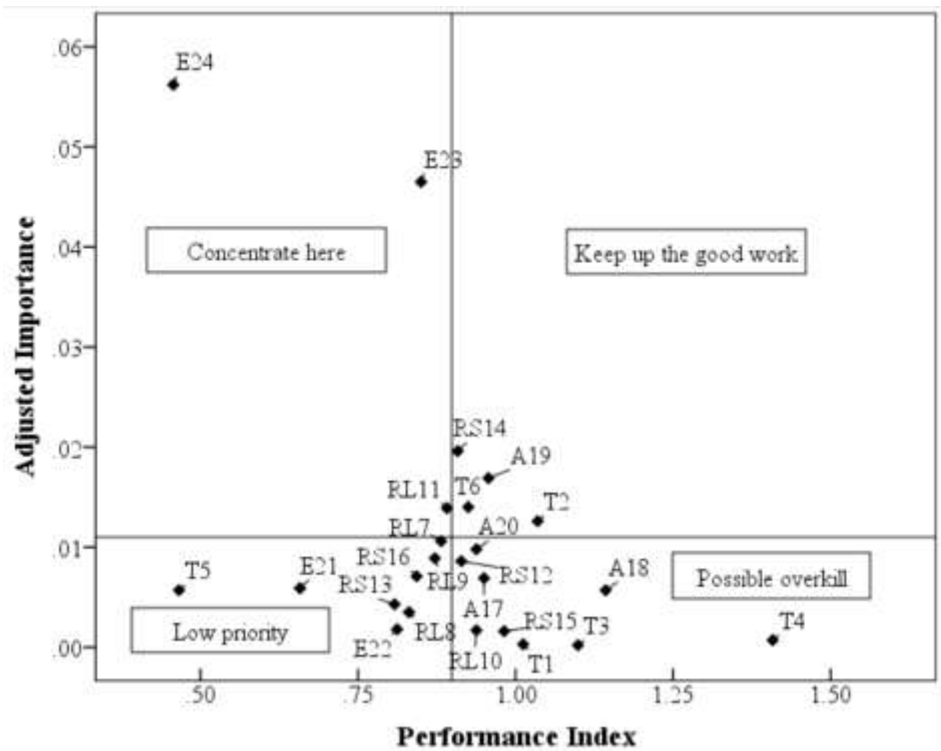


Figure 2. The new RIPA grid

The third improvement priority is *Perform the right service for the first time* in the 'Concentrate here' quadrant. It belongs to the *Reliability* dimension. The service operation delivery system of tourist hotels may be problematic, resulting in they cannot fulfill their promises or appropriately and efficiently respond to customer requirements at first time. Thus, tourist hotels should reexamine service operation delivery system to confirm the correctness and reliability of the service; strengthen staff education training to improve staff professional abilities; improve communication between managers, frontline staff, and customers to make sure the customer requirements; carefully check and determine promises made to customers; and ultimately construct a system to immediately and correctly respond to customer requirements.

Because customers always pursue high quality services, once the performance of the attributes in 'Concentrate Here' quadrant has been improved, hotel managers can use extra resources and efforts to improve attributes in the 'Lower Priority' quadrant according to *AIs*. In addition, tourist hotels may have invested too many resources in the attributes in the 'Possible

Overkill' quadrant. Hotel managers can reallocate the extra resources to the attributes in 'Concentrate Here'.

## CONCLUSIONS AND SUGGESTIONS

In order to solve the aforementioned problems regarding IPA, this paper used a unitless *SPI* to replace *SI* or *DI* (P) and an *AI* considering the standardized satisfaction gap to replace *DI* (I). Ultimately, this paper integrated them into a new RIPA. The advantages of the proposed approach include: (a) avoiding the work of pre-consuming measurement of attribute importance and saving time for both the researcher and respondents. It enhances the willingness to complete the questionnaires for respondents and reduces the probability of hasty responses or refusing to respond (Deng, 2007). (b) Using *SPI* to replace *SP* can overcome the shortcomings of unit inconsistency and standardization of the Likert scale. (c) Because *SPI* simultaneously considers the mean, standard deviation, and tolerable lower limit of *SP*, it is more comprehensive and representative than *SP*. The *SPI* can also adequately respond to the conforming rates of service attributes. (d) Because *AI* simultaneously considers *DI* (Matzler & Sauerwein, 2002; Deng, 2007) and the standardized satisfaction gap (Lyman, 1990), it is superior to *SI* and *DI*. It not only includes the characteristic of attribute category in the three-factor theory (Matzler et al., 2004; Deng, 2007) and presents the influence of individual attribute performance on overall satisfaction (Oh, 2001; Matzler et al., 2004), but also effectively identifies the improvement priority of service attributes. (e) The new RIPA comprises a three-factor theory concept, partial correlation analysis, and natural logarithmic transformation and avoids two erroneous assumptions of traditional IPA. In a word, the approach proposed in this paper can remedy the research gap in IPA research and can be applied in other industries except for hotels.

The research objects and sample are restricted to the consumers in Taichung, Taiwan. The inference range of research results is also limited in this paper. Future studies can use a more comprehensive and representative sample to verify the usage of the proposed IPA.

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**APPENDIX A**: Measurement of service dimensions and attributes

| Service dimensions | Service attributes | Literature sources |
|---|---|---|
| Tangibility | T1. Visually appealing buildings and facilities<br>T2. Comprehensive physical facilities<br>T3. Clean and comfortable environment<br>T4. Well dressed and neat appearance of staff<br>T5. Reasonable prices<br>T6. Safe and secure environment | Parasuraman, et al. (1988); Cadotte and Turgeon (1988); Saleh and Ryan (1991); Lau et al. (2005); Akbaba (2006); Deng (2007) |
| Reliability | RL7. Prompt service<br>RL8. Equipment works properly without failure<br>RL9. Provision of services as promised<br>RL10. Always available when needed<br>RL11. Perform the right service at the first time | Parasuraman, et al. (1988); Cadotte and Turgeon (1988); Saleh and Ryan (1991); Lau et al. (2005); Akbaba (2006) |
| Responsiveness | RS12. Readiness to respond to customer's requests<br>RS13. Prompt reply to customer's requests<br>RS14. Employees are always willing to serve customers<br>RS15. Giving prompt service to the customer at the promised time<br>RS16. Understanding the specific needs of customers | Parasuraman, et al. (1988); Cadotte and Turgeon (1988); Lau et al. (2005); Akbaba (2006); Deng (2007) |
| Assurance | A17. Employees provide trustworthy services<br>A18. Courtesy and friendliness of staff<br>A19. Employees have professional knowledge in response to customer requests<br>A20. Reliability in handling customer service problems | Parasuraman, et al. (1988); Cadotte and Turgeon (1988); Saleh and Ryan (1991); Lau et al. (2005); Akbaba (2006); Deng (2007); |
| Empathy | E21. Have customers' best interests at heart<br>E22. Personal attention given by staffs<br>E23. Actively care for customers<br>E24. Serve individual need | Parasuraman, et al. (1988); Cadotte and Turgeon (1988); Saleh and Ryan (1991); Lau et al. (2005); Akbaba (2006); Deng (2007) |