Full Length Research Paper

Using the Importance-Performance Analysis (IPA) approach to measure the service quality of mobile application stores in Taiwan

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The key purpose of this research is to apply importance-performance analysis (IPA) approach to empirically study the service quality of mobile application stores in Taiwan based upon the customers' perspective. To facilitate the main issue for evaluating service quality of mobile applications stores in Taiwan, a list of thirty-six service quality attributes is summarized. Then, the IPA approach in conjunction with the questionnaires is performed to screen these attributes. Study results show that twelve attributes of 'concentrate here' in quadrant 2, eleven attributes of 'low priority' in quadrant 3, nine attributes of 'keep up the good work' in quadrant 1, and four attributes of 'possible overkill' in quadrant 4 are plotted in a two dimensional (importance-performance) matrix, respectively. Besides, to acquire the voice of customer, the result shows twelve service quality attributes are suggested to improve.

Key words: Importance-Performance Analysis (IPA), service quality, mobile application stores.

INTRODUCTION

Mobile application stores are a type of network application transaction platform that allows mobile phone users to browse and download applications for mobile phone systems developed by application providers. The business models are different, and are according to the content of the suppliers; most application stores provide both free and charged software. Currently, the most representative suppliers are the iPhone APP store and Android Market by Google.

According to the statistics of GARTNER Company, the sales revenue for applications of Apple's APP Store was about US$ 4.2 billion in 2009. Due to the external threats, such as Apple' profits obtained from mobile applications and constant reduction of voicemail ratios, and to stop the declining average revenue per user (ARPU), telecommunication companies in Taiwan actively developed new applications for mobile phones. These companies introduced application stores in order to provide mobile application services, which intend to increase ARPU through more frequent data transmission use. According to the investigation results of Business Next (2010), Taiwanese consumers' top eight demands for mobile applications are music, games, GPS, online information browsing, e-mail, news and information searches, social networks (e.g., Facebook and Plurk), and video, which satisfy 90% of the expectations of mobile users. Therefore, rich download content and applications by third-party software suppliers are the drivers for consumers that are considering using mobile communications. Telecommunication companies' services, which are delivered through application stores, have thus rapidly increased.

Telecommunication companies in Taiwan suggest that their advantage in operating application stores is the large number of mobile users, and their introduction provides 3G users with greater choices of application services. However, do application stores operated by telecommunication companies in Taiwan meet the users' needs? Will the service quality attract consumers' use or transactions? These are the key factors of the companies' expansion of service scale. Service providers must enhance

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their service quality. They should firstly measure service quality, and determine its important factors, and then, enhance the service quality factors through related strategies and measures.

This issue is of great concern by telecommunication companies in Taiwan when providing services through mobile application stores.

In such a highly competitive industry, the provision of high-quality services has changed from the traditional tactical issues into strategic issues, which becomes the firms' commitment to their customers (Grönroos, 2000). From the perspective of marketing, service providers' service quality is a key to customers' repurchase intentions, as well as maintenance of customer satisfaction and loyalty.

Many researches (Grönroos, 2000; Hsu and Ho, 2009; Shyu, 2008) have suggested that customer satisfaction is experience accumulation after demand for service quality is satisfied, and service quality is a prerequisite of customer satisfaction. There is a significant correlation between customer satisfaction and service quality. According to the gap analysis model (PZB model), as proposed by Parasuraman, Zeithaml and Berry in1985 and 1988, service quality depends on the gap between expected service and perceived service. The model could analyze the sources of service quality, and assist management to improve service quality.

The issues related to service quality of mobile application stores are new, and therefore, there are no studies in Taiwan. In other countries, Lu et al. (2009) probed into service quality of mobile commerce in China, and hence, we cited the model of Lu et al. (2009) to measure the service quality of mobile application stores of telecommunication companies in Taiwan. Since the model to measure service quality of mobile communication, as proposed by Lu et al. (2009), is applicable and can be directly applied to other similar services or be promoted for studies of service quality of other types of mobile commerce. This study intends to partially improve the attributes of service quality according to the characteristics of Taiwanese consumers and the above scale.

In order to determine if the service quality attributes of mobile application stores are valued by customers, or if they are factors that should be improved by service providers, this study aims to conduct importance-performance analysis (IPA) approach, as proposed by Martilla and James in 1977.

The degree of importance in IPA indicates the decision-makers' value of the attribute, and the satisfaction represents the decision-makers' evaluation of and attitude toward the attribute. Therefore, this study intends to generalize service quality value of service providers, and further identify important service quality issues that should be maintained or improved.

In summary, the aim of this paper is to apply the IPA approach to measure the service quality of mobile application stores in Taiwan.

Service quality and its attributes

Since service quality is intangible, it involves production and consumption at the same time, shows is perishable, cannot be stored, and reveals heterogeneity. In comparison to the quality of physical products, it is more difficult to be measured. However, many scholars (e.g., Cronin and Taylor (1992), Grönroos (2000), Lewis and Vincent (1990), Lu et al. (2009), Parasuraman et al. (1985; 1988)) have overcome such the obstacles and proposed different measurement models able to measure and study service quality. Parasuraman et al. (1985; 1988) proposed the PZB model, and developed the scale "SERVQUAL," with the five constructs of service quality (i.e., tangibles, reliability, responsiveness, assurance, and empathy). They suggested that service quality is the gap between expected service and perceived service between service providers and customers in service delivery. This model analyzes the source of service quality and helps management to improve service quality. In addition, Cronin and Taylor (1992) proposed the scale "SERVPERF," which measures service quality according to service performance. Lu et al. (2009) modified and integrated "SERVQUAL" and "SERVPERF," and applied them to measure the service quality of mobile commerce in China.

The measurement model service quality of mobile commerce proposed by Lu et al. (2009), is applicable, and can be directly applied to similar services or studies on service quality of other types of mobile commerce. Therefore, this study intends to construct the attributes of service quality of mobile application stores in Taiwan. According to scale content of Lu et al. study, to define the characteristics of Taiwanese consumers upon the opinions of consumers, experts, and scholars regarding mobile communications, as a result, a list of thirty-six service quality attributes can be drawn in Table 1.

METHODOLOGY

A stepwise description of the IPA approach is briefly introduced thus:

Step 1: Assess the degrees of importance and satisfaction of the service quality attributes. Let b_{jp} and $c_{jp}, j = 1, 2, \ldots, m; \quad p = 1, 2, \ldots, n,$ be the importance value and satisfaction value, measured by Likert's 7-point scale, given to service quality attribute j by a decision-maker (DM) p, respectively. It is obvious that $1 \le b_{jp} \le 7$ and $1 \le c_{jp} \le 7$.

Step 2: Use the geometric mean technique to integrate the opinions of all DMs. Due to the fact that Saaty (1980) suggested the geometric mean is more effective in representing the multiple DMs' consensus opinions. In this paper, we use this technique to aggregate all information generated by the retrieved questionnaires. Let b_j and c_j denote the consensus opinion evaluation values of importance and satisfaction of the service quality attributes, respectively, then b_j and c_j can be represented by;

Table 1. Service quality attributes of mobile application stores in Taiwan.

Construct	Sub-construct	Service quality attribute	Explanation and description
(I). Interaction quality	(I-1). Attitude	1. Friendly service attitude	Service providers are friendly when serving users.
		2. Assist customer with use	Service providers actively assist users with using service of application stores (such as FAQ, forum or communities).
		3. Recognize users' needs	Service providers recognize users' demands for software and provide appropriate service content.
	(I-2). Expertise	4. Competent professionalism during service	Service providers are competent professionals while providing service in application stores.
		5. Answers questions rapidly	Service providers can immediately respond to users' questions related to service in software stores (both online and customer telephone lines).
		6. Satisfy users' demands for applications	Service providers recognize users' trust in their professional knowledge and they are able to satisfy users' demands for applications.
	(I-3). Problem solving	7. Sincerity in responses to users' questions	When users encounter problems related to systems or applications, service providers can sincerely respond to questions.
		8. Cope with problems or complaints	Service providers can directly (indirectly) cope with problems and complaints.
		9. The importance of solving users' problems	Service providers recognize the importance of solving users' problems.
	(I-4). Information	10. Provision of reliable information	Users can trust the information and descriptions provided by application stores.
		11. Provide defined service time	Application stores provide defined service time (period or deadline) for users.
		12. Provide the application information required by users	Application stores provide the application information required by users (downloading times, recommendations, or comments).
(II). Environment quality	(II-1). Equipment	13. Stable network connection service	Transactions and downloading services of application stores are connected and stable.
		14. Provide precise connection signal	When application stores conduct transactions and downloading services, communication network can provide precise connection signal.
		15. Importance of communication network for users	Service providers recognize the importance of communication networks for users of application store services.

Table 1. Contd.

	(II-1). Equipment	16. Mobile phone devices allow successful transactions	Users' smart mobile phone devices can successfully accomplish transactions in overall services of application stores.
		17. Immediate response of mobile phone device	In transactions of application stores, users' smart mobile phone device can immediately respond.
		18. Ability to provide consistent services	When brands, specifications, or system of users' smart mobile phones differ, application stores can provide consistent services.
(II). Environment quality	(II-2). Design	19. Impressive interface design	User interface design of application store impresses users.
		20. Satisfy users' demands in interfaces	Application store user interface designs can satisfy users' operational and use demands.
		21. Selection of different languages	Application stores provide selection of different languages.
		22. Importance of interface design for users	After influencing use and operations, service providers recognize the importance of interface design for users.
	(II-3). Situation	23. Satisfy users' communication needs	In general situations, communication network can satisfy users' needs.
		24. Need to use mobile phones in special environments.	Service providers recognize that uses need to use mobile phones in special environments, such as basements, elevators, and other areas with poor reception.
		25. Service functions in special environments	In special environments, such as basements, elevators, and other areas with poor reception, users are able to access services.
	(III-1). Punctuality	26. Transaction time is predictable	Users can predict transaction time in application stores.
		27. Speed of transaction information delivery	Transaction information delivery speed in application stores is rapid, and reduces users' waiting time.
(III). Outcome quality		28. Importance of immediate responses	Service providers recognize the importance of immediate responses for users.
	(III-2). Tangibles	29. Provides feedback after completing transactions	Feedback after completing transaction is provided by application stores, and includes the details of the transaction and payment.
		30. Immediate notification of successful transaction	Rapid notification of successful transactions and downloading results in application stores.

Table 1. Contd.

		31. Provide customized verification	After completing the transaction, service providers can provide customized with result verification for users (all transaction information, including transaction history, verification of use, etc.)
	(III-3). Valence	32. Positive experience of use	After application store completes services, users have the perception of a positive experience (entertainment, recreation, information provision, etc.)
		33. Provide positive use experience	I believe that application stores can provide positive use experiences for users.
		34. Recognize experience types required by users	I believe that application stores recognize experience types required by users.
	(III-4). Corporate image	35. Brand reputation of service providers	Service providers' brands are well-known to users.
		36. Service reputation of application stores	Application stores' services are well-known to users.

Source: The authors modified the study of Lu et al (2009).

$$\left(\prod_{p=1}^{n} b_{jp}\right)^{1/n} \text{ and } \left(\prod_{p=1}^{n} c_{jp}\right)^{1/n}$$, respectively.

Step 3: Set up the threshold values (TVs). In this paper, the TV of importance (i.e. first TV) and the TV of satisfaction (i.e. second TV) of all questionnaires are calculated by the arithmetic mean of all m service quality attributes (Hollenhorst et al., 1992; Lu and Wu, 2010). That is, the first and second TVs are $\mu_b = \sum_{j=1}^{m} b_j / m$ and

$\mu_c = \sum_{j=1}^{m} c_j / m$, respectively.

Step 4: Skeletonize the relative position of all service quality attributes as shown in Figure 1. The figure is plotted in a two-dimensional matrix, which is composed by 'keep up the good work' (in quadrant 1), 'concentrate here' (in quadrant 2), 'low priority' (in quadrant 3), and 'possible overkill' (in quadrant 4). That is:

i. The quadrant 1 represents the importance and

satisfaction values are relative higher than first and second TVs; that means the service quality attributes in this quadrant zone should be 'kept up the good work.' The setting up standard of this zone is $b_j \geq \mu_b$ and $c_j \geq \mu_c$, respectively. This zone of quadrant 1 is the place of competitive advantage for service providers.

ii. The quadrant 2 represents the importance value is higher than first TV, but the satisfaction value is lower than second TV; that means the service quality attributes in this quadrant zone should be 'concentrated here.' The set up standard of this zone is $b_j > \mu_b$ and $c_j < \mu_c$, respectively.

iii. The quadrant 3 represents the importance and satisfaction values are lower than first and second TVs; that means the service quality attributes in this quadrant zone is 'low priority.' The set up standard of this zone is $b_j < \mu_b$ and $c_j < \mu_c$, respectively.

iv. The quadrant 4 represents the importance value is lower than first TV, but the satisfaction value is higher than second TV; that means the service quality attributes in this quadrant zone is 'possible overkill.' The set up standard of this zone is $b_j < \mu_b$ and $c_j > \mu_c$, respectively. Some

resources of this zone can be transferred to the improved place for service providers.

Step 5: Acquisition of voice of customer (VOC) aims to calculate the weights of customer demands. Based on the views of Wu et al. (2008) study, the gap between the importance and satisfaction values of the jth service quality attribute is multiplied by the importance value of the jth service quality attribute. Then, we can obtain the original weights for the jth service quality attribute. For being convenience to analyze, the original weights can be normalized to obtain the standardized weights of all service quality attributes. The ranking order of improvement of service quality attributes in application stores can be determined. That is, the original weight of the jth service quality attribute is $OW_j = (b_j - c_j) \times b_j$, the

standardized weight is $SW_j = \dfrac{OW_j}{\sum_{j=1}^{m} OW_j}$, where

$0 \leq SW_j \leq 1, \ \sum SW_j = 1.$

High

Quadrant 2 Concentrate here	Quadrant 1 Keep up the good work
Quadrant 3 Low priority	Quadrant 4 Possible overkill

Importance degree

Low

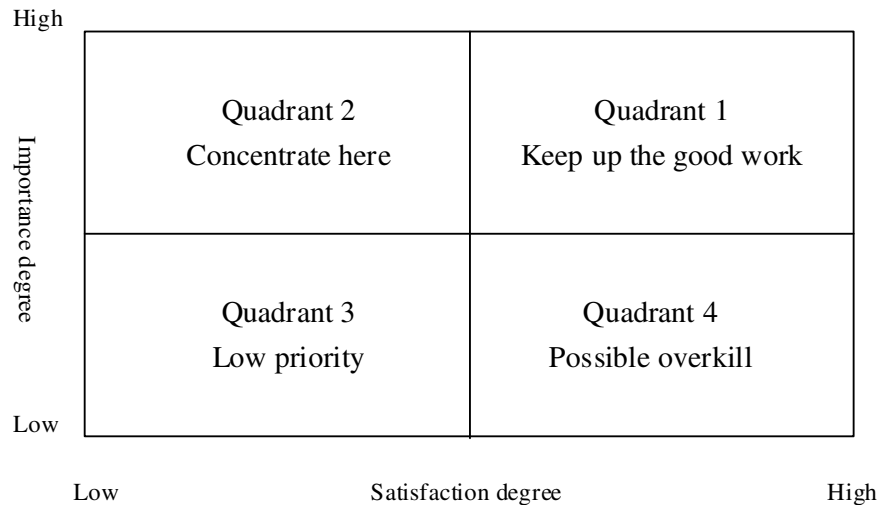Low   Satisfaction degree   High

Figure 1. The importance-performance matrix.

Questionnaire design and survey

In order to examine whether the attributes of service quality are valued by mobile communication users, and
whether they are factors that require improvement; the questionnaire content aims to evaluate the importance and relative satisfaction of the thirty-six attributes of service quality, as shown in Table 1. The questionnaire of this study was based on a Likert 7-point scale, ranging from 1 for "very unimportant" (strongly dissatisfied) to 7 for "very important" (strongly satisfied).

Regarding the reliability analysis of the questionnaire, Cronbach's α of service quality attributes was 0.82, indicating good consistency of the questionnaire. As to validity analysis, the items in the questionnaire were based on Lu et al. (2009) and expert opinions; thus, the questionnaire content had a certain degree of content validity. The total score was subtracted by the score of individual items, the new total-item correlation coefficient was 0.3, which was significant and indicated good construct validity. Since the correlation coefficients of items in this questionnaire were 0.53-0.82, they were significant and indicated good construct validity.

The questionnaire survey was carried out from August to September in 2010. In order to increase the return rate and representativeness of the questionnaire, the subjects were taken from several mobile communication companies and users of mobile application stores. A total of 152 questionnaires were distributed, and 133 effective samples were returned, for a valid return rate of 87.5%. Basic information in questionnaire survey is reorganized in Table 2.

RESULTS

The statistics in Table 2 are indicative of the following:

i. Males account for 57.9% and females 42.1%;
ii. Most participants are 25-29 years old (37.6%), and 26.3% are 30-34 years old;
iii. Most graduated from college or university (65.4%);
iv. Most are employed in private company (67.7%), followed by teachers and students (21.8%);
v. Most have an average monthly income of NTD 30,000-

50,000 (about US$ 970-1,610) (55.6%);
vi. 18.8% have experience with application stores for more than one year; 17.3% have 7-12 months experience, 25.6% have 4-6 months experience, 19.5% have 1-3 months experience, and 18.8% have less than one month experience.
vii. 53.4% use Chunghwa Telecom, 22.6% use Taiwan Mobile, and 20.3% use FET net; the total number users of these three major companies accounts for 96.2%.

The IPA results and findings

According to the Step 3 of the IPA approach, the first TV of service quality attributes was 5.736, and the second TV was 4.814 in this study. According to the steps of the IPA approach and empirical questionnaire surveys, the findings indicate that among the thirty-six service quality attributes, twelve service quality attributes were in Quadrant 2 (i.e. concentrate here), while eleven service quality attributes were in quadrant 3 (that is, low priority). As to service quality items, nine service quality attributes were in quadrant 1 (that is, keep up the good work), and four service quality attributes were in quadrant 4 (that is, possible overkill). The analytical results and processes are as shown in Table 3. The relative positions of these service quality attributes are as shown in Figure 2.

According to the Table 3, the service quality item with the highest mean of importance was 6.275, that is, stable network connection service (code 13); while the lowest mean of importance was 5.032, that is, selection of different languages (code 21). The highest mean of satisfaction was 5.116, that is, friendly service attitude (code 1); while the lowest was 4.541, that is, service functions in special environments (code 25):

i. Items in Quadrant 1 (keep up the good work) include

Table 2. Descriptive statistics data.

Measure	Option	Frequency	Percentage
Gender	Male	77	57.9
	Female	56	42.1
Age	<18	2	1.5
	18-24	24	18.0
	25-29	50	37.6
	30-34	35	26.3
	35-40	13	9.8
	>40	9	6.8
Education	Master degree or higher	36	27.1
	Bachelor or associate degree	87	65.4
	High school or lower	10	7.5
Occupation	Private company	90	67.7
	Government	5	3.8
	Teacher	6	4.5
	Student	23	17.3
	Others	9	6.8
Monthly income (New Taiwan Dollars, NTD)	<10,000	13	9.8
	10,000-20,000	11	8.3
	20,000-30,000	10	7.5
	30,000-50,000	74	55.6
	>50,000	25	18.8
Length using mobile application stores service (month)	<1	25	18.8
	1-3	26	19.5
	4-6	34	25.6
	7-12	23	17.3
	>12	25	18.8
Mobile network operator	Chunghwa Telecom	71	53.4
	Taiwan mobile	30	22.6
	FET net	27	20.3
	Others	5	3.8

'friendly service attitude (code 1)', assist customer with use (code 2),' 'stable network connection service (code 13),' 'provide precise connection signal (code 14),' 'importance of communication network for users (code 15),' 'mobile phone devices allow successful transactions (code 16),' 'immediate response of mobile phone device (code 17),' 'satisfy users' communication needs (code 23),' and 'immediate notification of successful transaction (code 30).' These nine items have a high degree of importance and performance suggested by mobile communication users, as they are the advantages of service providers' and key points in future development,

and thus, should be maintained.
ii. Items in quadrant 2 (concentrate here) include 'recognize users' needs (code 3),' 'competent professionalism during service (code 4),' 'answers questions rapidly (code 5),' 'sincerity in responses to users' questions (code 7),' 'cope with problems or complaints (code 8),' 'the importance of solving users' problems (code 9),' 'provision of reliable information (code 10),' 'provide the application information required by users (code 12),' 'importance of interface design for users (code 22),' 'importance of immediate responses (code 28),' 'positive experience of use (code 32),' and provide positive use experience

Table 3. The service quality attributes and the IPA analytical results.

Code	Service quality attribute	Geometric mean		Analytical result
		Importance	Performance	
1	Friendly service attitude	5.910	5.116	Quadrant 1
2	Assist customer with use	5.882	4.973	Quadrant 1
3	Recognize users' needs	5.952	4.782	Quadrant 2
4	Competent professionalism during service	5.753	4.733	Quadrant 2
5	Answers questions rapidly	5.898	4.693	Quadrant 2
6	Satisfy users' demands for applications	5.591	4.568	Quadrant 3
7	Sincerity in responses to users' questions	6.000	4.634	Quadrant 2
8	Cope with problems or complaints	5.753	4.741	Quadrant 2
9	The importance of solving users' problems	5.818	4.647	Quadrant 2
10	Provision of reliable information	5.909	4.749	Quadrant 2
11	Provide defined service time	5.584	4.808	Quadrant 3
12	Provide the application information required by users	5.866	4.805	Quadrant 2
13	Stable network connection service	6.275	4.902	Quadrant 1
14	Provide precise connection signal	6.267	5.038	Quadrant 1
15	Importance of communication network for users	6.019	5.103	Quadrant 1
16	Mobile phone devices allow successful transactions	5.827	5.007	Quadrant 1
17	Immediate response of mobile phone device	5.911	4.958	Quadrant 1
18	Ability to provide consistent services	5.698	4.852	Quadrant 4
19	Impressive interface design	5.527	4.739	Quadrant 3
20	Satisfy users' demands in interfaces	5.673	4.740	Quadrant 3
21	Selection of different languages	5.032	4.742	Quadrant 3
22	Importance of interface design for users	5.920	4.661	Quadrant 2
23	Satisfy users' communication needs	5.864	5.057	Quadrant 1
24	Need to use mobile phones in special environments.	5.478	4.611	Quadrant 3
25	Service functions in special environments	5.361	4.541	Quadrant 3
26	Transaction time is predictable	5.580	4.739	Quadrant 3
27	Speed of transaction information delivery	5.661	4.692	Quadrant 3
28	Importance of immediate responses	5.822	4.772	Quadrant 2
29	Provides feedback after completing transactions	5.598	4.892	Quadrant 4
30	Immediate notification of successful transaction	5.783	5.012	Quadrant 1
31	Provide customized verification	5.448	4.694	Quadrant 3
32	Positive experience of use	5.741	4.736	Quadrant 2
33	Provide positive use experience	5.857	4.707	Quadrant 2
34	Recognize experience types required by users	5.730	4.771	Quadrant 3
35	Brand reputation of service providers	5.230	4.998	Quadrant 4
36	Service reputation of application stores	5.264	5.109	Quadrant 4
	Average	5.736	4.814	

'provide positive use experience (code 33)', meaning that mobile communication users value the importance of these twelve items above all other items. However, service quality in application stores cannot satisfy mobile communication users and should be improved immediately.

iii. Items in Quadrant 3 (low priority) include 'satisfy users' demands for applications (code 6),' 'provide defined service time (code 11),' 'impressive interface design (code 19),' 'satisfy users' demands in interfaces (code 20),' 'selection of different languages (code 21),' 'need to use mobile phones in special environments (code 24),' 'service functions in special environments (code 25),' 'transaction time is predictable (code 26),' 'speed of transaction information delivery (code 27),' 'provide customized verification (code 31),' and 'recognize experience types required by users (code 34).' For mobile communication users, importance and performance of these items are lower than other items, and service providers should consider modifying them in the future in order to enhance users' satisfaction.

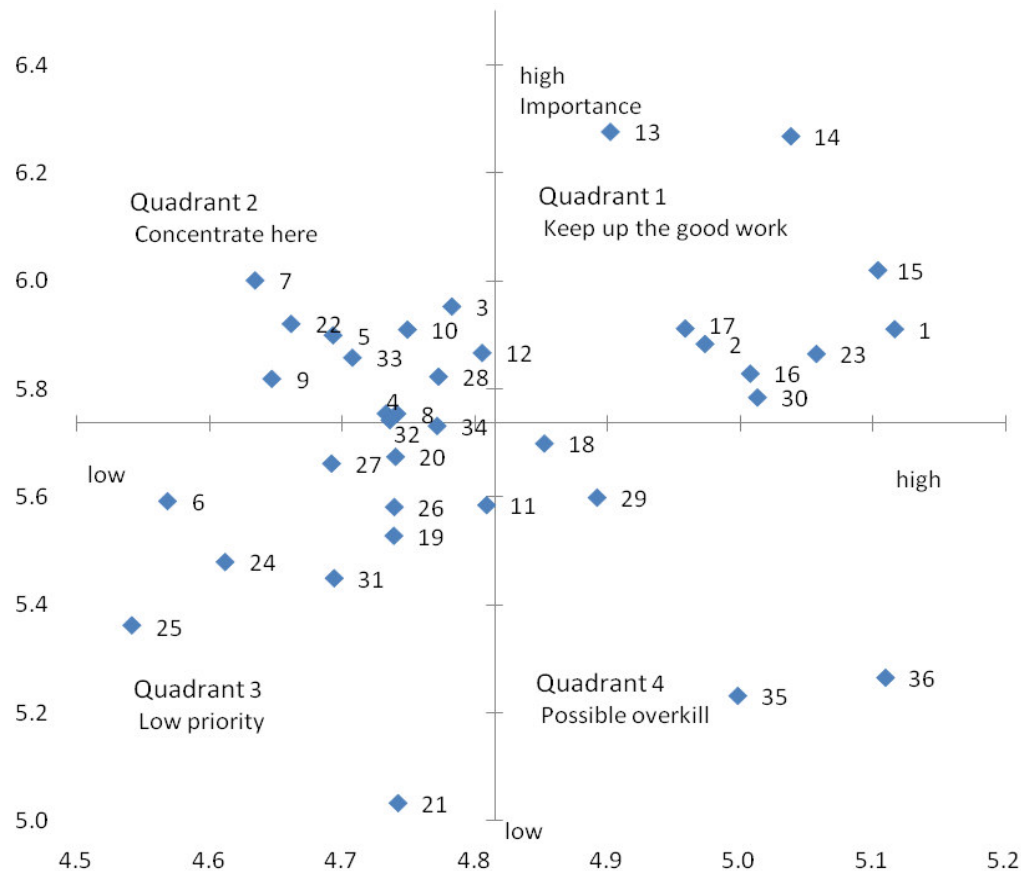iv. Items in Quadrant 4 (possible overkill) include 'ability

Figure 2. Point figure of service quality attributes.

to provide consistent services (code 18),' 'provides feedback after completing transactions (code 29),' 'brand reputation of service providers (code 35),' and 'service reputation of application stores (code 36),' meaning that mobile communication users consider the importance of these four items as lower. However, service quality of application stores is high; thus, this item can satisfy mobile communication users' needs without being overly emphasized.

v. In addition, the weights of customer demands can be obtained by step 5 of the IPA approach, acquisition of VOC. The analytical processes and results are as shown in Table 4. The VOC should be valued, and the top twelve service quality attributes that should be improved are as follows: 'sincerity in responses to users' questions (code 7),' 'importance of interface design for users (code 22),' 'answers questions rapidly (code 5),' 'recognize users' needs (code 3),' 'provision of reliable information (code 10),' 'the importance of solving users' problems (code 9),' 'provide positive use experience (code 33),' 'provide the application information required by users (code 12)', 'importance of immediate responses (code 28),' 'competent professionalism during service (code 4),' 'cope with problems or complaints (code 8),' and 'positive experience of use (code 32).'

Conclusions

This study applied the concept of the IPA approach proposed by Martilla & James (1977), in order to investigate and generalize the service quality attributes of application stores that are valued by mobile communication users. In order to identify the key attributes of service quality requiring improvements, this study constructed a feasible strategy to achieve positive service quality of application stores and set the priorities. Based on the results of the questionnaire survey, some important findings are made.

Firstly, a list of thirty-six service quality attributes is summarized to measure the service quality of mobile applications stores in Taiwan.
Secondly, the IPA approach, in conjunction with question-naires, is performed to screen the aforementioned thirty-six service quality attributes with the first TV of 5.736 and second TV of 4.814, respectively. Study results show that twelve service quality attributes were in quadrant 2, while eleven service quality attributes were in quadrant 3. As to service quality items, nine service quality attributes were in quadrant 1, and four service quality attributes were in quadrant 4. Besides, the results on the importance and

Table 4. The VOC: standardized weights of customer demand.

Code	Service quality attribute	Importance		Performance		OW_j	SW_j	Rank
		Mean	Rank	Mean	Rank			
1	Friendly service attitude	5.910	8	5.116	1	4.692	0.0244	27
2	Assist customer with use	5.882	11	4.973	9	5.350	0.0278	20
3	Recognize users' needs	5.952	5	4.782	16	6.961	0.0362	6
4	Competent professionalism during service	5.753	19	4.733	26	5.873	0.0305	12
5	Answers questions rapidly	5.898	10	4.693	29	7.110	0.0370	5
6	Satisfy users' demands for applications	5.591	27	4.568	35	5.720	0.0297	15
7	Sincerity in responses to users' questions	6.000	4	4.634	33	8.196	0.0426	2
8	Cope with problems or complaints	5.753	20	4.741	21	5.823	0.0303	13
9	The importance of solving users' problems	5.818	17	4.647	32	6.813	0.0354	8
10	Provision of reliable information	5.909	9	4.749	19	6.854	0.0356	7
11	Provide defined service time	5.584	28	4.808	14	4.329	0.0225	31
12	Provide the application information required by users	5.866	12	4.805	15	6.221	0.0324	10
13	Stable network connection service	6.275	1	4.902	11	8.620	0.0448	1
14	Provide precise connection signal	6.267	2	5.038	5	7.705	0.0401	3
15	Importance of communication network for users	6.019	3	5.103	3	5.512	0.0287	17
16	Mobile phone devices allow successful transactions	5.827	15	5.007	7	4.780	0.0249	23
17	Immediate response of mobile phone device	5.911	7	4.958	10	5.632	0.0293	16
18	Ability to provide consistent services	5.698	23	4.852	13	4.819	0.0251	22
19	Impressive interface design	5.527	30	4.739	24	4.358	0.0227	30
20	Satisfy users' demands in interfaces	5.673	24	4.740	22	5.295	0.0275	21
21	Selection of different languages	5.032	36	4.742	20	1.458	0.0076	34
22	Importance of interface design for users	5.920	6	4.661	31	7.448	0.0387	4
23	Satisfy users' communication needs	5.864	13	5.057	4	4.734	0.0246	25
24	Need to use mobile phones in special environments.	5.478	31	4.611	34	4.749	0.0247	24
25	Service functions in special environments	5.361	33	4.541	36	4.396	0.0229	29
26	Transaction time is predictable	5.580	29	4.739	23	4.694	0.0244	26
27	Speed of transaction information delivery	5.661	25	4.692	30	5.486	0.0285	19
28	Importance of immediate responses	5.822	16	4.772	17	6.109	0.0318	11
29	Provides feedback after completing transactions	5.598	26	4.892	12	3.952	0.0206	33
30	Immediate notification of successful transaction	5.783	18	5.012	6	4.457	0.0232	28
31	Provide customized verification	5.448	32	4.694	28	4.112	0.0214	32
32	Positive experience of use	5.741	21	4.736	25	5.774	0.0300	14
33	Provide positive use experience	5.857	14	4.707	27	6.732	0.0350	9
34	Recognize experience types required by users	5.730	22	4.771	18	5.497	0.0286	18
35	Brand reputation of service providers	5.230	35	4.998	8	1.218	0.0063	35
36	Service reputation of application stores	5.264	34	5.109	2	0.816	0.0042	36

satisfaction of mobile communication users for service quality attributes were converted into standardized weights of customer needs (the VOC). The top twelve service quality attributes are suggested to improve.

Finally, the results suggested that mobile communication users value the service quality items of application stores; however, they are not satisfied. Thus, telecommunication companies of Taiwan should recognize the users' needs in applications in order to maintain competitiveness, provide application service content, and immediately respond to customers' questions online or via telephone. When users encounter problems with a system or application, the companies can directly or indirectly solve their problems, address their complaints, and respond to and solve their problems. Application stores should provide reliable and well-explained information needed by the users.

In addition, telecommunication companies should recognize the importance of interface design and immediate response, which could influence users' use and operation of service. Moreover, application stores should provide users with positive entertainment recreation and information use experience in order to ensure positive experiences are perceived by mobile communication users.

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