THE KEY DIMENSIONS OF CRITERIA FOR THE EVALUATION FNA SELECTION OF ISPS: AN EXPLORATORY STUDY

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ABSTRACT

The progressive advancements in information technology (IT) coupled with the global expansion of communication infrastructure has enabled firms to create and sustain large scale strategic advantages, with the result of an ever-increasing demand from firms for new types of information services (IS) to facilitate and coordinate their daily operations. Hence, the aim of this research is to explore the underlying dimensions of criteria for the evaluation and selection of information service providers (ISPs). By undertaking a review of the literature, we first analyze the dynamics of ISPs to define their present day role before going on to develop a questionnaire for the field survey. Based on the data collected from 57 firms, two distinct procedures are adopted to carry out the exploratory factor analyses in order to derive the preliminary factor solutions. Followed by a process of post-analysis validation, these empirically derived factor solutions are reviewed and refined in accordance with domain experts' opinions, and as a result, the final factor solution is obtained. It is hoped that through the utilization of mechanical factor analyses and subsequent manual validation, it will be possible to achieve both "parsimony" and "inclusiveness" of the final factor solution. This study results that there are seven dimensions of criteria which are critical to the evaluation and selection of ISPs: (1) performance of information systems; (2) awareness of and response to customer requirements; (3) ISP's market capability; (4) performance of networking; (5) ISP's credibility and fame; (6) provision of customized professional services; and (7) innovative R&D into technology.

Keywords: Information service provider (ISP), Information service (IS), Electronic commerce (EC), Information infrastructure.

INTRODUCTION

Over recent decades, the global expansion of the communications infrastructure, coupled with the excellent cost/performance ratio of information technology (IT) has enabled firms to undertake organizational redesign and business process reengineering, as dictated by the intensifying global competition. Since it is now commonly considered that modern computers and communication technology can provide the means for firms to create and sustain large-scale strategic advantages (4, 6, 8, 34), information services (IS), and the continuous growth in demand for these services, have gained much more attention from within both industry and the academic community. One of the critical issues, among several, at a time when IS has assumed prevalence, is the establishment of necessary guidelines for the evaluation and selection of information service providers (ISPs).

An ISP is usually characterized as an entity providing IT-related services such as data processing, networking, training and education, on-line databases, and so on (39, 40). However, the recent commercialization of the Internet, with its potential for intelligent messaging, has enabled organizations to extend their processes across boundaries and to establish the synchronization of information (2). The widespread applications of the Internet into the business domain have also promoted the emergence of a new business paradigm, so-called Electronic Commerce (EC) (16, 44). The architecture of EC, and its inherent methods, can be applied to a wide range of domains, giving rise to firm's increasing demands for new generation IS. Nevertheless, the dynamic and variable nature of the Internet era has forced the ISP itself to adopt a broader perspective in redefining the roles that it should play. Therefore, the primary purpose of this study is to assume a perspective of IS demanders, through factor analyses and post-analysis validation, to explore the underlying dimensions of criteria for the evaluation and selection of ISPs.

The remainder of this paper is organized as follows: Section 2 discusses ISPs, including their definition, and the roles they should play in the current Internet era. Section 3 describes the research methodology, followed in Section 4 by exploratory factor analyses, based on the survey data, to preliminarily derive the dimensions of criteria. Post-analysis validation is then performed through consultation with domain experts to determine the final dimensions and the criteria contained within them. Finally, discussion of the findings and conclusions of this study are provided in Section 5 and Section 6, respectively.

ISPs: THEIR CHANGING NATURE AND ROLES

The term "information service" (IS) apparently originated in the 1980s, in the discussion of the supply of a broad range of information to users, including marketing and financial information, business and company news, social and political trends, scientific and research advances, and so on, which could be provided in easy-to-access and full-text formats (29). The role played by ISPs during this early period seemed to be simply one of "suppliers of information." Since the 1990s, however, the extensive applications of IT, and the growing demand from firms for IT – greatly induced by its attractive features of cost reductions along with performance enhancements – have encouraged researchers and practitioners alike to incorporate both information-centric and technology-based standpoints into their redefinition of both IS and ISPs. For example, the concept of "information intermediary" was first introduced in the early 1990s by Bakos (4, 5, 6), defining the firms operating electronic market system as the intermediary; this may be a market

participant, an independent third party or a multi-firm consortium to provide electronic data interchange (EDI) services, fund transfers, and so on. Similar notions could be subsequently found in Sarkar et al. (35), who proposed the concept of cybermediary in the electronics market to undertake the task of mediation, and in Shee et al. (37), where ISPs were justified as cybermediaries in EC, and in which they advocated the corresponding roles of agents of dynamic and rapid IT development, brokers of transactions, and even synthesized "EC facilitators."

Tallarico (39) pointed out that many IS companies are the providers of EC applications and services, with the services they provide consisting of data processing, network services, professional computer services and electronic information services. In their discussion on supply chain management in EC, Tang et al. (40) suggested that modern ISPs should take a broader perspective in providing a whole range of services such as data search, collection, processing and storage, product or service matching, producer and customer risk management, network and communication services, online database, professional IT services, and so on.

In Taiwan, there are two major organizations providing definitions of the IS industry: the *Directorate-General of the Budget, Account and Statistics* (DGBAS), which is a government agency, and the *Institute for Information Industry* (III), which is a non-profit organization. According to the DGBAS publication *Standard Industrial Classification Systems of Taiwan* (12), the IS industry belongs to Major Division I (Business Services), Division 75 (Data Processing and Information Services), Group 750 (Data Processing and Information Services), and consists of the following items: 7501 (software design services), 7502 (data processing services), 7503 (information supply services) and 7504 (integrated information system design service). According to a recent report from the III (41), the IS industry is divided into the following categories: software application, turnkey systems, systems integration, professional services, network services and processing services. Such definitions are periodically modified by both of these organizations, based on the current market situation and industrial structure. Today, the prevalence of the Internet promotes the emergence of "Access Provider" (20, 30) or "Internet Service Provider" (11, 42), which can be taken as examples of ISPs.

In the evaluation and selection of ISPs, Kull (26) considered that a flexible, differential pricing scheme becomes a critical concern of IS users. *The Ohio CPA Journal* (3) identified four important issues in the selection of an access provider: availability, service, support and price. Kojima's (25) report, which concentrates on Japan, suggested that in order to compete for customers, an ISP must be capable in each of the following areas: (1) differentiation by tasks and business categories; (2) specialization of technical expertise in network and database management; (3) accurately grasping the changing needs of users and providing corresponding services for these needs; (4) setting a policy which aims at the formation of a market in which IS can be provided at reasonable prices; and (5) the development of high quality IS. Although there are surprisingly few studies dealing with the evaluation and selection of ISPs, there are, however, rich studies in the field of service businesses that can contribute much to our study. Parasuraman et al. (33), for example, listed many of the criteria that consumers use to evaluate service quality, criteria which seem to fall into ten categories: reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding/ knowing, and tangibles. Brignall et al. (7) also identified six dimensions for the measurement and evaluation of the performance of service businesses: competitiveness, financial performance, service quality, flexibility, resource utilization and innovation. Through deliberate operationalization, these aforementioned dimensions, or categories of criteria, are useful for the questionnaire development. Furthermore, the results of several studies carried out in Taiwan (10, 17, 18, 19, 43, 45, 46) and Japan (22, 27, 31, 38) are also taken into consideration to assist in forming the basis of our study. The final list of criteria used in this study will be presented in Section 4.

It becomes apparent that the role played by ISPs nowadays is no longer simply one of "supplier of information" as was originally the case, and the services they provide are no longer restricted to "information" itself. The situation of an evolving business paradigm, coupled with the advances in computer and communication technology, have varied the nature of ISP's operations, whilst simultaneously broadening the content of IS. Along with the extensive utilization of IS in every sector of economic systems, ISPs now act as major sources of IT applications (37). In terms of firms' needs, they have to seek out specific IS which will assist in facilitating and coordinating their daily operations, as well as ascertaining guidelines for the future course of ISP selection. The ISP industry, on the other hand, also has to discover consumer preferences in IS and to explore and understand the underlying structures of criteria emphasized by consumers in selecting an ISP. Our study is intended to meet this purpose; the following sections will present the process and the results.

RESEARCH METHODOLOGY

A questionnaire survey is the primary method used to collect data for this study. The questionnaire was developed by means of a broad range review of previous works on a number of related topics, which resulted in the identification of 51 IS items (the first section of the questionnaire used to investigate the current and future IS utilization) and 36 criteria items (the second section of the questionnaire used to assess the importance of specific criteria), in combination with eight demographic questions (the third section of the questionnaire). The questionnaire was pretested by experts, comprised of two Professors of MIS and technology management respectively and three experienced practitioners in order to rate the accuracy, adequacy and relevance of the items and to verify their content validity in terms of IS and ISP selection. This was followed by a pilot test that involved sending questionnaires to ten IT-related personnel. Based on the results of the pretest and the pilot test, two minor modifications were made and the whole questionnaire was refined. The survey instrument also provided this definition of an ISP: "an entity which provides IT-related services, including software application, turnkey systems, systems integration, professional services, network services and processing services," consistent with the one adopted by the *Institute for Information Industry* which is well known and widely accepted by industry in Taiwan. The final list of criteria items used in the questionnaire, together with references to source studies is provided in Tables 4 and 5.[1]

The questionnaires were mailed to the CIO, or CEO, of 500 organizations selected randomly, including government agencies, government-owned businesses, private businesses, non-profit organizations, and so on. Sixty-five responses were received from the original mailing, which yielded a provisional response rate of 13%. From these 65 responses, 57 were verified

[1]The final questionnaire was produced in Chinese and is available on request.

as valid, yielding a net (or effective) response rate of 11.4%. The demographic information obtained from the survey (summarized in Table 1) indicates that the type of organization of most respondents were private business, and in terms of organization size they were mainly small and medium enterprises (SMEs), hardly surprising, since SMEs are the dominant enterprise form in Taiwan, playing an important role in the country's economic development.[2] Most respondents had an MIS department or outsourced, with 40% of respondents adopting a mixed strategy. The computer hardware architecture chosen was commonly multi-user PCs LAN and Minicomputer. About 80% of respondents utilized theirs every day, with over 70% of respondents having a history of more than five years of IS utilization.

TABLE 1
Demographic Information of Respondents

Profile of Respondents	Number	Ratio
Organization Type		
Government Agency	9	15.8%
Government-owned Business	5	8.8%
Private Business	37	64.9%
Non-profit Organization	3	5.3%
Other	3	5.3%
Industry Type		
Manufacturing	16	28.1%
IT & Software	10	17.5%
Banking and Insurance	9	15.8%
Other Service Industry	12	21.1%
Other	10	17.5%
Organization Size		
Top 100	19	33.3%
SMEs	25	43.9%
Other	13	22.8%
History of IS Utilization		
Within 1 year	1	1.8%
1 to 2 years	3	5.3%
2 to 5 years	11	19.3%
5 to 10 years	17	29.8%
10 to 20 years	18	31.6%
More than 20 years	7	12.3%

Profile of Respondents	Number	Ratio
Is there MIS department		
Yes	49	86.0%
No	8	14.0%
IS are provided by		
MIS department	22	38.6%
Outsourcer	12	21.1%
Both	23	40.4%
Computer Hardware Architecture		
Mostly Mainframe	9	15.8%
Mostly MiniComputer	14	24.6%
Mostly Workstation	8	14.0%
Mostly Multi-user PCs LAN	23	40.4%
Mostly Single-user PC	3	5.3%
The Frequency of IS Utilization		
Every day	45	78.9%
Twice or three times a week	8	14.0%
Once a week	3	5.3%
Once a month or less	1	1.8%

ANALYSES AND RESULTS

This section presents and analyzes the results of this study. Firstly, the descriptive results show the IS items which are currently prevalent, or which will be requested in the near future. Secondly, factor analysis is used to generate the key dimensions of criteria for the evaluation and selection of ISPs. In order to achieve both parsimony and inclusiveness of the final factor solution, two distinct procedures for factor analysis are applied into this study. Finally, as a result of the low response rate, in tandem with the consideration for greater factor stability, post-analysis validation is conducted to deal with these limitations.

The Frequently Requested Items of IS

Table 2 presents the top 14 items which are currently prevalent or which will be requested in the near future. Owing to space limitations, the remaining IS items of lower rank order are not given here. It is clear that, in accordance with Tallarico's (39) classification, data processing, network services and professional computer services currently maintain their important position, and that network services, such as e-mail, networking, Internet/Intranet/Extranet solutions, and so on, will become increasingly important in the future.

Factor Analyses

In order to determine the key dimensions of criteria for the evaluation and selection of ISPs, a series of exploratory factor analyses was undertaken. Two distinct procedures, which are shown in Table 3 as a form of Pascal-like pseudo code, are employed in the factor analyses in order to achieve both parsimony and inclusiveness of the final factor solution. As regards parsimony, both procedures established contain item-filtering mechanisms, a similar procedure to that adopted by Lederer and Sethi (28) and King and Teo (23). It is hoped that through item filtering occurring at every round of factor

[2]Until the end of 1998, there are 1,045,117 SMEs consisting in 98% of national enterprises all over Taiwan. One of the island's characteristics is that the devotion of SMEs to direct export exceeds more than 50%, whereas the devotion in developing countries in Asia-Pacific area indicates only 30%. (Source: **Small and Medium Enterprise Bureau of Ministry of Economic Affairs, The Executive Yuan, Taiwan;** http://www.moeasmea.gov.tw)

analysis, the original program space can be de-escalated and that parsimony will be achieved. Conversely, however, in order to avoid the exclusion of key items from the structural, mechanical process, the validation process (in the next subsection), based on the results of the two procedures, is conducted after factor analyses in order to keep the final factor solution validly inclusive. We can anticipate that the number of factors generated in Procedure 1 will be less than the number generated in Procedure 2, since Procedure 1 contains one more item-filtering mechanism than Procedure 2.

TABLE 2
The Top 15 List of Frequently Requested Items of IS

Current	Number	Ratio	Future	Number	Ratio
Provision of baseline software package and hardware	46	80.7%	E-mail	55	96.5%
E-mail	46	80.7%	Networking (dial-up service, leased public telecommunications lines)	52	91.2%
Payroll processing	43	75.4%	Virus prevention, detection and clearing	46	80.7%
Virus prevention, detection and clearing	39	68.4%	Payroll processing	42	73.7%
Networking (dial-up service, leased public telecommunication lines)	34	59.6%	Internet/Intranet/Extranet solution	38	66.7%
Transaction processing	34	59.6%	Provision of baseline software package and hardware	37	64.9%
Internet/Intranet/Extranet solution	30	52.6%	The operation, management and maintenance of IT facilities	37	64.9%
Website construction	29	50.9%	Web Page design	33	57.9%
Operation, management, and maintenance of IT facilities	27	47.4%	Transaction processing	32	56.1%
Web Page design	26	45.6%	Website construction	32	56.1%
Training and education	26	45.6%	The design for network security	32	56.1%
Custom computer programming	23	40.4%	The planning and construction for high speed network (e.g. ISDN, ADSL)	30	52.6%
The development of e-business systems	21	36.8%	Training and education	28	49.1%
The design for network security	20	35.1%	The development of e-business systems	28	49.1%
The planning and construction for high speed network (e.g. ISDN, ADSL)	16	28.1%	Searching for business opportunities on the Internet	27	47.4%

The rationale for this additional item-filtering mechanism in Procedure 1 is that for any factor within which only one item has a loading greater than 0.5, this can usually be represented by that one item when labeling or naming it, and it usually has an eigenvalue of about 1. It was decided to exclude such an item from next-round factor analysis, and to move it into the observation list (OL), partly because it can independently represent one single factor, and partly because any individual factor should account for the variance of more than a single item if it is to be interpreted, but unfortunately, such a factor has a low eigenvalue close to the cutoff value of latent root criterion (eigenvalue of greater than 1) (15). Nevertheless, the items removed or moved into OL during the process do not mean that they are forevermore excluded from the consideration in the final solution. They are further reviewed in the subsequent post-analysis validation.

Prior to factor analysis, the data were first screened to remove items that were weakly important, and since this study used a scale ranging from 1 (totally unimportant) to 7 (extremely important) it was decided that a criterion with a mean of less than 4 could be considered weakly important; a similar method can be found in King and Teo's (23) study. Hence, there were five criteria that were dropped during this process. To derive the factors, based on the aforementioned procedures, principal component analysis with Varimax rotation was carried out on the remaining 31 items to obtain simple orthogonal solutions. We then chose a latent root criterion (eigenvalue of greater than 1) for the factor extraction, and a cutoff value of 0.5 for items retention.

A series of factor analyses for both procedures was carried

out. Without specifying the number of factors, in the third-round factor analysis, Procedure 1 ended up with 23 items loading onto six dimensions, thus accounting for a total explained variance of 65.43%. Procedure 2 stabilized in the second round with 29 items loading onto 10 dimensions, accounting for a total explained variance of 73.24%. The results of the final-round factor analysis generated from both procedures are shown in Table 4, and the items excluded from the factor solutions are listed in Table 5. From a comparison of the two procedures, we can conclude the following major findings from the factor analyses:

TABLE 3
The Pascal-like Pseudo Codes for Two Procedures

Procedure 1

```
BEGIN
  Continue:=true;
  REPEAT
    Start factor analysis with M items;
  IF (there is any item with loading of less than 0.5 on all factors)
  OR (there is any item with loading of greater than 0.5 on two or
  more factors)
    THEN
      BEGIN
        Remove such items;
        Continue:=true;
        M:=M-the number of removed items;
      END.
    ELSE
      Continue:=false;
  IF there is any factor within which only one item is with loading
  of greater than 0.5
    THEN
      BEGIN
        move such items to Observation List (OL);
      Continue:=true;
      M:=M-the number of items moved into
  OL;
      END.
    ELSE
      Continue:=false;
  UNTIL NOT Continue;
END.
```

Procedure 2

```
BEGIN
  Continue:=true;
  REPEAT
    Start factor analysis with M items;
  IF (there is any item with loading of less than 0.5 on all factors)
  OR (there is any item with loading of greater than 0.5 on two or
  more factors)
    THEN
      BEGIN
        Remove such items;
        Continue:=true;
        M:=M-the number of removed items
      END.
    ELSE
      Continue:=false;
  UNTIL NOT Continue;
END.
```

(1) In the whole process of factor analyses, Procedure 1 removed three items as compared with the removal of two items in Procedure 2. Moreover, in Procedure 1, there were five items moved into the OL.

(2) For the number of generated factors, Procedure 1 resulted in a more parsimonious set of factors than Procedure 2 (6 vs. 10). However, from a different perspective, we can say that Procedure 2 takes into consideration more items, which results in a more totally inclusive factor solution than that provided by Procedure 1.

(3) Although the included items in both procedures were different at the beginning of the final-round factor analysis, that is, that the problem spaces were different. For the explained variance, however, Procedure 2 was more explanatory than Procedure 1 (75.24% vs. 65.43%).

(4) In the Bartlett Test of Sphericity, both procedures rejected the null hypothesis (p=0.00) in the final-round factor analyses, indicating the presence of correlation among the items, and suggesting that factor analysis was necessary.

(5) In measuring the sampling adequacy, the values of Kaiser-Meyer-Olkin (KMO) coefficients, obtained from both procedures in the final-round factor analysis, indicated that for the included items in both procedures, Procedure 1 provided greater sampling adequacy than Procedure 2 (KMO: 0.68 vs. 0.563).

Furthermore, all of the factors generated in Procedure 1 were presented in the generated factors in Procedure 2 (factors 1, 2, 3, 4, 5 and 7) with the only difference in items' loading. We can conclude, therefore, that Procedure 2 resulted in a more inclusive factor solution as opposed to Procedure 1, which resulted in a more parsimonious one. However, the reliability assessment showed that factor 6 in Procedure 1 (the same as factor 7 in Procedure 2), along with the additional factors generated in Procedure 2, were mostly not internally related, in other words, they possessed low Cronbach's alpha values. In order to deal with this dilemma, a post-analysis validation process would be carried out to reevaluate those factors seen as internally inconsistent. The items removed or moved into the OL would be simultaneously reviewed for the purpose of consideration of eventually including them in the final factor solution. It was hoped that such a process could resolve the conflict between parsimony and inclusiveness of the final factor solution.

TABLE 4
The Results of Final-Round Factor Analysis

Items (Criteria)	Disposition (Procedure 1)						Disposition (Procedure 2)									
	F1	F2	F3	F4	F5	F6	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
C07 maintenance of normal IS operation [29, 33, 46]	.655	.115	.223	.084	-.053	.246	.576	.114	.261	.091	-.014	-.329	.351	-.124	.067	-.122
C09 Stable information systems with ever-increasing speed [7, 17, 19, 27, 29, 43]	.811	.059	.157	.283	.034	.044	.791	.010	.157	.267	-.002	-.016	.072	.159	-.087	-.118
C10 Virus and hacker damage prevention [19, 46, 47]	.781	.298	.050	.128	.238	-.119	.819	.264	.081	.113	.214	.029	-.098	.033	.042	.048
C11 Data security and user privacy protection [17, 33, 43, 47]	.851	.279	-.025	.104	.223	-.126	.881	.226	.019	.100	.208	-.007	-.080	-.009	.096	.016
C12 Real-time monitoring and management for IT-related facilities [17, 19, 33, 43]	.728	.013	.177	.011	-.083	-.057	.714	.028	.219	-.008	-.152	-.071	-.015	-.256	-.252	-.058
C04 Fast and unlimited access to IS [7, 27, 29, 33]	.158	.696	.415	.187	.026	-.048	.139	.783	.390	.126	.008	-.192	.016	-.025	.005	.116
C06 Rich information content and layout editing methods [19, 33]	.301	.674	.338	-.068	.085	.098	.327	.650	.342	-.088	.079	.083	.105	-.096	.093	.091
C28 Correctly grasping and quickly responding to customers' requirement [7, 33]	.301	.697	.019	.111	-.035	.062	.290	.668	-.009	.118	.043	-.125	.135	.109	.344	-.094
C29 Rapid resolution of customers' problems [9, 25, 33]	.156	.726	.111	.099	.169	-.082	.170	.771	.020	.097	.145	.193	-.122	.083	-.061	-.221
C16 ISP's growth [17, 18, 19, 43]	.457	.145	.574	-.135	-.071	.284	.392	.153	.547	-.092	-.054	.075	.277	.052	-.003	-.341
C18 Level of marketing strategies and marketing activities proactiveness [9, 45]	.130	.173	.801	-.059	.064	.075	.094	.127	.815	-.017	.124	.048	.084	-.136	.121	-.128
C19 ISP's market share [19, 45]	.259	-.012	.739	.217	.150	-.140	.227	.064	.744	.185	.128	-.144	-.115	-.004	-.112	-.035
C27 Understanding and responding to marketplace trends [7, 33]	.003	.092	.684	-.049	.057	-.228	.035	.152	.673	-.092	.026	.200	-.282	.242	-.050	.089
C01 Stable networking with ever-increasing speed [17, 19, 21, 36, 43]	.215	-.002	.178	.613	.135	-.141	.178	-.038	.183	.670	.197	-.065	-.139	-.092	.098	-.170
C02 World-wide connection and support various types of communication standards [17, 19]	.097	.026	.017	.837	-.028	.088	.082	.058	.019	.838	-.038	-.018	.093	.117	-.058	-.006
C03 Provision of easy-to-use tools for information search and retrieve [17, 29, 33, 43]	.088	-.076	-.105	.776	.027	.204	.098	.006	-.110	.720	-.037	-.047	.200	.111	-.234	.171
C08 Flexible on-line services [29, 46, 47]	.004	.343	-.096	.661	-.268	-.127	.077	.240	-.051	.670	-.256	.082	-.136	-.284	.183	.201
C21 Completeness of IS and IT-related products [7, 9, 33]	.088	.037	.283	.084	.770	.143	.078	.062	.254	.101	.764	.110	.119	.044	-.169	-.142
C22 Credibility of provided information [10, 17, 19, 43]	.234	.328	.009	-.093	.719	-.136	.280	.287	.002	-.080	.714	.105	-.145	-.078	-.028	-.004
C23 Public praise and renown of provided IS [10, 33]	-.083	-.075	-.029	-.036	.793	.069	-.062	-.063	.001	-.078	.775	-.146	.100	-.100	-.059	.211
C33 Help customers project their future visions [25, 27, 38]	-.116	.186	-.133	-.021	-.072	.704	-.113	.072	-.123	.002	-.003	.176	.681	-.049	.332	.002
C34 Division of labor and specialization for new services and technologies [25, 38]	.132	-.083	-.002	.116	.211	.776	.113	-.007	-.005	.084	.131	.179	.738	.155	-.307	.122
C31 Well two-way communication with customers [25, 26, 33]	–	–	–	–	–	–	.277	-.045	.154	.155	.028	.519	.181	.314	.471	-.005
C32 Flexible and reasonable charging method [22, 36]	–	–	–	–	–	–	-.108	.112	-.045	-.231	-.012	.666	.111	-.088	.161	-.293
C36 Differentiation by tasks and business categories [25]	–	–	–	–	–	–	-.088	-.039	.101	.075	.033	.761	.170	.050	-.228	.236
C26 Alliance with other IS companies [25, 33]	–	-.531	–	–	–	–	.161	-.460	.154	.144	.082	-.267	-.181	.524	.160	.124
C30 Provision of customized services [7, 18, 33, 43]	–	–	–	–	–	–	-.110	.108	-.036	-.028	-.151	.096	.100	.892	-.014	.006
C15 Innovativeness of IS and IT-related products [19, 36, 46]	–	–	–	–	–	–	-.096	.100	-.016	-.089	-.199	-.047	-.014	-.023	.702	.043
C25 Knowledge and skills of service personnel [33, 46]	–	–	–	–	–	–	-.085	-.064	-.120	.064	.060	.021	.081	.037	.042	.879
Eigenvalue	3.668	2.757	2.566	2.430	2.072	1.556	3.688	2.698	2.590	2.465	2.070	1.777	1.629	1.556	1.406	1.364
Variance Explained (Accumulated %)	15.95	27.93	39.09	49.66	58.67	65.43	12.72	22.02	30.95	39.45	46.59	52.71	58.33	63.69	68.54	73.24
Cronbach Alpha	.868	.818	.746	.735	.703	.427	.868	.818	.746	.735	.703	.523	.427	.350	(N/A)	(N/A)

[Note 1]: For Procedure 1, KMO = 0.68, Bartlett Test of Sphericity = 579.568, Significance = 0.000. For Procedure 2, KMO = 0.563, Bartlett Test of Sphericity = 737.067, Significance = 0.000

[Note 2]: For factor 2 in Procedure 1, the elimination of item C26 will increase the value of Cronbach's alpha very much, from 0.613 to 0.818. Hence, C26 is dropped.

Post-Analysis Validation

Post-analysis validation was necessary, partly because of the low response rate – which may have a negative effect on factor stability – and partly because of the consideration for both parsimony and inclusiveness of the final factor solution. This validation process was carried out through discussions with domain experts, including one professor in MIS, one professor in technology management, and three experienced practitioners, in order to examine the factor solutions of both procedures. Based on the factor solution from Procedure 1, due to its parsimony, the process would start with the first five factors, which were the same as those forming the first five factors of Procedure 2 and which were all internally related (Cronbach's alpha > 0.7), and take them as part of final factor solution. We then attempted to obtain additional factors by reviewing those items removed or moved into OL in Procedure 1 (C05, C15, C24, C25, C26, C30, C31, C32 and C36) and by making reference to factors 6-10 generated in Procedure 2. Through a series of discussions, the following validation decisions were made.

TABLE 5
The Items (Criteria) Excluded from the Factor Solutions

Items (Criteria)	Disposition: Procedure 1	Disposition: Procedure 2
C05 Provision of diversified IS (29, 33, 38)	Removed (1st)*	Removed (1st)*
C13 Performance of used or provided hardware and software (17, 33, 43)	Mean <4.0	
C14 Effectiveness of provided multimedia technology (18, 31, 36, 45)	Mean <4.0	
C15 Innovativeness of IS and IT-related products (19, 36, 46)	OL (1st)	F9
C17 ISP's goals and objectives (9, 18, 36, 45)	Mean <4.0	
C20 ISP's oversea strength (7, 9, 33)	Mean <4.0	
C24 ISP's technical and R&D capability (17, 19, 27, 36, 42)	Removed (1st)**	Removed (1st)**
C25 Knowledge and skills of service personnel (33, 46)	OL (1st)	F10
C30 Provision of customized services (7, 18, 33, 43)	OL (1st)	F8
C31 Good two-way communication with customers (25, 26, 33)	OL (2nd)	F6
C32 Flexible and reasonable charging method (22, 36)	Removed (2nd)**	F6
C35 Help customers strengthen their upstream business operations (25, 38)	Mean <4.0	
C36 Differentiation by tasks and business categories (25)	OL (2nd)	F6

Note 1: *Removed (1st)* means that items are removed at the 1st-round factor analysis
Note 2: OL (1st) means that items are moved to the observation list at the 1st-round factor analysis
Note 3: * means that items are moved due to cross-loading. ** means that items are removed due to they are with loading of less than 0.5 on all factors

(1) Prior to factor analysis, the data were first screened to remove items that were considered weakly important (mean <4.0). In the validation process, we further decided to exclude items with a mean greater than, but around 4.0< from subsequent consideration. Hence, C26 (mean=4.26) and C36 (mean=4.33), those with the lowest mean among the reviewed items, were subsequently dropped.
(2) We found that C05 (provision of diversified IS) seems redundant in connotation as compared with C21 (completeness of IS and IT-related products), since C05 has been found cross-loading, and C15 has been loading onto factor 5. Hence, C05 was dropped.
(3) To obtain additional factors, we found that factors 6, 7, 8 generated in Procedure 2 were rather consistent with one another in construction, where their contained items were related somewhat to "customized professional services." Hence, we decided to merge items C30, C31, C32, C33 and C34 into a single factor (C26 and C36 were dropped). Conversely, the removed item C24, which was considered important (mean=5.11), and items C15 and C25, which were the only item with loading greater than 0.5 in factors 9 and 10, respectively, could be characterized by the same construct associated with "innovative R&D into technology."

As a result of the validation process, there would be seven factors in the final factor solution, including five derived empirically and two additional factors obtained from the aforementioned manual process. The seven factors with the names being subjectively inferred from the contained items are presented in Table 6. The reliability assessment shows that the Cronbach's alpha values for the empirically derived factors were all above 0.70, which can thus be categorized as high reliability (14). For the remaining manually derived factors, however, the Cronbach's alpha values would not qualify them as highly reliable, but they could still be viewed as acceptable for exploratory research (14, 32).[3]

RESULTS AND DISCUSSIONS

The first dimension (Factor 1) can be referred to as the *Performance of Information Systems.* This contains criteria indicating how important it is for an ISP to establish an information system for daily operation, and to assist in maintaining its normal functions. Detecting viruses, preventing fraud and terrorism, having an aggressive managerial policy for IT-related facilities, having backup and recovery mechanisms,

[3]Guielford (1965) suggested that reliability above 0.70 is high, between 0.70 and 0.35 is acceptable, and below 0.35 is low. Nunnally (1978) suggested that reliability of 0.5 or 0.6 would suffice in the early stages of research.

all relate to such a dimension. This set of criteria will greatly affect firm's decisions on the selection of an ISP.

The second dimension (Factor 2) is the *Awareness of and Response to Customer Requirements* as it represents the ISP's attitude toward consumers. Accurately grasping customers' IS requirements, feeding them with all types of IS, and solving their problems as soon as possible are all key elements in the ISP's continuous competition for customers. Furthermore, as a demander of IS, they will choose an ISP with the highest level of quality in customer service when alternative ISPs have similar cost levels (40).

The third dimension (Factor 3), *ISP's Market Capability*, refers to the demographics of ISPs, such as their annual rate of growth, market share, and so on, which are critical references in evaluating and selecting ISPs. Such public data, in combination with other data (not listed here), has been widely used to assess the potential and value of an ISP, but demographics do not mean everything to an ISP's capability in the market. The ISP's marketing strategies, and associated activities used to implement those strategies, are also essential in responding to market trends, which will result in a positive effect for the level of market acceptance.

TABLE 6
The Final Factor Solution

Factor 1 (α=0.868): Performance of Information Systems	
C07	Maintenance of normal IS operation
C09	Stable information systems with ever-increasing speed
C10	Virus and hacker damage prevention
C11	Data security and user privacy protection
C12	Real-time monitoring and management for IT-related facilities
Factor 2 (α=0.818): Awareness of and Response to Customer Requirements	
C04	Fast and unlimited access to IS
C06	Rich information content and layout editing methods
C28	Correctly grasping and quickly responding to customers' requirements
C29	Rapid resolution of customers' problems
Factor 3 (α=0.746): ISP's Market Capability	
C16	ISP's growth
C18	Level of marketing strategies and marketing activity proactiveness
C19	ISP's market share
C27	Understanding and responding to marketplace trends
Factor 4 (α=0.735): Performance of Networking	
C01	Stable networking with ever-increasing speed
C02	Worldwide connection and support various types of communication standards
C03	Provision of easy-to-use tools for information search and retrieval
C08	Flexible on-line services
Factor 5 (α=0.703): ISP's Credibility and Fame	
C21	Completeness of IS and IT-related products
C22	Credibility of provided information
C23	Public praise and renown of provided IS
Factor 6 (α=0.532): Provision of Customized Professional Services	
C30	Provision of customized services
C31	Good two-way communication with customers
C32	Flexible and reasonable charging method
C33	Help customers project their future visions
C34	Division of labor and specialization for new services and technologies
Factor 7 (α=0.501): Innovative R&D into Technology	
C15	Innovativeness of IS and IT-related products
C24	ISP's Technical and R&D capability
C25	Knowledge and skills of service personnel

The fourth dimension (Factor 4), the *Performance of Networking*, focuses on networking. This dimension is similar in nature to the first dimension; both contain criteria relating to technology, and such technology-related issues are much more important in the so-called electronic commerce era than ever before (1). Not only must the ISP be capable of networking with high quality and support for various protocols, but it must also provide appropriate tools to access on-line information services. Presently, most network services are conducted under consideration of web-based technology due to the rapid growth of Internet-based businesses (39), and many companies are now asking for the establishment of value-added, semi-private networks, such as Intranets or Extranets, based on Web standards with extra improvements in security and reliability, which can simultaneously provide front-end Web access and back-end data maintenance (24).

The fifth dimension (Factor 5), *ISP's Credibility and Fame*, reflects the importance of what is referred to as public image and renown. Surprisingly, the completeness of IS and IT-related products, which is an important criterion in ISP selection, loaded onto this factor. Typically, the ability to provide a wide range of services is usually characterized as one of the determinants of quality in service business (33). Once an ISP achieves this, it can usually achieve great renown for being a competent player

in the business.

The sixth dimension (Factor 6), points out that the *Provision of Customized Professional Services* is also critical as a means of attracting potential demanders of IS. Since "customization" has replaced "mass production" as the mainstream strategy for competition in the division of manufacturing and production, similar thinking is now widely applied in the service division. The provision of professional services customized by tasks and business categories is a further key to the success of ISPs. In addition, specialized communication skills and a differentiated system of charging for IS, which relate to such a success, are also essential.

Finally, the *Innovative R&D into Technology* (the seventh dimension, Factor 7) can continually revitalize an ISP because innovation plays a pivotal role in increasing a firm's value and its competitive advantage (13), and R&D activities are consistently the source of innovation. The ISP has to be operated with an aggressive attitude toward R&D in information technology as a response to the changing demand structure caused by the evolution of consumer needs and technological trends.

CONCLUSIONS

This paper, based on the continuing role of ISPs in performing mediating tasks in the electronic marketplace, has explored the underlying key dimensions of criteria for the selection and evaluation of ISPs. Rather than taking ISPs simply as "suppliers of information," this study has adopted a broader perspective to incorporate both information-centric and technology-based standpoints into the redefinition of IS and ISP. The results of data analyses reveal that data processing, network services and professional computer services continue to have significant importance, but that several items relating to the provision of network services will gain even greater importance in the future. The primary concerns for organizations choosing an ISP will be the ISP's capabilities in information systems, networking, customized professional services and R&D activities, along with the ISP's good reputation in IS, marketing strategies and customer satisfaction. Based on the findings of this study, we suggest that ISPs should capitalize on their technical know-how and experience, and introduce a new generation of IS into different industries since their capital investment in upgrading their facilities and equipment will be an important part of the global business infrastructure.

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