

AN EMPIRICAL STUDY OF APPLICATION SERVICE PROVIDER (ASP) ADOPTION IN SMEs

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ABSTRACT

With the rising trend of e-business and IT outsourcing, emergence of Application Service Providers (ASP) can satisfy the needs of numerous small and medium enterprises (SMEs), which in usual has a shortage of information technology professionals and appropriate cost-effective software applications. An ASP is a mode of software services offered through rental. This type of arrangements enables corporations to bring in reliable information systems with much lower costs. The availability of such services effectively upgrades the levels of information application in corporations. Since ASPs are expected to provide direct support for SMEs, this research is initiated with the intent to uncover the real needs of SMEs for ASP. The main objective of this study is to provide an empirical study of the needs among enterprises in various industries for ASPs. From this research, it is found out that food and beverage industry, retailers, and restaurant businesses lean toward software rental mode, and are suitable targets for the application of the ASPs services in the surveyed industries. Another finding in this survey is that the top concern of SMEs focuses on execution level services. This observation is useful for ASPs to meet the needs of their potential customers.

Keywords: Application Service Providers, IT Outsourcing, Small and Medium Enterprises

1. INTRODUCTION

Due to the dramatic changes in response to the competitive environment, more and more enterprises are relying on information systems to meet the growing needs from the customers. For either a large or small corporation, information technology (IT) has become an indispensable weapon. While the needs toward e-business are expanding very fast, shortage of IT professionals, complexity to implement e-business applications, and the risks associated with the huge costs involved in the projects can hinder the use of IT. Many enterprises have therefore outsourced their information services to solve the issues mentioned above. The so called information outsourcing means part or all of the information functions in an organization are delivered by service providers that are outside of the organization [19]. A completed outsourcing business may cover information processing, application software system development, application facilities management,

system integration, and backup activities. The use of information technology is facing a shifting paradigm: from the product-oriented to service-oriented. The emergence of application service providers (ASPs) is a timing solution that fit the increasing demands from the enterprise. ASP is a mode of rental software services which enables corporations to implement reliable information systems suitable for their own needs yet with very affordable costs. It is no doubt playing a big role to corporations in their transformation into e-businesses [20].

Considering the characteristics in organizational structure, small and medium enterprises should be the first as well as the most receptive group to new business models such as the e-business, and they are most likely to be the biggest gainers from the innovations. However, reality shows that most businesses proactively adopting e-business or e-commerce at present stage are large information/electronic corporations [1][4]. Although there are also a few small and medium enterprises that have adopted the e-business mode, most of them are still hesitating on further developments. While

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based on the forecast published by the Gartner Group, the global market for ASP is growing in the past few years in the world, but what are the real demands of ASPs from SMEs and whether all industries have the same demands in Taiwan are still unknown. These are the questions this research attempts to explore.

2. E-BUSINESS AND ASP IN SME

2.1 E-business in SMEs

SMEs are characteristic in ways that the scales are relatively smaller than the larger corporations and their levels of management are also fewer; therefore, in such a setting, the managements of SMEs are able to carry out decision-making processes in a higher speed as well as keep a better control of their core competence. With the characteristics, SMEs have higher flexibilities to adjust their production capacities and marketing strategies; consequently, they react faster to changes in the outside environment. Contrarily, because of their smaller scale, they have less resource; therefore, they are more conservative in financial management with lower level of professional division as well as less sufficient information technology application. From the perspective of information technology utilization, the most significant difference between SMEs and large corporations is that smaller businesses are mostly short of corporate resources and information technology staffs. Due to which, SMEs often lag behind large corporation a substantial distance in utilization of information technologies [5]. Also, in the process of introducing information systems into their operations, the information department of SMEs often lack experiences in operating with such a new tool; thus, the operating procedures very often are not fully integrated with the information systems; in result, the whole of the operation effectiveness of the enterprises are affected [6].

Small and Medium Enterprises face many hindrances when it comes to using information technologies. The real effects of such systems are often not fully utilized. Upon the arrival of the internet era, the industries are facing turbulent changes externally as well as internally. The scale of market is expanding into the whole globe; the market structure and ways of trading are also changing. In order to be able to adapt to the environment and respond to the challenges, it has become a requirement now for small and medium enterprises to adopt information technologies. However, with limited resources, the necessities to foster information technology professionals or throw tremendous capital into software development and system setup will bring the enterprises heavy burdens. Plus the factors such as frequent software and hardware updates and staff turnovers, the less funded small and medium enterprises are in the middle of a

tug of war between installing information systems and their finances [12][13].

Emergence of ASP in recent years has become a major subject of attention of small and medium enterprises when initiating information systems into their operations. ASPs not only are able to lower the threshold for enterprises to own high-level information systems but also provide business owners application software services of the large corporation class. However, ASPs in many countries are still in the budding stage. In operations, quality of services, and scope of applications, ASPs still need to be tested by the market.

2.2 Application Service Providers-the ASPs

In order to achieve the best allocation of the limited resources for the goal of generating maximum profits for the organization and concentrate the resources on the activities that will create the highest added value, companies turn over a section of their operations to other service providers in a contract form. This type of arrangements is called out-sourcing [16]. Currently, most out-sourced services are more of information management and software integration/maintenance. In the future, enterprises will gradually require more of software rental and restructuring of corporate procedures [11].

Application Service Providers are exactly the newly emerged industry that provides enterprises out-sourced services for information technologies. Although the concept of ASP is an extension of the existing out-sourcing arrangements adopted for other services, its operational mode is rather different from other traditional out-sourcing services. Currently, there are various definitions to the service contents and scopes of ASPs. The following are some of the commonly recognized definitions. ASP is a centralized management facility, where rental, management, and utilization of application software take place in a contract form [7]. An ASP is responsible for directly or indirectly conducting specific activities and providing professional knowledge that maintain the application systems [3]. An ASP is a middleman who provides application system installation, management, and remote setup services employed in a rental contract form through its centralized server [14]. Finally, an ASP is a third party who operates on the basis of providing customers software services through the internet and charge an amount of fees for the services they provide. An ASP can also be a type of suppliers who offer their software rental services through the internet or dedicated lines [22].

Summarized from the above definitions, this research defines ASP in two levels – the narrow sense and the broad sense. The narrow sense definition classifies ASPs as “the suppliers who provide customers application rental and related services

through internet platforms". Which means the software rental and related services provided by the ASPs should include software maintenance/updates, system facility management, data center setup, security certification, and system integration. The broad sense definition focuses on the industrial model; from which, Independent Service Venders (ISV) are responsible for providing software and authorize ASPs to sign Service Level Agreements (SLA) with the customers. After the fees and service contents/scopes are set, the authorizations for using the software are then released to the customers through rental [21]. Since the scope of services of software rental is rather broad, including application software, network infrastructure, system integration/management, and data center and system facility management, companies like telecommunication operators, system integration services (SI), and internet service providers (ISP) are all common participants in the application service offering. These participants themselves are not directly related to application software, but from the broad sense definition, they can still be considered as a link in the ASP industrial model. Since ASP is still a concept in the budding stage that is not matured enough to take an integrated form, the boundary of definition is thus expanded. At the current stage, any new breakthroughs in technology or commerce will bring new variables to emerge in the whole industrial environment. The main success factors for ASP-based information systems on the basis of past information system success models are explored

2.3 Services Provided by ASPs

As suggested by Gillan et al. (1999), to provide services, ASPs must integrate three capabilities, including service, networking, and application software [7]. This research thinks that seeing from the definition of ASP set by this research, software management and maintenance is the core business of ASPs; therefore, the core capabilities of ASPs should lie on the two parts of software and service; networking ability should only be considered as a supplementary ability. At present, many ISPs are increasingly making their presences in the ASP market. Due to the fact that ISPs are already networking service providers, comparing to other pure ASPs who have to gain their networking capabilities through out-sourcing or strategic alliances, the ISPs will be more competitive in the market.

The scope of services offered by ASPs is rather broad; therefore, it is rather difficult for one single business to cover all the services offered. Thus, professional labor division is very important to the whole of the ASP industry [20]. Services that may be provided by ASPs can be classified into four categories; they are networking service, hardware

facility, application software, and total solution. Categorized according to Gillan et al. (1999) based on the complexity of ASP services, ASP can be classified into Analytical Application Software, Vertical Application Software, ERP Application Software, CRM Application Software, E-Commerce Software, Co-op Application Software, and Personal Usage Application Software. From this list, most people may think that key mission applications such as ERP and CRM are very suitable for the operational modes of ASPs; on the contrary, non key-mission applications are the earliest to be favored by users at the earlier stage [3]. This research thinks that application services with higher key-missions often involve companies' internal procedures; therefore, it requires a higher degree of involvement of the companies' management level as well as resources. Nowadays, the economic environment is seeing the arrival of the minimum-profit era. Corporations' profit earning is compressed, especially the small and medium enterprises. Therefore, corporations are more willing to bring in the basic services with lower level key-mission since initiation of such services require minimum input of resources.

From the aspect of service value-chain, since ASPs directly face the customers, to satisfy their one-stop shopping needs, an ASP may simultaneously provide networking, data center, system integration, and information consultation services. For operational labor division, infrastructure services such as networking and data center can be arranged by cooperative operations of ISPs and IDCs. And, for services with higher added-values such as system integration and information consultancy, under the expectations of increasing service added-values, strategic alliances formed by each of the members on the service value-chain that vertically integrate the upper and lower stream businesses will be able to bring lower costs and higher operational effectiveness, as well as differentiating the integrated sector from other competing ASPs.

2.4 ASP Services

Based on the ASP service model proposed by Lixin (2001) which includes ASPs, ASP Resellers, ISVs (independent software venders), NSPs (network service providers), and Application experts, each type of the service models contains specific service items [20]. This research thinks that this classification is still valid for ASPs at the current stage. Services of ASPs are services employed through strategic decisions to fill in the gaps of insufficiency in system resources and capabilities, and when the importance of the services provided by ASPs increases, ASP users will have to put in more resources as well [2]. ASP users must have a set of resource allocation methods to determine the order of resource utilization,

and each industry has its unique demands for utilizations of electronic tools [14] [24]. Therefore, this research is conducted to understand the differences of various industries in the demands for services from ASPs through actual case studies.

3. RESEARCH METHOD

3.1 Research Assumptions

According to the ASP service models discussed in the previous section, the core service of ASPs is software rental, and hardware facility/system setup belong to the category of traditional out-sourcing services [20]. Placing the focuses on software rental services may reduce the associated risks for small and medium enterprises for software purchases [17][18]. At the same time, since ASPs are responsible for software updates as well as providing long-term maintenance services, there is no need for small and medium enterprises to shoulder the huge cost of acquiring the information technology resources [23]. Services focused on hardware and system setup, on the other hand, are more similar to the traditional information out-sourcing services at earlier times because the scope of services is limited internally at the business concerned, and the huge cost of using information technology resources lies on the enterprises themselves [8][9]. Since each of the industries is characteristically different, this research wishes to verify the characteristics of the industries through hypothesis verification and examine whether enterprises' demands for ASPs services vary according to these unique characteristics. Based on the above deduction, this research organized the first research hypothesis.

Hypothesis 1: Different industries have different needs for ASP service items.

The service function of the so-called ASP means the level of corporate value the service provider is able to provide to the user [20]. Higher level corporate values focus on the level of a company's operational strategy, including corporate resource planning, supply chain management, and customer relations management. This type of services often involves the operational level of the company and is closely related to the company's value chain; therefore, efficiency and security are the two major factors of consideration [10]. Thus, when providing such services, ASPs must prepare tightly organized Service Level Agreements (SLA) and a comprehensive remote backup mechanism to fulfill the company's requirement for security. Lower level services focus more on the execution aspect, including financial/accounting system and human resource management system. This type of services can be standardized and is suitable for most industries. Each industry is characteristic in its own

way; therefore, it has different needs for services from ASPs. Based on the above deduction, this research organized the second hypothesis.

Hypothesis 2: Different industries have different needs for ASP service functions.

Each industry has unique needs for its electronization; therefore, different industries have different needs for ASP services [22]. The potential factors are grouped into system quality and service quality [15]. Thus, factors considered by different industries will also be different. Factors that may be considered include whether an application software should be set up on top of a shared server or independent server, whether the speed of the server will be affected by the volume of data flow, how ASPs ensure the security and validity of the data, how ASP manage daily data backup and emergency recovery, whether the ASP provides its customers guarantees for safe connections, other than the browser, what are the software and hardware required before the company can use the ASP services, whether application software backup services are provided by the ASP or software company, whether the ASP provides comprehensive education/training services, how the ASP manage software upgrade procedures, how the ASP handle networking interruptions or data loss, and whether the ASP provides detailed application software retrieval/usage reports. Based on the above deduction, this research organized the third hypothesis.

Hypothesis 3: Different industries have different factors of consideration when choosing ASP services.

3.2 Research Method

The objective of this research is to verify the differences in the needs for ASP services of small and medium enterprises in different industries when initiating e-business into their operations. Research subjects include five industries in Taiwan: the food/beverage industry, metal product industry, electronic/electrical industry, wholesale/retail and food service industry, environmental hygiene and pollution prevention service industry.

Based on the research literatures, this research organized and designed the contents of the questionnaire into ASP service items, ASP service functions, and the factors of consideration when choosing ASPs. In addition, this research also classified ASP service models into five levels and detailed the levels into eight service items. They are software rental, hardware facility setup, system setup and integration, data storage service, guidance and consultation, corporate procedure restructuring, and data transmission. The usage levels of ASP service functions are classified into five levels and detailed into twelve items. They are logistic, financial procurement, corporate resource planning, customer

relations management, supply chain management, e-commerce, office productivity software, group software, data storage, financial/accounting system, and human resource/payroll. Factors of consideration are classified into five categories. They are data security, service quality, speed of connection, brand of software, and the quality of consultants.

This research adopts a two-part analysis. The first part is the initial data analysis, focusing on three categories of basic data - the number of employees, amount of capital, and amount of turnover. The basic data are then put through a descriptive statistic analysis to describe the basic status of the industries. The second part is a cross analysis on the scales of the enterprises and industries according to the categories of ASP service items, ASP service functions, and major factors of consideration. In addition, this research has also verified, through statistics, whether the industries have significant differences in their needs for ASP service items and ASP service functions, for the purpose of finding a direction that is suitable for the future development of the ASP industry.

4. DATA ANALYSIS

For this research, the food/beverage industry, metal product industry, electronic/electrical industry, wholesale/retail and food service industry, environmental hygiene and pollution prevention service industry were firstly selected by the SMEA, MOEA (Ministry of Economics Affairs). A total of 500 questionnaires were sent out for the survey where each industry had chosen 100 representative companies. Since the questionnaires are conducted by dedicated personnel in person; therefore, the rate of return is 100%. The objective of this research is to explore small and medium enterprises' needs for ASP services; therefore, companies that answered "no need for ASP services" are considered invalid questionnaires. After a statistic organization, 73 companies in the Food/beverage industry, 75 in the metal product industry, 73 in the electronic/electrical industry, 67 in the whole/retail and food service industry, and 47 in the environmental hygiene and pollution prevention service industry answered "no need for ASP services". After deducting the invalid questionnaires, valid samples are recorded as 27 for the Food/beverage industry, 25 for the metal product industry, 27 for the whole/retail and food service industry, 33 for the electronic/electrical industry, and 53 for the environmental hygiene and pollution prevention service industry. A total of 165 valid questionnaires are returned. The number indicates that at the present stage, approximately 33% of small and medium enterprises have some degree of needs for ASP services.

4.1 Basic Data for the Questionnaire

The basic data category in this questionnaire is divided into four sections, including number of employees, amount of capital, and amount of turnover (Table 1). From the percentage ratio of the number of employees, companies with fewer than 20 employees take up 42%, which indicates that close to half of the companies are insufficient in human resources. The quality of human resources is also relatively lower. Some companies do not even have information departments. Due to which, a large portion of them are not knowledgeable in information technologies as well as unwilling to use them. From the percentage ratio of the amount of capital, we see that over 70% of companies have less than NT\$ 1.5 million, which indicates that most of the companies are small in scale, especially the companies in the Wholesale/Retail industry and Food/Beverage and Food Service industries. On the other hand, companies with capitals over NT\$ 3 million are mostly companies in the Metal Product Industry and Electronic and Electrical Industry. From the percentage ratio of the amount of turnover, we can see that a major portion of companies are in the categories of "NT\$ 300 thousand-1.5 million" and "NT\$ 3.0 million to 15 million". Companies in the Electronic and Electrical Industry and Environmental Hygiene and Pollution Prevention Service industry have relatively higher turnovers. Because of the higher turnover, these companies also have more internal resources compared to other industries; therefore, they are more proactive in employing ASP services.

Table 1: Basic data for the questionnaire

Total Number of Employees		
Number of Employees	Number of Businesses	Percentage
Under 20	60	36%
21~40	39	24%
41~60	23	14%
61~80	14	8%
80	29	18%
Total Turnover per Company(NT\$)		
Turnover (Thousand)	Number of Businesses	Percentage
Below 300	14	8%
300 ~1500	49	30%
1500~3000	24	15%
3000~15000	66	40%
Over 15000	12	7%
Capital (NT\$)		
Capital (Thousand)	Number of Businesses	Percentage
Below 300	50	30%
300~1500	66	40%
1500~3000	21	13%
3000~15000	25	15%
Over 15000	3	2%

4.2 Questionnaire Data Analysis

(1) ASP Service Items

At the present stage, small and medium enterprises are more focused on the traditional hardware and system setup/integration and data processing services, the costs of these services are lower and these services involve less in the operational level [20]. From the result, we can see

that a major portion of the small and medium enterprises in Taiwan do not have a higher level of cognition neither do they value ASP services. In which, the lower the level of cognition is, the lower the degree of ASP services are employed. Companies at level 1 to 3 take up 71.1%, and companies at level 4 and 5 take up only 28.9% (Table 2).

Table 2: Utilization of ASP services

Level	Services	Wholesale	Metal	Food	Electronic Engineering	Environmental Hygiene	Total
1	Hardware Facilities	0	12	4	11	50	77
2	Software/System Development	0	7	2	8	0	17
3	System Setup/Integration	3	1	4	2	2	12
	Guidance/Consultation	2	0	1	4	1	8
4	Data Transmission	11	2	7	2	0	22
	Data Storage	2	2	5	2	0	11
	Corporate Procedure Restructuring	1	1	0	1	0	3
5	Software Rental	8	0	4	3	0	15

In this research, the average scales of the industries are measured by the "Industrial Average Turnover". For which, the total turnover of companies in an industry is totaled, and the sum of turnover is then averaged by the number of companies that needs ASP services (table 3). The number is then assigned as the x axis. Moreover, in this research, "ASP Service Items" are classified into five levels (1 to 5) based on the definitions proposed in the research literatures [20]. Furthermore, the degrees of utilization of ASP items in the small and medium enterprises in each of the industries are further ranked. The rank of each level is calculated by the multiplication of level and the number of companies that belong to the level. The ranks are then summed as "Sum of Level Points" and averaged to derive a set of "ASP Service Item Index" (table 4). The index is then assigned as the y axis. In which, higher level service items focus more on software rental and lower level service items focus on hardware facility setup. Through an ANOVA analysis, we derived $F=103.04(p=0.000)$, which verifies that there are significant differences in the five industries in the Service Item Index. Finally, using the relative positions of each of the industries on the x and y axis, a cross analysis was conducted and the result shows that there are differences among industries for ASP service items (Figure 1). In the chart, the smaller-scale group includes the food/beverage industry and wholesale/retail/food service industry, and the larger-scale group includes the environmental hygiene/pollution prevention service industry, metal product industry, and electronic/electrical industry.

The two groups are then put through a t test, and the result shows $t=25.179(p=0.000)$. From the statistic, it is verified that there are significant differences among industries in the utilization level of ASP service items. Therefore, H1 is supported.

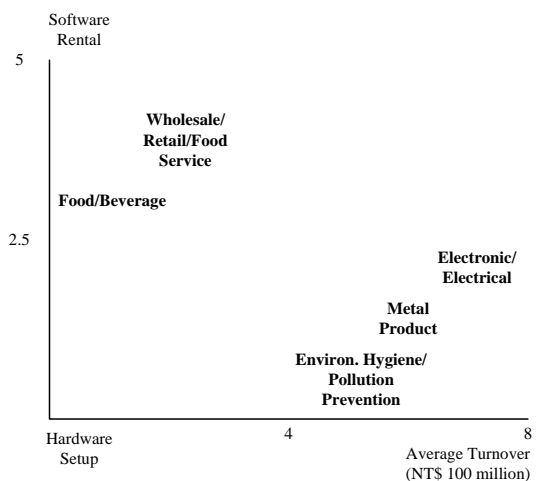


Figure 1: Cross analysis-company scale vs. ASP service items

Table 3: Turnover by industry

	Wholesale	Metal	Food	Electrical	Environmental
Sum of Turnover (NT\$ 100 million)	25.5	157	62.4	250	218.1
Average Turnover (NT\$ 100 million)	0.94	6.28	2.31	7.58	4.12

Table 4: ASP service item dimensions

	wholesale	Metal	Food	Electrical	Environmental
Sum of Level Points	111	49	91	80	59
Valid Questionnaires	27	25	27	33	53
Service Item Index	4.11	1.96	3.37	2.42	1.11

This research expects that different industries have needs for ASP items. Although companies in the food/beverage industry and wholesale/retail/food

service industry have lower levels of ASP utilization, services employed by these companies are leaning more towards software rental, which is a category of service at a higher rank. Therefore, e-business adoption in the industries such as the food/beverage industry and wholesale/retail/food service industry may be an emerging market that can be further developed by ASPs. ASPs may be able to target on the specific needs of these industries and provide them with suitable services.

(2) ASP Service Functions

Currently, small and medium enterprises focus more on basic functions such as website setup

(e-commerce) and backup system (payroll and financial/accounting system), as contrary to the strategic operational functions such as corporate resource planning, supply chain management, and customer relations management employed by the information industry. From another aspect, financial/accounting systems have the highest utilization rate in small and medium enterprises. It is a standardized service; therefore, it is an ASP service function highly suitable to be promoted to small and medium enterprises (Table 5). In the category, business operators do not have high demands for ASPs for office productivity services, which is probably due to the success of MS Office.

Table 5: ASP service functions

Ranks	Service Functions	Wholesale	Metal	Food	Electrical	Environmental	Total
1	Office Productivity	1	23	17	7	24	72
2	Financial/Accounting System	5	0	5	5	19	34
	Payroll System	8	0	2	3	7	20
	E-Commerce	7	0	0	3	2	12
3	Data Storage	2	1	1	3	0	7
	Group Software	0	0	0	5	0	5
	Procurement	0	1	1	2	0	4
4	Banking	1	0	0	1	0	2
	Distribution	1	0	0	2	0	3
5	Customer Relations Management	0	0	1	0	0	1
	Supply Chain Management	1	0	0	1	0	2
	Corporate Resource Planning	1	0	0	1	1	3

This research assigns the “Industrial Average Turnover” as the x axis to measure the average scales of the industries, and at the same time, ranked the “ASP service functions” into five levels based on the complexity of the application software involved [16]. The levels of ASP service utilization of the companies in each of the industries are also ranked. The rank of each level is calculated in the same way for table 4. The ranks are then totaled as “Sum of Ranks” and averaged to derive the “ASP Service Function Index” (Table 6). The index is then assigned as the y axis. In which, higher level service items focus more on the company’s operational strategy level, with service functions such as corporate resource planning, supply chain management, and customer relations management. Lower level service items focus on the execution level, with services such as financial/accounting system, human resource system, and e-commerce. Through an ANOVA analysis, we derived - $F=42.81(p=0.000)$, which verifies that there are significant differences among the five industries in the Service Function Index. Finally, using the relative positions of each of the industries on the x and y axis, a cross analysis was conducted and the result shows that there are differences among industries for ASP service functions (Figure 2). From the chart, this research found that the wholesale/retail/food service industry and electronic/electrical industry have higher ASP

service function indexes, and the food/beverage industry, metal product industry, and environmental hygiene/pollution prevention service industry have lower ASP service function indexes. The two groups are then put through a t test, and the result shows $t=7.361(p=0.000)$. From the statistic, it is verified that there are significant differences among industries in the utilization level of ASP service functions. Therefore, H2 is supported.

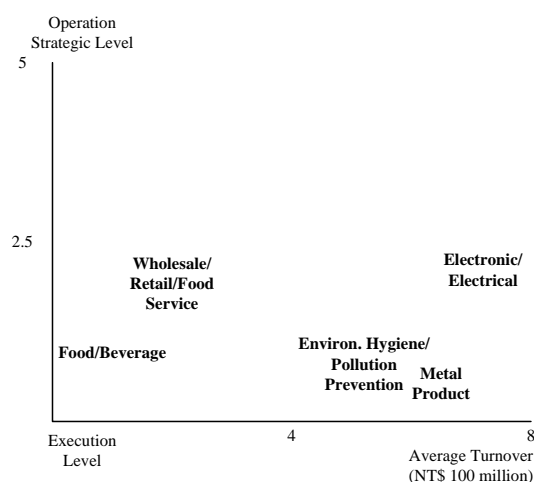


Figure 2: Cross analysis - company scale vs. ASP service functions

Table 6: ASP service function dimensions

	Wholesale	Metal	Food	Electrical	Environmental
Sum of Ranks	65	29	42	81	85
Valid Questionnaires	27	25	27	33	53
Service Function Index	2.41	1.16	1.56	2.45	1.60

From the result, this research concludes that there are significant differences among industries for different needs in ASP service items, but they are leaning more towards the execution level. Although operational strategic level ASP services (ex: corporate resource planning, supply chain management, customer relations management) can effectively upgrade the companies' operational effectiveness, relatively, a tremendous amount of resources are also required before a system is completely set up. The real needs of small and medium enterprises for ASP services are more at the execution level. In which, ASP services were constantly demanded by the wholesale/retail/food service industry and electronic/electrical industry including: financial/accounting system, payroll system, and e-commerce. Although these services are not mission critical, they are services urgently needed by a vast number of small and medium enterprises in the country. We wish that ASP operators will provide services and develop software that target on the real needs of small and medium enterprises.

(3) Major Factors of Consideration when Choosing ASP Services

Based on research literatures, this research divided the major factors considered by businesses when choosing ASP services into five categories and according to the degree of consideration, the categories are ranked into 5 levels. The level points indicated by the companies in each of the industries are then summed and averaged. According to the data,

the factor cared most by small and medium enterprises when choosing ASP services are data safety and service quality because once important company data is leaked out, the company may lose its competitiveness completely. Moreover, since small and medium enterprises are rather limited in resources, the range of ASP services affordable to them is also limited; therefore, the quality of services may affect a company's operational effectiveness directly.

This research uses Scheffe multi-layer comparison to verify whether the industries have the same factors of considerations when choosing ASP services (table 7). From the result of verification, we derived that the electronic/electrical industry cares more for data security when choosing ASP services because most companies in this industry are larger than those in the other four industries; therefore, the volumes of their internal data are also larger, and due to which, they care more about the security of their data. The environmental hygiene/pollution prevention service industry cares more for the service quality because this industry has higher degree of ASP utilization compared to the other four industries in this research; therefore, they care to a higher degree for the service quality. The wholesale/retail/food service industry cares about the connection speed and service quality the most because most companies in this industry have multiple points-of-sales; therefore, they have higher degrees of needs for data transmission. Because of which, companies in this industry pay more attention to the speed of connection and service quality. Moreover, both the electronic/electrical industry and environmental hygiene/pollution prevention service industry care more for the quality of consultants. For software brand, none of the five industries show any significance. Therefore, this research thinks that different industries have different considerations when choosing ASP services. Therefore, H3 is supported.

Table 7: Multiple-layer verification-factors of consideration when choosing ASP services

Factors	Groups of Different Numbers of Employees					F Value	P Value	Scheffe
	1 (n=27)	2 (n=25)	3 (n=27)	4 (n=33)	5 (n=53)			
Data Security	4.0	3.0	3.1	4.8	3.7	212.68	0.000*	4>1=5>2=3
Service Quality	4.2	2.4	2.9	3.0	3.9	164.19	0.000*	1>5>4=3>2
Speed of Connection	3.9	1.9	2.3	3.1	2.9	165.40	0.000*	1>4=5>3>2
Quality of Consultants	2.2	2.1	2.7	2.9	2.9	37.70	0.000*	3=4=5>1=2
Software Brand	2.1	2.1	2.2	2.0	2.2	2.36	0.065	--

*: Indicates p-value<0.05

5. CONCLUSIONS AND FUTURE RESEARCH DIRECTIONS

The main objective of this research is to verify the needs of small and medium enterprises in each of the industries for ASP services and analyze the

differences in the needs of different industries. From this research, we found that larger-scale companies such as companies in the environmental hygiene/pollution prevention service industry, metal product industry, and electronic/electrical industry have higher degrees of ASP utilization, but the items of utilization focus more on hardware and system

setup, which are not real ASP services. Although the utilization levels of smaller-scale companies such as companies in the food/beverage and wholesale/retail/food service industries, the services used by these companies are leaning more towards software rental, which is more suitable for the development of the ASP industry. From the above, this research thinks that ASP operators should target on specific industries and provide them with specific services, especially companies in the food/beverage and wholesale/retail/food service industries. For example, ASPs can provide online POS systems for food service companies, logistic management systems for hotel businesses, and global merchandise tracking for merchandising companies. Services vary according to the different characteristics of the industries. The objective is to solve the problems faced by the specific industry.

In another aspect, although focusing on the operational strategic ASP services (ex: corporate resource planning, supply chain management, and customer relations management) can effectively upgrade a company's operational effectiveness, relatively, a tremendous amount of resources must also be put in before the system is completely set up. However, the real needs of small and medium enterprises still lie on the execution level ASP service functions. Therefore, this research thinks that ASP operators should provide basic services that are with added values to small and medium enterprises, such as e-mail management, antivirus, financial/accounting system, human resource system, and stock management system. These services are needed by most companies; therefore, they are suitable for all industries. They are also the type of services urgently needed by small and medium enterprises in the country.

At the present stage, the factors cared most by small and medium enterprises when choosing ASP services are data security and service quality. From the result of statistical verification, we derived that companies in different industries have different considerations when choosing ASPs. For examples, the electronic/electrical industry cares more for data security when choosing ASP services, the environmental hygiene/pollution prevention service industry cares more for the service quality, and the wholesale/retail/food service industry cares about the connection speed and service quality the most. Therefore, this research considers that different industries have different considerations when choosing ASP services.

The main objective of this research is to explore small and medium enterprises' needs in ASP services. To the ASP industry, the niche of small and medium enterprises is still an emerging market that is continuously growing. Subjects relevant to utilization of ASP services by small and medium enterprises are still awaiting researchers for further explorations. This research concludes that probable directions for

future researches may include the following. Basic services with added values are the major profit base for out-sourced ASP services; among which, financial/accounting systems are most welcomed by small and medium enterprises. As how to use relevant information technologies to develop such systems is a subject worth exploring in future studies. Moreover, the food/beverage industry and wholesale/retail/food service industry are businesses in the category of distribution/service industry, and the ASP services feasible for these companies are more focused on software rental and consultation. In the future, the distribution/service industry may become one of the emerging markets for ASP development. As what kinds of specific services that can be provided by ASPs are subjects of further discussions. Finally, there are still some risks involved when small and medium enterprises employ ASP services. How to reduce the risks is also a subject area worth exploring.

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中小企業對應用服務供應商需求之實證研究

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摘要

隨著電子化企業與資訊科技外包應用廣泛性增加，應用服務供應商應運而生，以滿足多數小型企業於資訊科技專業及成本效益分析方面之需求。應用服務供應商透過租賃的方式提供企業軟體服務，使企業能夠以較低的使用成本提昇企業資訊系統。應用服務供應商預期將可為中小企業帶來相當大的助益。因此本文就中小企業對應用服務供應商之需求進行研究，主要針對不同產業對應用服務供應商需求進行實證研究。研究結果發現，食品飲料業與零售餐飲業傾向使用軟體租賃方式，並可為本文研究之其他產業之目標。本研究亦探討中小企業在執行面所關切之議題，所得結果可作為應用服務供應商之參考，以滿足其潛在顧客需求。

關鍵詞：應用服務供應商、資訊科技外包、中小企業

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