Utility Computing: ASP by another name, or a new trend?

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Abstract: *Application Service Providing (ASP) emerged towards the end of 90s with claims of extensive advantages for client organizations, in particular for small and medium size enterprises (SMEs). Notwithstanding many perceived advantages the ASP approach has not gained wide acceptance as the new model for delivery of enterprise applications. Many of the early ASP providers have not been able to establish a viable business model and have discontinued ASP services, or went out of business altogether. However, some major ICT vendors have recently re-confirmed their commitment to the application-as-service model and made large investments in Utility Computing infrastructure. What are the long-term prospects for application servicing? Is Utility Computing a new paradigm for the delivery of enterprise applications, or is this yet another ICT industry fad? How should user organizations respond to these developments?*

This paper follows on from earlier contributions of the authors at SI 2002 and SI 2003, and gives a detailed description of the ASP approach and an analysis of the reasons for failure of many of the early ASP providers. We then summarize both technological and business prerequisites for successful application servicing. We argue that the application-as-service model constitutes a viable alternative to software licensing for many application types today, and will become the dominant method for delivery of enterprise applications in not too distant future. End user organizations need to prepare now for this shift from licensed software and in-house implementation towards applications delivered as services, so that they are able to take full advantage of this new trend.

1. Introduction

Application Service Providing (ASP) emerged towards the end of 90s with claims of extensive advantages for client organizations, in particular for SMEs. Notwithstanding many perceived advantages the ASP approach has not gained wide acceptance as the new model for delivery of enterprise applications. Many of the early ASP providers have not been able to establish a viable business model for application servicing, and have discontinued ASP services, or went out of business altogether. Other important factors contributing to the failure of early ASP providers included lack of a suitable technological infrastructure for hosting a large number of complex enterprise applications in a scalable and secure manner, poor customization capabilities, and almost total lack of integration facilities. As a result of these shortcomings, early ASP providers failed to deliver major cost savings to their customers, resulting in poor acceptance of application servicing by the market place. Recently, however, a number of important ICT vendors have re-confirmed their commitment to application servicing in the context of the new Utility Computing approach (see section 3 for more detailed discussion), and have made large investments in infrastructure for the delivery of application services. Given earlier experiences with traditional outsourcing and ASP most user organizations remain skeptical about Utility Computing and are waiting to see if the benefits of are going to be realized as

claimed by the vendors. In this paper we describe the main distinguishing features of application servicing when compared to the traditional software-licensing model (section 2), and then discuss recent trends in enterprise-level application servicing including Utility Computing and service-oriented computing (section 3). Finally, we discuss user organization strategies for adoption of application servicing (section 4) and consider how user organizations can benefit from application servicing.

2. What are the key characteristics of ASP?

ASP or the software-as-a-service model has crystallized into specific service delivery model in the last two years. In Table 1 we characterize the application service model from three perspectives: design and technology, business, and ICT management viewpoints [Feuerlicht, Vorisek, 2002], [Levy, 2004], [McCabe, 2004], [Vorisek et all, 2003], [Wainewright, 2004]. We compare the ASP model with the traditional approach in which software vendor sells the software license and the customer runs the software on its own technology infrastructure. This detailed analysis emphasizes the features of the ASP model that can help organizations to solve their IS/ICT problems in new and more efficient ways then the traditional approach.

Differentiator	ASP (SW as Service)	Traditional Approach (SW as License)
Main characteristics	Application service provider controls all necessary ICT infrastructure (HW+SW) and delivers application functionality as a service.	Software vendor develops the application; the application is implemented on customer's HW and customer is responsible for the operations.
Design and technology Issues		
Design premise	Designed from the outset for delivery as Internet-based service for a large number of customers.	Designed for implementation by specialist and for customer to operate and maintain.
Technological architecture	Multi-tenant architecture designed to run hundreds or thousands of users from different user organizations on a scalable technological infrastructure.	Architecture suitable for deployment by individual company on a dedicated ICT infrastructure.
Client interface	Browser is the main and often the only interface for all applications. It eliminates the need to develop, install, and support multiple client interfaces.	Many SW vendors have added browser interfaces, but most support multiple clients – it increases development, installation and support costs.
Service management	Applications with embedded service management, monitoring metering and security capabilities.	Typically must add service management, monitoring and metering features subsequent to product development.
Customization method	Customization provided for individual customers without impacting on the core application components minimizing additional development costs.	Extensive customization supported for both the configuration and source code levels.
Upgrades	Frequent (every 3-6 month) upgrades possible. All customers are upgraded simultaneously resulting in significant cost reductions.	Infrequent, major updates (every 12-24 months). Both, provider and customer, have to implement version management process.
Business Issues		

Differentiator	ASP (SW as Service)	Traditional Approach (SW as License)
Readiness of the service	Short implementation cycle.	Long implementation cycle due to complex implementation of HW, SW, and knowledge transfer to customer sites.
Availability of the service	The service is available from any location (globally).	Could be limited to single organization via intranet or client/server interface.
Scalability	The volume of the services delivered (i.e. number of users supported, number of transactions) can be scaled (up or down).	Configuration needs to support peak requirements, and cannot be scaled down.
Flexibility to business changes	Good if alternative service providers are available.	Good if the business change requires only minor application changes. Inflexible if the business change requires major application changes or new application development.
Customization	Typically limited.	Extensive customization possible, but expensive.
Functionality	Often limited functionality, application designed for narrow vertical market.	Extensive functionality, customers often use only small part of the available functions.
Technical and administrator training	Minimal training required.	Extensive training needed.
Internal sources utilization (people, technology, etc.)	Only few internal sources used for ICT processes support. Most of the company sources are used for core business processes.	Many internal sources used for ICT processes support.
Costs of ICT	Predictable, no investments required - operating costs only. The costs are highly correlated with the volume of services.	Both investments and operating costs. High overhead costs given by depreciation and amortizing of investments. The costs may not correlated with volume of service delivered.
ICT management Issues		
ICT sources utilization	ICT sources of the provider (HW, SW, ICT specialists) are used across all customers; provider has advantages of economies of scale.	ICT sources are used only for one organization.
Responsibility for ICT infrastructure	Provider.	Customer (but some of the activities often realized by third parties).
ICT knowledge required at customer site	How to use ICT for competitiveness enhancement, available services at ICT market, SLA structure, and management of service delivery.	The same as in ASP plus: wide spectrum of ICT knowledge. The required ICT knowledge is dependent on number of platforms and types of application used.
Size of ICT personnel at customer site	Very small.	Large – different types of specialists needed.
SLA	The usage of SLA is standard.	SLA in most cases not used.

Differentiator	ASP (SW as Service)	Traditional Approach (SW as License)
Evaluation of an application	The application can be evaluated before the purchase.	Application is evaluated after purchase, installation and customization.
Problem and change management procedures	Short feedback cycle - procedures enable almost immediate feedback. Support staff or programmers can directly identify and fix problems. Fixing a problem for one customer fixes it for everyone, which reduces support costs.	Problem solving is often indirect via intermediaries (VARs, SIs, etc). Patches and upgrades are implemented at individual customer sites. Costly and unreliable, as customers often delay installation of patches and upgrades.
Risks	Loss of control over ICT resources. Stability of the provider. Poor system performance. Poor customization. Difficult systems integration – who should be responsible? Enhancements not under control of the customer. Security.	Stability of the provider – but not to the same extent as for ASP. Technology backwardness. High TCO (Total Cost of Ownership).

Table 1: *Comparison of the software-as-license vs. software-as-service models for enterprise applications*

The above table makes a compelling argument for the ASP model as the next logical step in the IS/ICT evolution. Many of the benefits listed above are results of recent technology developments and on deepening specialization of players in this market segment. The speed of further adoption of the ASP model for delivery of enterprise applications will to a large extend depend on the ability of both providers and the users to minimize the risks and maximize the advantages associated with application servicing.

3. Recent trends in Application Servicing

As discussed in section 1 above the first wave of ASP providers have not been able to significantly reduce the costs associated with delivery of enterprise applications. The lack of a suitable technological infrastructure and a viable business model prevented early ASPs from achieving economies of scale that are essential for this approach to gain wider acceptance. However, a number of important recent ICT trends (both business and technical) are likely to shift the balance from in-house implementation of licensed software towards application servicing.

Business Factors

As a result of the recent ICT downturn the sales of new licenses for enterprise application software have stagnated and in some cases declined. There is some evidence that as the enterprise application software market matures, major ERP vendors are changing their revenue model to decrease their reliance on new software licenses towards income generated from software license upgrades and product support [Oracle, 2004], [SAP, 2004]. This combined with the fact that most organizations spend as much as 80% of software-related costs on software maintenance and related activities [Haber, 2004], creates a situation where licensed software is de-facto *rented.* It is precisely this high-level of

on-going costs that motivate many organizations towards alternatives such as outsourcing and application servicing.

Emergence of Utility Computing

The main idea of utility computing is that ICT services are supplied on demand (i.e. as required by the end-user organization) via a grid of interconnected, dynamically configurable, highly reliable and scalable computing resources (i.e. servers, storage, and applications). Computing grid provides an ideal infrastructure for application servicing as it can host a large number of ASP applications in a scalable and reliable manner. Resource sharing and improved hardware utilization of grid computing environments provides a more cost effective solution for hosting enterprise applications than a set of independent servers each dedicated to a specific application. Clusters of servers, storage devices and other resources constructed from low-cost (commodity) components create *virtual* resources on-demand as required by enterprise applications. A number of infrastructure vendors (IBM, HP, Oracle) are in the process of building large data centers with the view of moving towards the Utility Computing model [Eriksen, 2003]. Investment in infrastructure on this scale clearly demonstrates a strategic commitment to Utility Computing and more specifically to application servicing as the new outsourcing model for enterprise applications. Recent efforts to standardize Utility Computing infrastructure in order to facilitate interoperability between vendor solutions led to the creation of Utility Computing Working Group under the auspices of DMTF (Distributed Management Task Force) [DMTF, 2004] and with the participation of major ICT players including Cisco Systems, EDS, EMC, HP, IBM, Oracle, Sun Microsystems and VERITAS. The main objective of the DMTF Utility Computing Working Group is to develop a set of interoperability standards in collaboration with other organizations including OASIS (Organization for the Advancement of Structured Information Standards) and GGF (Global Grid Forum) that will allow the assembly of comprehensive services from components supplied by different vendor platforms.

Role of Web Services

Another key trend favoring application servicing over the traditional software-licensing model is the move towards service-oriented architecture (SOA) for enterprise computing. The nature of enterprise applications have changed dramatically over the last five years; most enterprise applications today have requirements to interoperate across enterprise boundaries (i.e. requirements for e-business). Service-oriented computing based on Web services standards and technologies is widely regarded as having the potential to address the requirements for e-business interoperability and are likely to become the dominant enterprise computing architecture in the future. There is a close relationship between application servicing and service-oriented computing, and Web services are regarded as the enabling technology for the integration of ASP applications, and for delivery of low-granularity application services. The wide adoptions of Web services standards across the various computing environments (i.e. .Net, enterprise Java) makes Web services an ideal solution for application integration, and for exposing selected business functions of complex enterprise applications.

In summary, business and technological factors discussed in this section have created a situation where delivery of enterprise application in the form of services becomes both technically possible, and economically desirable. This is likely to have major impact on enterprise computing over the next five years, finally tipping the balance from licensed software towards software delivered as service.

4. What are the pre-requisites for successful adoption of the ASP model?

In Table 1 (section 2) we listed the differentiators between ASP and the traditional approach for implementation of enterprise applications. In this section we identify the main critical success factors (CSF) for both approaches (Table 2).

Differentiator	ASP (SW as Service)	Traditional Approach (SW as License)
Main CSF – (customer perspective)	Well-designed application and technology architecture based on the emerging service standards: Web services, etc. Optimal granularity of outsourcing solutions (which components of enterprise ICT architecture are the external providers responsible for). Integration of the IS/ICT. The importance of the integration task increases with the number of external service suppliers. Detailed information about ICT market. Control of IS/ICT and service costs. Informed decisions about which ICT resources and ICT services to outsource. SLA specification with focus on the description of the customer-provider interface, not on how the responsibilities of the external provider will be fulfilled.	Choice of the optimal ICT components of the IS/ICT infrastructure. Scalability and flexibility of IS/ICT infrastructure. ICT services availability and security. Management of IS/ICT operations and IS/ICT maintenance. Integration of the IS/ICT. Appropriate knowledge and capacity of internal ICT staff.

Table 2: *Main Critical Success Factors (CSF) for software-as-license vs. software-as-service models for enterprise applications*

As we see in Table 2 successful adoption of application servicing by an organization is dependent on a number of CSF factors. The following factors are particularly important to address in order to realize the potential benefits of the ASP model:

- Ensure close link between business objectives, ICT, and sourcing strategies,
- Specify the interface between business processes and ICT processes on the basis of ICT service definition (SLA),
- Define and manage ICT processes in order to deliver ICT services effectively,
- Define and manage ICT architecture to ensure low operational and maintenance costs and efficient ASP usage.

♦ *Close link between business, ICT, and souring strategies*

It is recognized today that business and ICT strategies cannot be developed independently, and that ICT strategies cannot be derived from business strategies. In particular, organizations whose core business is based on ICT (banks, insurance companies, telecoms, etc.) have to develop the main components of both strategies together. A new element introduced by application servicing and outsourcing is that sourcing strategies for both core business and for ICT have to be defined at the same time. The following are reasons for this new requirement:

- Efficient business strategy defines the core business of the organization, separating core business processes from supporting processes, and defines the partners and their competences and responsibilities as used in the supply chain. When organization decides to outsource a supporting

business process to an external partner (so called Business Process Outsourcing – BPO) then in most cases the ICT structure has to be modified,

- ICT strategy defines what services are delivered to different groups of users (employees, top management, partners in the supply chain, customers, and public). These services have to be aligned with the products and services produced by core business processes,
- ICT strategy specifies ICT processes and ICT resources that are used to deliver ICT services and which ICT resources will be owned by the organization and which by its external partners. ASP is one of possible outsourcing options that needs to be considered [Feuerlicht, Vorisek, 2003]. ICT strategy decisions have impact not only on ICT efficiency but also on organization's flexibility and competitiveness [Aberbethy, 2004].

♦ *Effective management of business and ICT processes and resources*

Another key element for effective ASP deployment is the structure of business and ICT processes management; in this respect the SPSR model as illustrated in Figure 1 is a useful tool. In this model business goals are achieved through core business processes. Both the core and supporting business processes are supported by IS/ICT services, which are defined in the form of SLA's. IS/ICT services are produced by IS/ICT processes, which consume IS/ICT resources.

The purpose of dividing business management into five layers is to identify the responsibilities of different types of business and ICT managers in a transparent manner that delineates the business goals, up to the layer of ICT resources management. It also enables the creation of a set of metrics that can be used for business and ICT processes control (situations where different metrics can be used are indicated by a *clock*). The model was described in more details elsewhere [Feuerlicht, Vorisek, 2002].

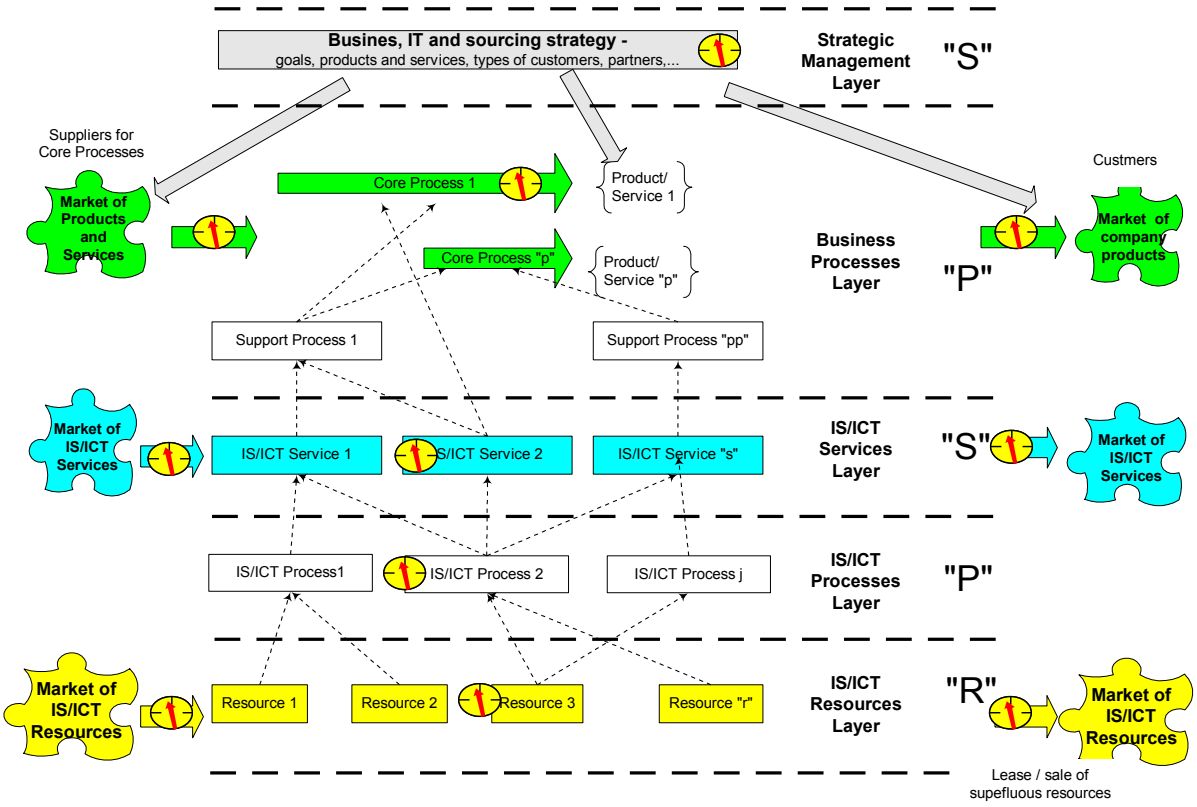

***Figure 1:** SPSR Model*

The fourth level – IS/ICT processes – was incorporated into the model recently in order to take advantage of the methodologies of IS/ICT processes management such as ITIL or COBIT. Irrespective of the deployed methodology, the IS/ICT processes have to be defined so that they enable the organization to achieve its business goals (Table 3 below).

	Goals of the Processes	Outcome of the Process and its Priority
Strategic Level	• New business opportunities. • Exclusive partner relationships.	Complex changes of partner relationships. Priority: Integration of goals and visions of organization and provider.
Tactical Level	• Enhancement of business processes efficiency. • Flexible IS/ICT services and resources aligned with business needs. • Competitive advantage.	Service portfolio management; on-time evaluation of insufficient system performance; incident, problem and change management; changes of SLA's (according to technology and service supply development). Priority: Flexible SLA's.
Operational Level	• IS/ICT services delivery according to SLA's. • Services and resources costs evaluation.	Service delivery management, user support, reports and costs evaluation. Priority: Service according to SLA.

Table 3: *Business goals and outcomes*

Using this model enables organizations to define IS/ICT processes that support business processes effectively and to evaluate which IS/ICT services and resources to outsource and which variant of outsourcing to use.

♦ *Technology architecture design and management*

The next condition for effective ASP deployment is a suitable technology architecture design and management – see Figure 2 below. Organizations that have mature ICT architecture and consistently use standards (the best case in the picture) typically achieve overall reduction in the total cost of ownership (TCO) and the decisions about what to outsource can be made in the context of the architectural framework, rather than ad-hoc.

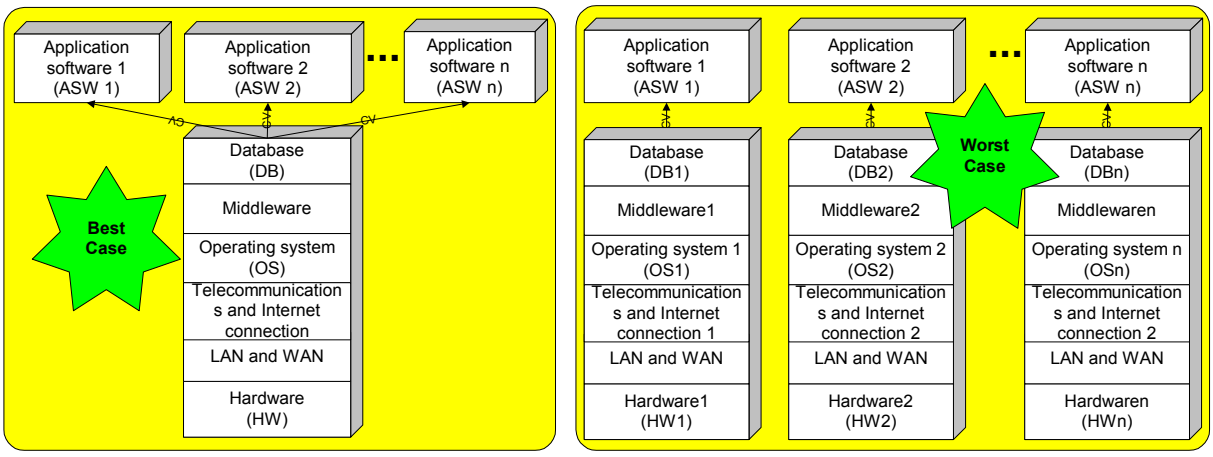

Figure 2: *Technology Architecture Variants*

Another important success factor is the identification of suitable applications for ASP delivery. Certain types of applications are not suitable candidates for ASP given the current limitations of this approach. In particular:

- Mission critical core business applications – typically not available from external providers, and the critical nature of these applications dictates in-house implementation and control,

- Highly customized and specialized applications – providers can not gain economies of scale as the number of customers using such applications is very small,
- Applications with extensive integration requirements – such applications have close dependencies on other enterprise applications and cannot be managed externally.

5. Conclusions

In conclusion, the ASP or software-as-service model provides a viable alternative to software licensing for most application types today, and it is likely that the ASP model in combination with Utility Computing will become the dominant method for delivery of enterprise applications in not too distant future. This view is supported by other studies, for example Gartner ranked "software as service" as one of the current megatrends and predicts that up to 40 percent of all applications will be delivered over the Internet within the next 2 to 3 years. There are important consequences of the shift from the traditional software-as-license model to the software-as-service model for the delivery of enterprise applications. The emergence of Utility Computing as the new paradigm for enterprise applications will have major impact on the *ICT landscape*, creating new opportunities and challenges for both the providers of ICT technologies and services and customer organizations. The reduction in the size of the traditional software license market, reduced demand for on-site implementation and the corresponding increase in demand for application services will lead to further rationalization of the ICT vendor market. Reduction of demand for in-house ICT specialists will lead to the restructuring of the ICT labor market, and demand important changes from user organizations that will need to implement suitable ICT architecture that enable effective participation in the world of service-oriented computing.

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