A Framework for Business-to-Business
e-Commerce for Application Service Providers

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Abstract

The rate of growth of Electronic Commerce (EC) world-wide is racing ahead of forecasts that only a year ago were deemed optimistic. Business-to-business EC has always made up the bulk of revenues. However, enterprises implementing EC, in particular the small and medium sized ones, are faced with several obstacles. These include concerns about information management infrastructure, unclear business models, and lack of resources and skills.

This paper proposes that Application Service Providers (ASPs), who host applications on centralised facilities and lease access to those applications to end users, can play a key role in addressing these issues. It presents a Framework for EC that can be adopted by an ASP. This framework consists of four dimensions: business models and policy, EC applications, technology standards, and information management infrastructure.

1.   Introduction

Enterprises are discovering that they are in a new *"digital economy"*, where traditional solutions do not work with today's problems because the business parameters have changed. Electronic Commerce (EC) is becoming critical in business-to-consumer (B2C), intra-business, and business-to-business (B2B) interactions. In particular, EC is impacting B2B interactions by facilitating virtual organisations where small flexible firms rely on other partner companies in a supply chain. Such virtual enterprises are able to effectively meet changing customer demand by managing the supply chain linking customers, workers, suppliers, distributors, and even competitors.

There are many definitions of EC, from the "buying and selling over the Internet" as commonly found in the popular press, to the broader definition of the "exchange of goods and services of any kind through an electronic medium" used by policy makers [Gilbert et al., 1999]. In this paper, we define EC as: "*An evolving set of information technology tools and implementation techniques, as well as the business strategies and practices necessary to allow the exchange of value within and across business processes through a universal and ubiquitous information infrastructure*". Information must represent value to the business processes that need or use them. "Value" represents value-added information, of which financial and procurement data constitute just a small part. Business processes, such as product development, manufacturing, and distribution, must support business strategies. And the exchange of information requires some universal information infrastructure, which today is often the Internet.

EC growth is racing ahead of forecasts that only a year ago were deemed optimistic. B2B EC has always made up the bulk of revenues. Figure 1 by eMarketer, a company that publishes an average of forecasts by major analysts, shows that B2B EC's share of total EC is projected to increase consistently from US$226 billion in 2000 to up to US$2,775 billion in 2004 [eMarketer, 2001].

A major trend accompanying this growth is the outsourcing of applications and services. Forrester Research predicts that the application outsourcing market will reach US$6.4 billion by 2001. The Meta Group expects the Enterprise Resource Planning outsourcing market to rise from about US$1

billion to US$6-8 billion within the next 3-4 years. And, according to the Gartner Group, the world-wide Application Service Provider (ASP) market will reach US$22.7 billion by 2003 [Sun, 2000].

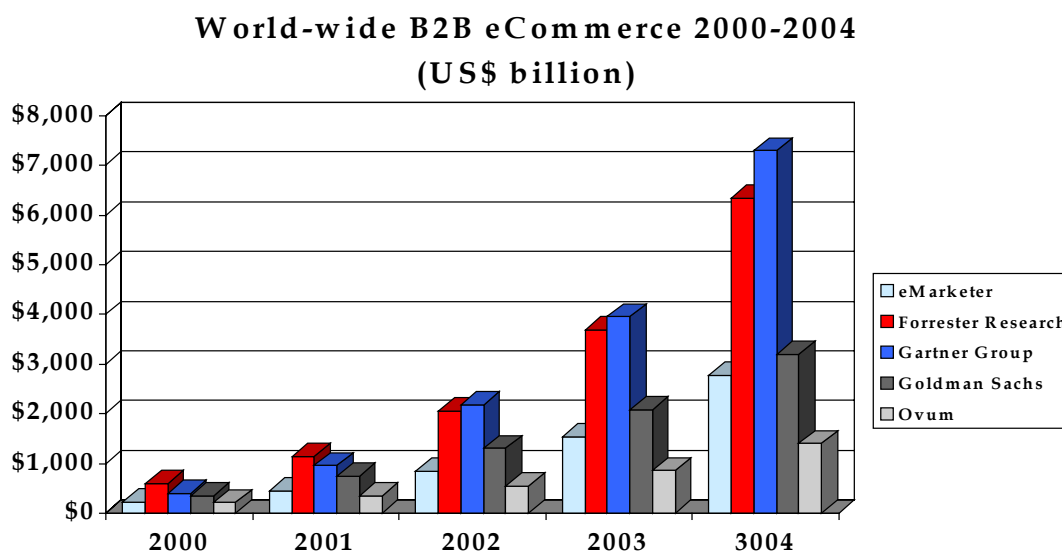**World-wide B2B eCommerce 2000-2004 (US$ billion)**

Figure 1: Worldwide Business-to-Business E-Commerce Revenue [eMarketer, 2001]

However, businesses, especially the small and medium enterprises (SMEs), typically face problems in EC implementation. Some of these problems are: concerns about infrastructure, especially in terms of costs; unclear business models; and lack of resources and skills [Sng, 2000a].

This paper proposes that Application Service Providers (ASPs) can play a key role in addressing the needs for B2B EC, and identifies a Framework for EC that can be adopted by an ASP. The next section discusses the requirements for B2B EC based on the results of four studies conducted in Singapore and around the world. Section 3 reviews the value offered by ASPs, while Section 4 describes how the Framework for EC can be of use to an ASP.

2.   Requirements for Business-to-Business E-Commerce

2.1   Overview of Sources

The primary sources of data for the requirements identified in this paper are:

- *CommerceNet 1999 Study on Barriers & Inhibitors to E-Commerce [Terry, 1999]:* This world-wide survey was designed to identify barriers and inhibitors to EC from three different perspectives: B2B EC in large corporations, EC in SMEs, and B2C EC (retail). Over 900 responses were received from around the world, with over 75% coming from outside the USA, primarily from Europe. This indicates the trend towards the increasing globalisation of EC.

- *NCB 1999 Survey on Internet-based Business-to-Business EC in Singapore [NCB, 1999]*: This survey covered more than 1000 companies in eight industry sectors in Singapore, including manufacturing, freight forwarding, and publishing.

- *CommerceNet Singapore (CNSG) 1999 Study on Barriers to the Development & Diffusion of EC in Singapore & ASEAN [Gilbert et al., 1999]*: The research panel for this study consisted of 100 upper-ranked executives from four segments of the EC industry in Singapore: the B2B sector, online retailers, technology suppliers, and EC solution providers, as well as public agencies concerned with the governance of Web-based economic activity.

- *Consultation with Industry & Government [Sng, 2000a]*: This qualitative study focused on the motivation and requirements for B2B EC, and was conducted as part of the author's Ph.D. thesis. Of the 14 interviewees, over two-thirds were from Singapore. More than half were from senior management of their organisations, and almost a quarter were responsible for EC activities. There was an almost equal spread of manufacturers and vendors, and about a fifth coming from government organisations. The interviewees have worked an average of seven years in their current organisations, with many more years of working experience.

2.2   Interest & Usage of EC

The NCB Study found that companies in selected industry sectors in Singapore were highly Internet-ready, while others were not:

- Close to three-quarters of the companies surveyed had corporate Internet access, and over a third had corporate Web-sites.

- About 9% of the companies were already buying and selling with their trading partners over the Internet, while 28% expressed interest in doing so within the next six months. However, 63% of the companies were either not interested in EC or unsure of their future EC plans.

- The manufacturing and logistics sectors were the most ready for EC.

- Larger companies were embracing B2B EC more readily: 16% of the large companies, compared with less than 8% of the SMEs, were currently trading with their partners over the Internet.

Most of the Consultation Study interviewees came from organisations that were early adopters of EC:

- Most of their organisations implemented EC with the intention for it to make a significant contribution to their competitive positions. Their motivation was pre-emptive, to stay ahead of the competition and to be among the first to take advantage of EC.

- On average, they have been implementing or using EC for almost 6 years.

- In most cases, the Chief Information Officer reported directly to the Chief Executive Officer. Furthermore, their Management Information Systems departments played an important role in their long-range business planning and EC policy.

- About two-thirds of these organisations had a corporate EC strategy, while the rest expect to have such a strategy in one to three years time.

From these studies, it can be seen that the early adopters tend to be larger companies that had the vision and resources to incorporate EC into the corporate strategy, and have put in place the organisational structure to do so. These companies came from the manufacturing and logistics industries, which highlighted the importance of using EC to support Supply Chain Management (SCM).

2.3   Motivation for EC

The top five motivations for EC from the NCB and the Consultation studies are shown in Table 1:

NCB Study	Consultation Study
• Image and reputation	• Ability to reach international markets quickly
• Increase in Sales	• Improved customer service
• Global reach of Suppliers	• Improved information sharing with customers
• Global reach of Customers	• Increased customer loyalty & retention
• Improved Productivity	• Increased revenue through EC channels

Table 1: Top Five Motivations for EC

The common theme among the studies was the need to add value to the supply chain by reaching out to markets, customers, and suppliers, as well as improving information sharing and customer relationships so as to maintain customer loyalty. This translated into improved sales and revenue for the enterprises. This is reflected in the NCB Survey [NCB, 1999]:

- Of the companies already involved in EC trading activity, 95% expected an increase in their EC transaction value in the next 12 months.

- About 25% expected their procurement value to grow by at least 50%.

This theme was reinforced during the Consultation Study where the majority of the interviewees expected customers and suppliers to be the primary users of EC. By improving supply chain partnership, enterprises delivered better value to their customers thus ensuring continued profits [Sng, 2000a].

2.4   Obstacles & Barriers to EC

The top three barriers to B2B EC identified by the primary sources are shown in Table 2 below:

CommerceNet Survey	NCB Study	CNSG Study	Consultation Study
• Corporate Culture • Interoperability with Legacy Systems • Organisation	• Security • Initial Set-up Costs • On-going Operational Costs	• Unclear Business Models • Lack of Skilled Resources • Lack of Legal & Policy Infrastructure	• Internet Security • Legal issues (contracts & liability) • EC use too low among suppliers & customers

Table 2: Top Three Barriers & Inhibitors to EC

The above barriers can be reduced to five broad categories [Sng, 2000a]:

- Concerns about Information Management Infrastructure
- Unclear Business Models
- Lack of Resources & Skills
- Corporate Culture & Mindset
- Lack of a Legal & Policy Infrastructure

2.4.1   Concerns about Information Management Infrastructure

These concerns were raised in all four studies, with costs and security being major issues in the NCB Survey and Consultation Study:

- *Initial Set-up and On-going Operational Costs*: About a third of the NCB Survey respondents felt that such costs were key barriers. Interviewees in the Consultation Study recognised that this was a potential barrier to entry for SMEs.

- *Interoperability*: For EC to provide significant benefits, the EC applications must interoperate with the back-end systems. Often these back-end systems were legacy systems.

- *Security*: Businesses were always acutely aware of security risks, and the corresponding damage that security breaches can do to their reputations. Two thirds of the NCB Survey respondents and all the Consultation Study interviewees felt this was an important barrier.

- *Service Quality*: Early adopters see the value of higher service quality for network access and were willing to pay for it. The mainstream users wanted a low-cost service at an "appropriate" service quality.

Consider the issue of costs being a barrier to entry for SMEs in Singapore. The overall set-up and operational cost of a leased line was a sizeable sum for a SME [Sng, 2000a]. But their customers were demanding a higher degree of information sharing (eg. for just-in-time manufacturing), often in real-

time or near real-time (eg. sharing of status, inventory, and yield information). Thus the SMEs required their own EC servers which had to be linked to their backend systems (eg. MRP II or statistical process control) behind their firewall. Third party hosting services were not appropriate in this scenario.

2.4.2   Unclear Business Models

The CNSG Study defined business models as "the underlying structure and behaviour of the interactions and relationships among the entities necessary to conduct business in a particular way". Panellists in the CNSG Study consistently reported the lack of knowledge of online business models as the most important issue affecting EC in ASEAN today. Most of the EC business models come from the US. However, the markets and overall structure of the Asia-Pacific economies are significantly different from USA. It is usually not possible to adopt US business models directly [Sng, 2000a].

The CNSG Study identified four sub-themes under this category of unclear business models:

- *Inability to Identify and Characterise Different Business Models*: There were too many business models, and a lack of understanding of current business models.

- *Differences between EC and Traditional Business Models*: There were now opportunities for dis-intermediation (the removal of intermediaries, or middlemen, from a value chain), as illustrated by the business model of Dell Computer, and opportunities for re-intermediation, which were illustrated by the various portal and brokerage services appearing on the Web. However, the Internet allows enterprises to compete on a global basis, a fact that had not yet been fully appreciated by most ASEAN businesses.

- *Experimentation vs. Risk Aversion*: Because of the "Asian mindset", most local firms were "risk averse". This prevented them from experimenting and learning about EC, as well as formulating their own business models.

- *Need for Asian and Sector Specific Business Models*: The dynamics of online businesses were dependent on market dynamics. Asian companies conduct business differently from the US and Europe, Singapore companies conduct business differently from the rest of ASEAN, and companies in electronics conduct business differently from petro-chemical companies.

2.4.3   Lack of Resources & Skills

The CNSG Study emphasised that the resource and skill problem was not one of a shortage of technical skills (although there were weaknesses in certain areas), but rather a lack of the right combination of technical and business knowledge. Lack of technical skills tended to affect only the early adopters. The main issues were:

- *Need for Management Understanding*: There was a need to build knowledge and understanding of EC amongst managers. Top management needed to understand the implications of EC on their own and their competitors' business models.

- *Mapping of Technological Skill to Business Skills*: The real challenge was to find technically skilled people with business skills as well, and the ability to apply technology to business.

- *Lack of knowledge of EC developments*: The panellists were divided into two groups here. One group saw the need to keep up with the latest technologies. The second group preferred to stay with relatively stable technologies for some period. This echoed the NCB survey that indicated that one-third of local businesses were interested in EC, while the rest were not.

2.4.4   Corporate Culture & Mindset

Corporations today had not made the necessary organisational and management changes necessary to integrate EC into their business processes on a large scale. This was both a global problem (shown by the CommerceNet Survey), as well as a local problem (highlighted by the NCB and CNSG studies).

The CNSG Study highlighted the problem of the "Asian mindset" as the true barrier to EC diffusion in the region. This mindset came with a desire for immediate return on investment, a belief that it is better to be a follower than an innovator, that "failure is forever", and a reliance on government initiatives. This mindset prevented Asian companies from experimenting with EC. As a consequence, the interviewees in the Consultation Study found that the EC use among suppliers and customers was too low, especially among the local suppliers.

2.4.5   Lack of a Legal & Policy Infrastructure

The CNSG Study found that the following policy issues would affect business-to-business EC:

- *Laws governing Cross-Border Commercial Transactions*: Panellists in the CNSG Study ranked cross-border order facilitation as the highest issue. This is particularly important in the case of global supply chains. Bilateral and multi-lateral arrangements between like-minded countries are needed. In the words of one interviewee in the Consultation Study: "*It is easier to ship goods from Los Angeles to New York, than from Bangkok to Hanoi (a smaller distance)*".

- *Taxation Policy*: Taxation on the Internet was such a difficult issue that the Clinton Administration had decided to refrain from imposing any taxes or tariffs on commercial activities over the Internet [Clinton & Gore, 1997]. Another Consultation Study interviewee felt that: "*structuring corporate taxes across borders would be difficult*".

- *Financing Infrastructure*: The development of hard and soft infrastructure to support the rapid growth of EC was a major challenge for most of ASEAN. Singapore appears to have an advantage with its Singapore ONE broadband information infrastructure. But until Singapore ONE is linked to overseas broadband networks (and until those networks actually exist), Singapore's policy of being a regional hub will not prove to be very successful.

This paper proposes that ASPs can play a major role in alleviating the first three issues. The fourth issue, corporate culture and mindset, requires an industry-wide effort to overcome it, while multi-lateral government action is required to resolve the last issue, legal and policy infrastructure.

3.   Application Service Providers – A Possible Solution

3.1   What is an ASP?

The most comprehensive definition of an Application Service Provider (ASP) is given by International Data Corporation (IDC): "*ASPs provide contractual service offering to deploy, host, manage and rent access to an application from a centrally managed facility. They are responsible for either directly or indirectly providing all specific activities and expertise aimed at managing a software application or set of applications.*" [IDC, 1999]

The ASP concept is simple – software as a service. Scott McNealy, CEO of Sun Microsystems, supports this vision: "*Five years from now, if you're a CIO with a head for business, you won't be buying computers anymore. You won't buy software either. You'll rent all your resources from a service provider.*" Customers have long been able to buy monthly access to every major utility (eg. telephone, power, and water). Before the Internet, delivering software as a service was impractical. The primary reason is that there was no low-cost delivery mechanism that allowed a software provider to leverage infrastructure across multiple users economically. Packaged applications had to be installed in a client/server environment with a large number of users on a WAN to justify the expense. The Internet is essentially a high-speed, high-bandwidth, cheap WAN that a service provider can leverage to deliver software to a theoretically unlimited number of users [Dean & Gilchrist, 2000].

Another reason software as a service matured slowly was the lack of software applications that could be efficiently deployed on the Web. A revolution has begun in the software industry to develop Web-ready applications in a three-tier architecture. The software and IT infrastructure markets have

converged to create a new solution in which Net-centric software is now delivered via the Internet (Figure 2). The provider of this solution is the ASP [Dean & Gilchrist, 2000].
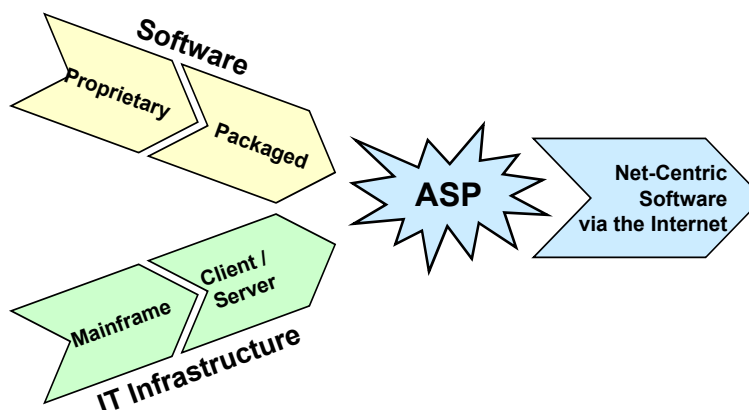

Figure 2: Convergence of Software & IT Infrastructure to the Internet [Source: J.C. Bradford & Co.]

3.2   Why ASPs?

What value do ASPs bring to their customers? Apart from the technology push, the main reasons are driving this trend are: need, and strong value propositions [Gay, 2000].

3.2.1   The Need

ASPs provides a viable solution to the three key friction points faced by most organisations when deciding whether to invest in a packaged software application [Dean & Gilchrist, 2000]:

- The high up-front cost of a packaged software license;

- The lack of in-house IT human resources to install and maintain the software;

- The high cost of building and maintaining the IT infrastructure necessary to support the application.

With an ASP, the customer does not pay an up-front license fee, and outsources the human resource and infrastructure issues to the ASP. The ASP is able to leverage its technical talent and infrastructure across multiple customers, creating an efficient, scalable model [Dean & Gilchrist, 2000]. The ASP way of conducting business overcomes these obstacles for the smaller companies whilst making it cheaper and more efficient for the larger companies [Gay, 2000].

This need has resulted in the ASP model gaining significant acceptance in the USA and Europe. According to the Gartner Group, although the ASP segment is still small and highly immature compared to the overall IT services market, world-wide ASP revenue has grown from US$850 million in 1998 to US$1 billion in 1999 [Berg, 2000b].

3.2.2   Value Proposition of ASPs

The software market has evolved dramatically over the last 20 years from a market dominated by custom applications to one increasingly dominated by packaged applications. Every major software category has a viable packaged software solution, which incorporates industry knowledge and best practices from multiple development experiences and customers [Dean & Gilchrist, 2000]. The result is a relatively lower-cost, higher-functionality product.

Packaged software has achieved deep penetration in the marketplace, particularly among large organizations, because it generally costs less and takes less time to develop and implement than customer applications. However, the cost of a packaged solution, such as Enterprise Resource Planning (ERP), is still beyond many SMEs. Forrester Research estimates that less than 5% of small

businesses have automated basic internal operations like financials and human resource management (this would compare with 100% at large organizations and 50%-plus at middle-market firms) [Dean & Gilchrist, 2000].   Moreover, the high license cost of such applications causes many larger organizations to require strong justification before deciding to make an initial purchase and/or perform an upgrade.

Even if an organisation can afford to buy such software, it may not have the human resources to install and maintain it.   Finally, many packaged applications require a tremendous amount of IT infrastructure and connectivity in order to run at optimum levels. Most organisations do not have the in-house talent or the financial resources to support the necessary infrastructure. ASPs address these issues with a fundamentally different value proposition [Dean & Gilchrist, 2000]:

- *Turnkey solutions*:   ASPs bundle software, hardware, systems development, integration, and management into one offering. The result is that the role of general technology contractor shifts from the company (i.e., CIO) to the ASP. The result is a significant reduction in the decision-making and administrative burden on a company looking for IT solutions..

- *Predictable costs and lower up-front investment*:   ASPs typically price their offerings using contractual monthly fees. Because of the lower up-front costs, an ASP can allow a company to get into a more sophisticated software product than if purchased outright. Prices vary depending on the type of software, the level of customisation, the number of users, and the length of the contract. If there is an up-front cost, it will usually relate to the implementation. The license cost and ongoing maintenance and connectivity costs are part of the monthly fee.

- *Faster time to market*: ASPs can generally deliver software to a client more rapidly than in-house resources or an external systems integrator. There are two reasons for this. Firstly, ASPs typically do not provide a deep level of customisation. Secondly, the ASP is putting the software on its own hardware, a configuration it is familiar with. For example, a typical ERP installation at a client site can take anywhere from six months to two years. Enterprise ASPs can typically deliver ERP solutions in 90–120 days.

- *Ability to scale rapidly*:   Additions to an existing user base and applications leverage initial investments and exhibit rapidly diminishing marginal costs.

- *Easier upgrade cycles*: ASPs do not typically perform a high level of software customisation, but upgrades to a customer's applications can be done more easily. In addition, since the customer did not pay a license fee up front, it will be more likely to want to have the upgrade performed.

- *Minimise the IT human resource headache*: ASPs reduce the IT headcount needs of companies. Moreover, ASPs are able to leverage IT professionals across multiple clients. ASPs should free up internal staff to work on more mission-critical processes and systems.

- *A viable solution to a mobile, distributed work force*: Enterprises are increasingly coping with a work force that is very distributed and often mobile. An ASP can allow a firm to provide employees with access to all relevant applications simply through a browser. This makes it easier for the employee to sign on and work on the network remotely and significantly reduces the firm's burden in maintaining a distributed computing environment.

- *Improve focus on core competencies*:   Most organizations would agree that their core competencies are something other than running IT systems. Despite this, most organizations spend a tremendous amount in the time and money on these systems. ASPs may not reduce the total cost of IT, but they will allow for increased focus on a firm's core competencies.

3.3   Characteristics of an ASP

IDC provides some defining characteristics for an ASP [IDC, 1999]:

- *Application Centric*:   ASPs provide access to and management of commercially available applications. These services are different from business process outsourcing (BPO), where the

outsourcing contract encompasses the management of entire business processes, such as human resources or finance. They are also different from basic hosting services, where the focus is the management of the IT infrastructure (such as networks, servers and databases) with minimal applications management

- *"Selling" Application Access*:   ASP services offer customers access to new application environment without making up-front investments in the application licenses, server, people and other resources. The ASP either owns or has a contractual agreement with the software vendor to license access to the software, and rents access to the application on a shared basis.

- *Centrally Managed*: ASP services are managed from a central location rather than at each customer's site. Customers access applications remotely over the Internet or via leased lines.

- *One-to-Many Service*: ASP services are designed to be one-to-many offerings. The ASP partners with the vendors to package standardised offerings (providing minimal or no customisation) that many companies will subscribe to over a specific contract period. Conversely, IS outsourcing, application management services, and traditional hosting are one-to-one, with each solution deployed to meet the unique needs of the client organisation.

- *Delivering the Contract*: The ASP is responsible for delivering on the customer contract, ensuring that the application service is provided as promised. ASP services will often involve several partners. If a problem arises, however, it is the ASP that is responsible for closing the loop on the problem, even if the ASP works with other vendors to provide the actual support

3.3.1   Types of ASP

There are as many types of ASPs as there are applications. Some typical ones include [IDC, 1999]:

- *Analytic Applications*: These include any application built to analyse a business problem (eg., financial analysis, customer churn analysis, Web site analysis, and risk analysis).

- *Vertical Applications*: These include any industry-specific application, such as MRP in the manufacturing industry, patient billing in the healthcare industry, and claims processing in the insurance industry.

- *Enterprise Resource Management (ERM) Applications*:   These include accounting, human resources, materials management, and facilities management.

- *Customer Relationship Management (CRM) Applications*: These include sales force automation, customer service, and marketing applications.

- *Collaborative Applications*: These include groupware, email, and conferencing applications.

- *Personal Applications*: These include office productivity suites such as Sun's Star Office.

3.3.2   ASP Services

ASP services can be broadly categorised as follows [IDC, 1999]:

- *Core services*: These services include the foundation services that an ASP needs to provide to manage the application environment and provide a base level of customer satisfaction. These include services such as application updates and upgrades, 7x24x365 monitoring of the application, network and servers on which the application would run, and basic customer support.

- *Managed services*: These include all of the core services, plus additional services and guarantees around support, security, application performance, and data redundancy. They would include services such as service level agreements (SLAs) around application performance and data security, dedicated technical support personnel, and daily backup of the application and its data.

- *Extended services*: These include all the managed services, plus additional services. The extended ASP services begin to border on a custom-delivery model. Extended services include application configuration and extension, strategy and planning, and educational support.

3.4   ASP Market

Forrester Research projects the market for application hosting will be worth US$11.3 billion by 2003. This forecast only includes applications for e-Commerce, CRM, manufacturing, human resource, finance, supply chain, and product development.   J.C. Bradford & Co (which adds email, collaboration, and desktop applications to Forrester's definition) forecasts that the ASP market will eventually grow to over US$20 billion by 2003 They believes that as more three-tier applications are introduced in the near term, the large company market for ASPs will gain traction – particularly in email, collaboration, e-Commerce, and CRM applications [Dean & Gilchrist, 2000].
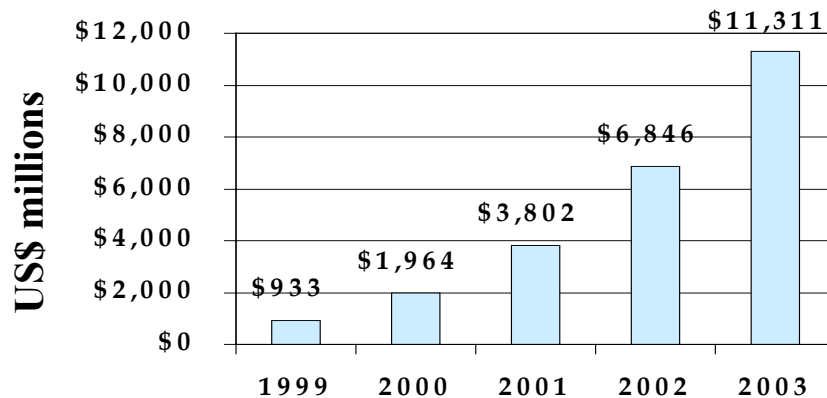

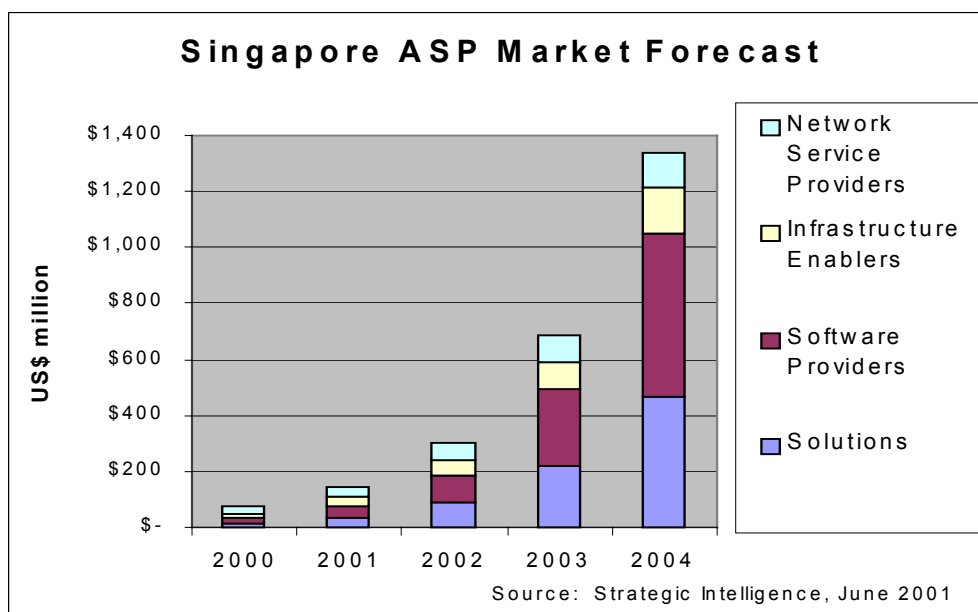Figure 3: Application Hosting Market Forecast [Source: Forrester Research]

Figure 4: Singapore's ASP Market Forecast [Waide, 2001]

Strategic Intelligence forecasts that Singapore's ASP marketspace in 2001 will reach a value of US$143 million, roughly twice the value for 2000. This value, however, represents less than 2% of the US$7.2 billion that will be spent on IT and communication equipment and services in Singapore in 2001. They expect that the total ASP marketplace will rach a value of US$1.3 billion in 2004, an average annual growth of 74% from 2001. This will consume over 12% of Singapore's total IT spending by that time [Waide, 2001].

However, the Gartner Group assesses the ASP market to be at the "peak of inflated expectations" and is beginning the next phase, "the trough of disillusionment". Gartner forecasts that this will occur over a 12 to 18 month period between late 2000 to 2001. They cite three main reasons for this [Berg, 2000b]:

- *Confusion*: ASPs have failed to create a well-defined ASP market in which they can compete on their respective strengths. The rapidly growing number of vendors with different core competencies, the wide range of applications of different types and complexity, and the vast variety of partnerships and alliances have created a confusing picture for potential customers.

- *Pricing Problems*: The "pay-as-you-use" approach for delivering application functionality should be the strongest driver for the ASP model. However, software vendors are still struggling to move from the traditional "license selling" model to a "license renting" model. Thus the ASPs, which have to pre-invest in large volumes of licenses before they can generate revenue, lose flexibility and cannot offer attractive prices to their customers. Software vendors that do not practice a more balanced risk sharing with ASPs will become inhibitors to the ASP model

- *Business Realities*: The ASP business is about high volumes, economies of scale, low margins, and consequent cost management. An ASP must perfect these disciplines across a complex value chain of different suppliers. Only tightly coupled alliances of delivery partners with efficiently linked and managed processes will survive in the market. Furthermore, retaining and motivating highly skilled workforces to run their operations will become increasingly difficult for ASPs.

Nevertheless, Gartner still believes that the ASP model has potential for a great future [Berg, 2000b]. But first, the ASP market must endure a period of consolidation and maturation, before it is able to develop effective strategies to deliver quality services at reasonable cost to its customers.

The ASPs in Forrester's projections above can be considered to be the first-generation ASPs, which are product centric and focus mainly on digital marketplaces. J.C. Bradford & Co include what can be considered to be second generation ASPs. These are project centric and focus on collaboration. These second generation ASPs will offer greater value to enterprises as they will facilitate collaboration within and between value chains. They will be the catalyst for the next phase of growth in the ASP market.

4. A Framework for Electronic Commerce

To be successful, an ASP will need a framework to unify the four key dimensions (business, applications, standards, and infrastructure) relevant to any EC implementation effort. The framework must provide an open, heterogeneous, distributed and integrated environment for collaboration, with information seamlessly shared between humans, computer systems, software tools, and business processes. Such a framework will support a systematic planning and implementation effort, resulting in greater productivity and efficiency. With such a framework in place, it would be possible to implement an EC strategy to give the ASP a competitive edge in the global market place. The Framework for EC proposed by Sng meets this need [Sng, 2000b].

Figure 5 shows the proposed framework for EC. This consists of the Business Models and Policy dimension, a suite of EC Applications, the Technical Standards dimension, all of which are supported by several layers of Information Management Infrastructure [Sng, 2000b].

The **Business Models and Policy** dimension play a critical role in defining the business models that drive the EC applications and the policies required to ensure their success. This dimension includes the business models for the EC applications, corporate culture, and legal issues.

- *Business Models*: Gilbert et al define business models as "*the underlying structure and behaviour of the interactions and relationships among the entities necessary to conduct business in a particular way*" [Gilbert et al, 1999]. Examples of business models include the marketplaces (vertical and horizontal), online catalogues, auctions, and exchanges.

- *Corporate Culture & Mindset*: The move to EC involves massive changes for organisations, and the individuals within the organisation. Such changes are never easy, and there is a natural resistance to changes that are not well understood or liked. In particular, is the issue of the "Asian Mindset" [Gilbert et al, 1999].

- *Policy*: The business models define a broad high-level approach to the goal of the implementation of EC. They are realised by means of policies, which provide definite guidelines on which design decisions and operations procedures can be based. Policies can be grouped into two broad categories: strategic and tactical. Strategic policies deal with intentions, priorities, and focus, and are typically implemented at a national or corporate level. Tactical policies are more specific, focusing on effective execution, and can be implemented down to a project level.

- *Legal & Regulatory Infrastructure*: For EC to flourish, there needs to be a conducive legal and regulatory environment to allow businesses to enjoy the same protection online as they do conventionally. For example, in Singapore, several laws have been passed or enhanced to protect businesses when they engage in EC. These include the Electronic Transactions Act 1998, the Electronic Transactions (Certification Authority) Regulation 1998, Computer Misuse (Amendment) Act 1998, and Copyright Act.

- *Resources & Skills*: Two key issues are: management having a good understanding of EC, and the project team having the right combination of business and technical skills.
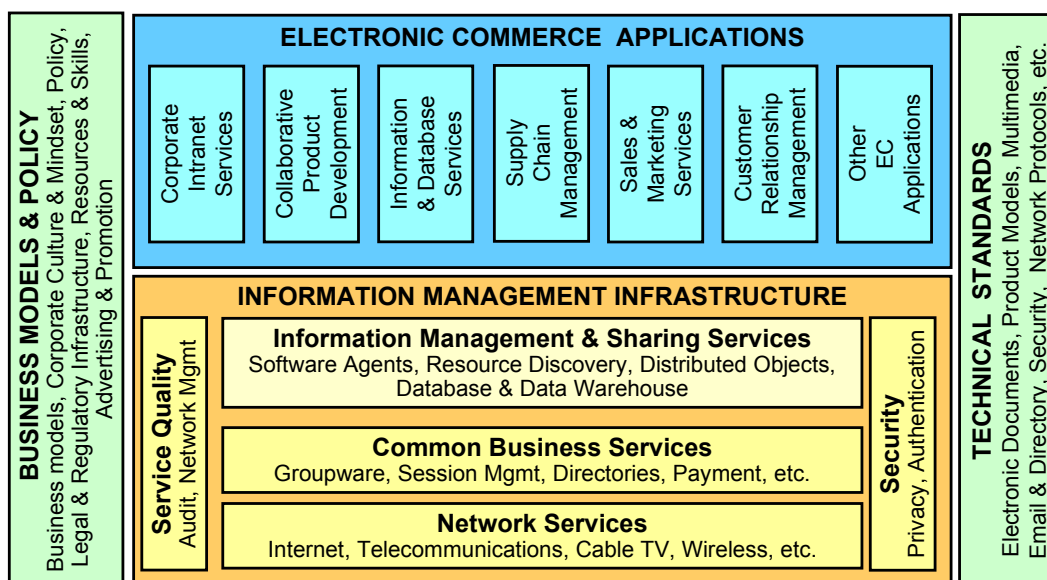

Figure 5: Framework for Electronic Commerce [Sng, 2000b]

The **Electronic Commerce Applications** dimension implements and supports the overall business strategy. They consist of business processes enabled by information technology and cover the range of B2B EC applications found in corporate supply chains.

Technical Standards are essential for ensuring compatibility and interoperability between EC applications across the entire network. These include standards for electronic documents, product models, multimedia content, and network protocols.

Critical to the technical feasibility of the EC applications are the **Information Management Infrastructure** layers:

- *Service Quality*: This involves the provision of infrastructure management services to ensure a desired level of quality to the end user. Services include the collection, storing, processing, and distribution of data. It involves the determination of service levels (as defined by the ASP's Service Level Agreements) and audit requirements.

- *Security*: These services ensure reliable and secure transactions between entities. It provides security mechanisms for ensuring the privacy of content, authentication of users and content, confirming the integrity of content and connections, and supporting scalability to very large numbers of users, transactions, and content.

- *Information Management & Sharing Services*: This layer provides the means for creating, sending, discovering, and retrieving information. The World Wide Web provides a means to create information (content) and to publish it in some distribution centre (network server). Once content has been stored on a server, information sharing services carry that content across the network. This is the middleware that sits between the Web servers and end user applications, and masks the peculiarities of the environment from the user.

- *Common Business Services*: This facilitates the various business processes by providing an adequate level of services like session management, directory services, and electronic payment.

- *Network Services*: This is the foundation of the framework, providing the physical infrastructure along which all information must travel. It consists of many forms of high-speed network transport, including land-based telephone, cable television, wireless, and satellite systems.

A key issue is whether this EC Framework can cope with change. The Framework is designed to be independent of any particular business model, policy, application, standard, or infrastructure. Rather, it provides a comprehensive "checklist" of issues based on the four key dimensions that need to be addressed in any EC initiative [Sng, 2000b].

The key drivers of change are usually technology or policy. Technological change typically results in a "bottom-up" effect. A new technology (eg. mobile technology) would result in new standards (eg. Wireless Access Protocol, WAP) and changes in information management infrastructure (eg. WAP infrastructure). It would also result in new applications (eg. based on the Wireless Markup Language, WML). These in turn would drive new business models, and possibly require changes in policy and regulations (eg. making it illegal to drive a car while using a WAP phone). All four dimensions of the Framework are affected in this scenario. But the Framework itself need not be changed – only particular instances of Framework elements need to be replaced (eg. new standards, new service quality requirements, new applications, and new business models or policies). And, as mobile technology becomes ubiquitous, the majority of devices on the Internet will not be computers, but "e-appliances". Again, the Framework is still applicable in this scenario, only the end-devices have changed.

Policy changes have a "top-down" effect. A new government policy (eg. telecommunications deregulation) may result in new business models introduced by telecommunications companies for competitive advantage. These result in new applications, based on new standards, and requiring new information management infrastructure. Again, change must be considered in all Framework dimensions with some elements replaced (eg. different business model) or new ones introduced (eg. new class of standards). Nevertheless, the overall structure of the Framework remains the same.

5.   Conclusion

Over the past few years, EC has grown beyond all expectations. Businesses are finding new ways to provide innovative products and services electronically, to globally distributed customers and partners. The Internet is changing the way enterprises do business, from the acquisition and servicing of customers, to the management of their relations with suppliers world-wide. EC's rapid growth provides evidence that it will be the engine for global economic growth in the 21st century.

The Gartner Group observes that the ASP model has emerged as a major global trend driving the phenomenal growth in the delivery of application services. Today, ASPs often provide enterprises with complete life-cycle applications services, from application hosting to net-sourcing to net-based applications [Berg, 2000a]. ASPs address three of the barriers to EC identified in Section 2.4:

- *Concerns about Information Management Infrastructure*: ASPs alleviate the need for major investments in software applications, hardware, and infrastructure.

- *Unclear Business Models*: ASPs provides a standard business models, and the enterprise just has to select the one that best fits its strategy.

- *Lack of Resources & Skills*: Since enterprises obtains outsource services from the ASP, the enterprise need not make significant investments in resources for EC. It only needs to maintain a core staff for managing the ASPs and their services.

Gartner foresees that the future trend for application delivery is a pre-partnered, repeatable solution in which multiple companies (eg. systems integrators, consultants, out-sourcers, or application vendors) form a formal partnership to delivery the full spectrum of enterprise application services [Berg, 2000a]. The Framework for EC presented in this paper will help ASPs in planning their operations and information infrastructures, as well as how to integrate these with their partners.

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