COLLABORATIVE APPLICATION SERVERS

by

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ABSTRACT

The pace of change in the world we live in is becoming faster with the tick of the clock. New technologies emerge and alter the way we live, the way we do business and even the way we communicate. Better technologies are then sought to help cope with the unexpected changes and conflicts resulting from previously applied technological solutions.

A very important sector of the human life being redefined by the electronic revolution is business. With the Internet technology, new business models are becoming possible. The "Virtual Extended Corporation" and value networks are real business models based on new business strategies and supported by a new technology that makes them function. The concept of collaboration is today's dominant strategy in E-business applications and transformation. However, achieving collaboration is only possible through sophisticated technological models that can prove to be efficient and easy to handle.

This thesis aims at explaining the concept of collaboration as the backbone of today's E-business landscape, and studies the collaborative application servers as the emerging solution for achieving business collaboration.

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CHAPTER ONE

COLLABORATION: THE BACKBONE OF THE CURRENT E-BUSINESS MODEL

This thesis tackles one of the recently emerging services in the IT industry, the collaborative application servers. As a first step, my aim is to define the concept of collaboration that I address in the first chapter. This is done by focusing on the reasons and the context that lead to the dominance of collaboration as a main strategy in today's E-business application. Chapter one also shows how the evolving strategies for achieving inter-enterprise collaboration highlight the fact that collaboration requires a sophisticated IT service and an expensive implementation and updating of the newest software applications. The high cost and the skills required for handling today's technologies lead to the acceptance of the outsourcing of IT services as a flexible, affordable and highly practical solution. This concept of outsourcing introduces the application service providers as a convergence of technology and business trends and as a new means of acquiring computing within the reach of enterprises. Chapters 2, 3 and 4 are dedicated for a thorough analysis of the application service providers. Chapter 2 defines the application service providers and details the factors, catalysts and enablers behind their adoption and their market trends. It also focuses on the ASP advantages as well as on the barriers to be crossed in their implementation. Chapter 3

describes the evolution of technology platforms that lead to the ASP "Thin Client" architecture which makes it possible for an ASP to acquire the characteristics of an "efficiency model". Chapter 4 describes the different types of ASP applications like CRM, ERP and collaborative applications and highlights the emerging business models in the ASP industry. Chapter 5 combines this late ASP technology with the recent business collaboration concept by zooming on a specific type of ASPs, collaborative ASPs, their objective, their architecture, the applications they provide, and the goal they achieve. This is done through the analysis of ieCOLLAB project as a case study and through the description of current collaborative ASPs already competing in the market. The last chapter highlights the strong impact of ASPs on IT industry as a whole, whether on software, hardware, services or communication industries and leads to future market expectations for this technology, a way of emphasizing the importance of ASP as a revolutionary solution in the IT industry.

1.1 The E-Business Landscape

Looking across industries at the myriad activities taking place in the business world of today, a clear pattern of advanced practices begin to emerge. The most significant trend currently emerging, particularly in the high-tech industry, represents a fundamental transformation of the traditional model of business. The new model referred to as the E-Business trend is defined by IBM as " the model covering the full range of business interactions between enterprises conducted over the Internet and other electronic media " [Benchmarking Partners, Inc. and IBM Corporation, 2000]. E-Business encompasses supply chain management, customer relationship management (CRM), enterprise resource planning (ERP) and E-Commerce solutions. New dynamics emerge when a value chain, the combined demand chain and supply chain, is empowered by E-Business methods and technologies. It is a business model that lies behind the rise of the virtual extended corporation driven by market pressure for speed, precision and agility, enabled by increasingly accessible internet-based electronic capabilities. This model is stimulated by IT progression and, on the other hand, its application continuously asks for better IT solutions.

1.2 Collaborative E-Business Trends

New E-Business models are emerging as companies in all industries transform themselves to compete in the Net economy. In fact, today's best practices include the real-time, Internet-based flow of information, documents, and processes across enterprises, system to system.

1.2.1 The Virtual Extended Corporation

The Virtual Extended Corporation is a corporation made possible to function by the present computer networking and telecommunication technology. In a traditional corporation, the steps in a process are typically handled within the four walls of one enterprise. For example, a customer order is received, and the order information flows from department to department through order entry, manufacturing, warehousing, distribution, and finance until a product is delivered to the customer and payment is collected. In the virtual extended corporation, the steps in the process flow across the boundaries of the corporation and are handled by a number of different companies behaving as if they are one company. The emergence of the Virtual Extended Corporation is most evident in the high-tech industry (see Figure 1). Companies in this industry have been eliminating non-core competencies and focusing intensely on their core competencies. Most system manufacturers in this industry have transitioned the majority of their manufacturing to contract manufacturers and to distributors that handle in-channel assembly. While system manufacturers retain control of engineering and design, they have shifted some activities to the contract manufacturers, device manufacturers, and semi-conductor firms. Now, system manufacturers also take orders directly from the customers, contract manufacturers fulfill directly to the customer and third-party logistics firms handle consolidated shipments. What this means is that functions that used to be concentrated in one or two players in the value chain are now performed by multiple companies behaving as if they are one [Benchmarking Partners inc., 2000].

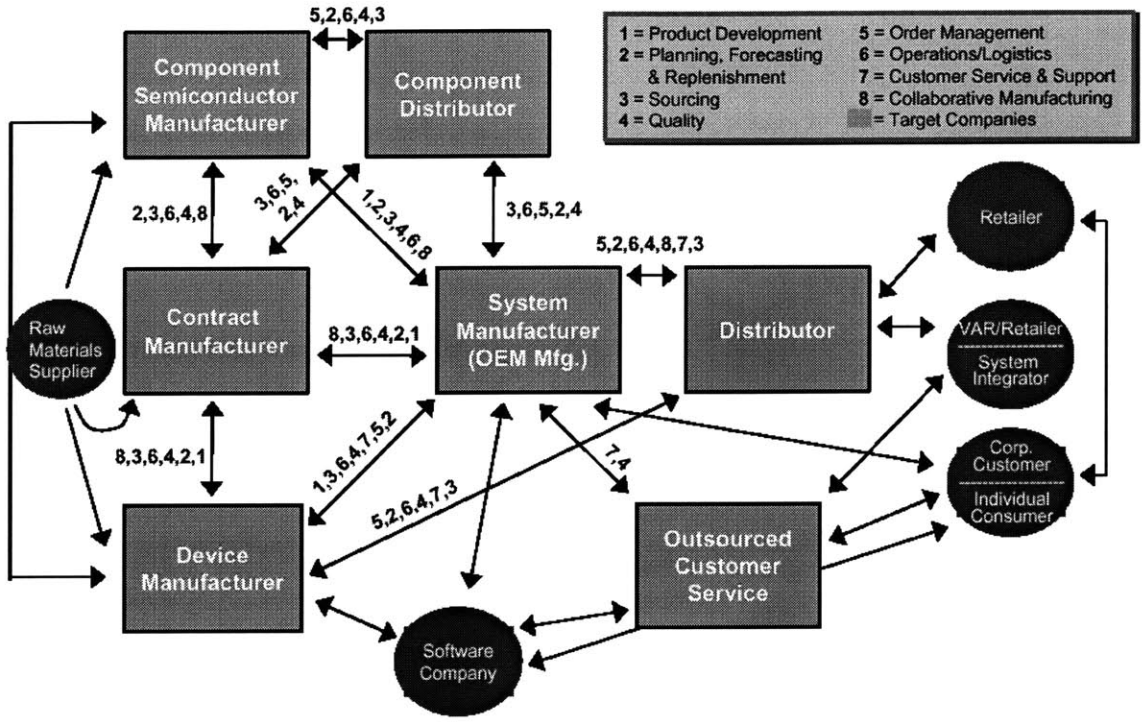

Figure 1. High-Tech Industry Diagram [IBM Corporation, 2000]

1.2.2 Cross –Enterprise, Collaborative Processes

The concept of the virtual extended corporation gave way to the Cross-Enterprise collaborative business model. This is a real-time, cross-enterprise flow of information, documents, and processes, routed and driven by negotiated business rules, untouched by human hands [Benchmarking Partners, Inc., 2000]. This model mandates tight business-to-business (B2B) integration, enabling highly coordinated communities of business partners and customers with shared business objectives to operate with the speed and agility of a single well-run organization. A contract manufacturer executive said, "We don't just want to pass documents back and forth. We want both companies to see materials at the same time, be able to change things at the same time, work on them together." In short, this requires a seamless end-to-end flow of information across companies in the value chain. "It is what we call the cross-enterprise collaborative process that requires an inter-enterprise, web-enabled, system-to-system integration" [Benchmarking Partners, Inc., 2000].

1.2.3 Value Networks

The next step in E-Business evolution is moving beyond inter-Enterprise connections to Value-Networks business models. More complex connections across multiple value chains are currently creating value networks in many-to-many exchange environment. Most industries are becoming a combination of multiple value chains. In the high-tech industry, for example, there is a computer value chain, a router value chain, a printer value chain, and a storage device value chain among others. The product of each value chain is configured and sold separately, and more important is served separately. Players in this industry are looking to provide more comprehensive, better integrated, better performing, and faster to implement total solutions at a lower cost. They are even heading to make complex multi-product solutions more accessible to the individual consumer. This multi-value chain, however, requires moving from one-to-one collaboration, to one-to-many, to many-to-many collaboration. It requires going beyond collaborative value chains, to collaborative interactions among value networks in a many-to-many exchange environment [Benchmarking Partners, Inc., 2000].

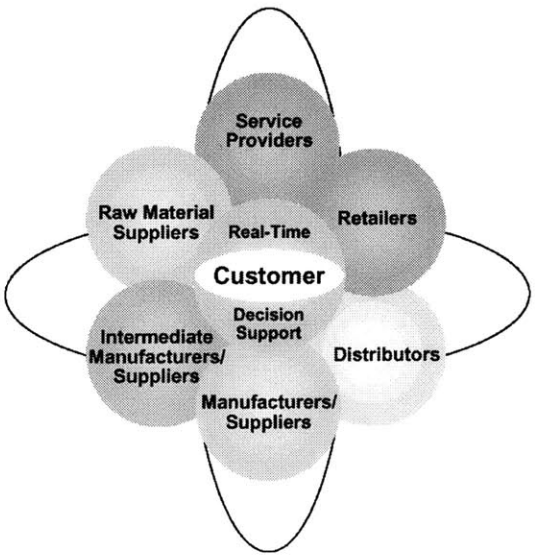

Figure 2. Value Networks [Benchmarking Partners inc., 2000]

1.3 E-Business Maturity

Companies vary in the degree of their e-business maturity. There are "lighthouse" industries that are more progressive as a whole in their e-business practices than other industries. Similarly, a "lighthouse" company is more advanced in its e-business practices than other companies are [Benchmarking Partners, Inc., 2000]. Figure 1 shows the different E-Business maturity stages.

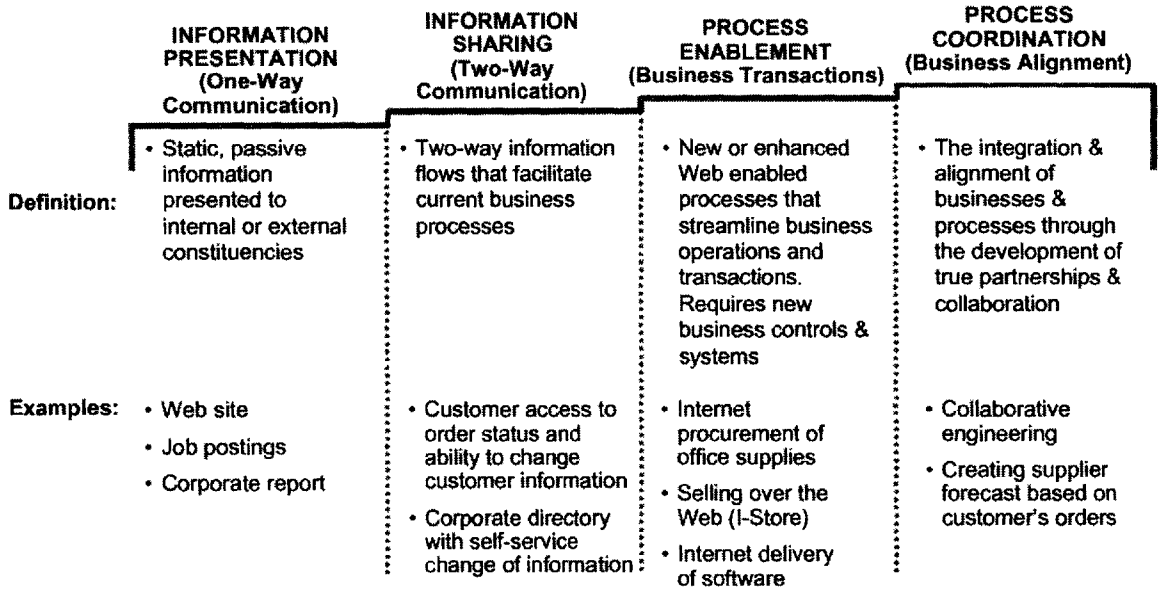

Figure 3. E-Business Maturity Stages [EMC Corporation, 2000]

1.3.1 E-Business Adoption Progression

E-business adoption progresses through several industry and company maturity levels. Three key drivers push companies through the maturity levels [Benchmarking Partners, Inc., 2000]:

- E-business adoption moves from the customer across the value chain: Pressure to adopt e-business practices moves from the customer back across the value chain. A company engages in e-business activity in response to pressure from a key customer,

in turn pressing its suppliers, who pressure their suppliers, and so on. First movers "pull" their nearest trading partners and activity progresses through the value chain. This applies to industries, companies, and value chains.

- Benefits are a motivator: e-business adoption is also motivated by visible benefits. Companies engage in e-business as they observe and experience the benefits from it. Typical benefits from e-business transformation include reduced order cycle time, reduced logistics costs, reduced manufacturing cycle time and costs, improved purchasing productivity, reduced channel inventory, and improved forecast accuracy. These benefits are a result of the dynamic demand/supply network alignment, business process and decision-making integration, internet-enabled internal and external collaboration, and postponement assembly and distribution strategies [Benchmarking Partners, Inc., 2000]. This competitive advantage is achieved through the fulfillment alignment across multiple business entities which leads to optimizing shared operating resources, increased specialization and outsourcing. This makes possible the focus on core competencies in each of the business entities.

- Leapfrogging propels an industry forward: While there are clear advantages to being a "first mover" in e-business, there are disadvantages as well: First movers must invent new methods and systems, clearing the path for followers. Systems built by first movers quickly become legacy systems that can constrain their own continued rapid progress and leave room for new entrants that have learned from the first mover's mistakes and leapfrog their efforts. The "strategic follower" approach, therefore, is a useful option for some companies.

1.3.2 E-Business Drivers and Enablers

There are external market forces that drive a company's rate of progression, as well as internal factors that either constrain or enable progression. How close a particular company is to the end customer in the value chain, the degree of competitor pressure, and the maturity of its industry partners all drive the speed with which a company can and will adopt

e-business practices. In addition, how receptive a particular company is to transformation and to technology both play a role in how quickly and to what degree a company can engage in e-business activities. Some of the business problems that act as drivers for e-business adoption are [Benchmarking Partners inc., 2000]:

- Unacceptable levels of lost sales and shrinking growth
- Weak customer retention rates and eroding brand loyalty
- Margin erosion and excessive unproductive promotions
- Excess finished and raw materials inventory levels
- Total delivered cost inefficiencies
- Excess cycle times to delivery

Some enablers for e-business adoption are:

- Potential from emerging process enablers that encompasses more flexible and integrated organizations and a moving decision control closer to customer.
- Potential from emerging technologies that include mainly the Internet as collaborative backbone, transaction and data warehouse solutions, and decision support demand and supply chain solutions.

1.4 Collaboration: The main Strategy for E-Business Transformation

Collaboration can be defined on different levels; on the first level it signifies interaction between the various members within a company. On the second more sophisticated level, collaboration can be defined as "the process resulting in closed-loop decision making among multiple business entities" [Benchmarking Partners, Inc., 2000].

As the definition implies collaboration is the main method by which the E-Business trends function. Collaboration has become a critical factor to evaluate the E-Business maturity and success. Understanding the company maturity level and the E-Business deployment maturity provides a baseline from which to move forward. E-business is a fundamentally different concept that leverages all elements of business strategy, relationships, and decision making simultaneously. The next step, therefore, is to define the transformational strategies that will best enable a company to respond to its competitive environment. Transformational strategies should be formed in response to business drivers. For effective E-Business transformations, companies must define the dynamic relationship among the business drivers that are shaping the competitive environment and the strategies they can adopt to embrace these drivers and take advantages of core competencies. Figure 1 illustrates the basic business processes supporting an end-to-end product life cycle, from design of a product through delivery and support [Benchmarking Partners, Inc., 2000].

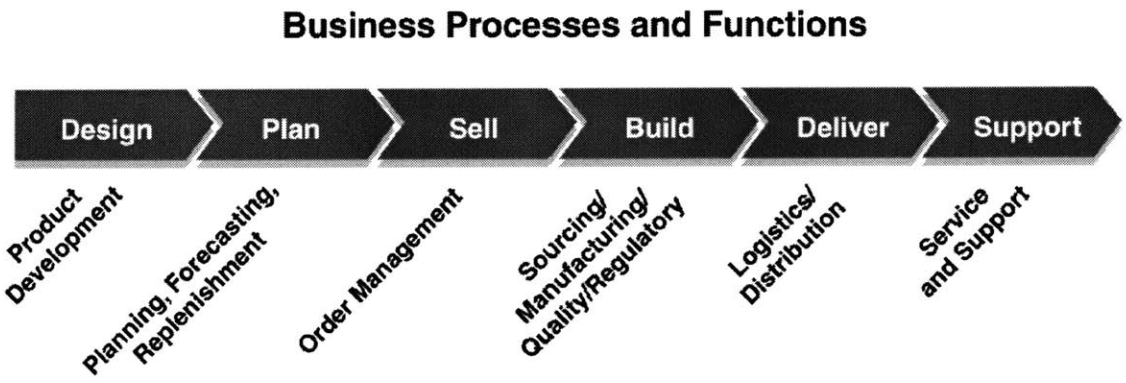

Figure 4. Business Processes and Functions [Benchmarking Partners, Inc. and IBM Corporation, 2000]

While they are clearly inter-related, each of these functional areas has distinct pressures that are driving E-Business transformation. To respond to these drivers, progressive companies are embracing a range of E-Business strategies, including collaborative new product requirements definition, collaborative design, joint quality testing, and industry standards for design inter-operability. A study of several functional areas in today's E-Business practice reveals the level to which collaboration has become a transformation strategy.

1.4.1 Product Development

To remain competitive, manufacturers must introduce products in ever-shrinking time frames. They must also continually improve the quality, reliability, cost, customizability, and serviceability. In some areas, products have become too complex for any one company to design and deliver the whole product. Products and services, especially in high-tech industry, must be designed to inter-operate with other products and services. Another driver is the increased rate of returns, resulting from online ordering and liberalized return policies. The main strategies in response to these drivers include [Benchmarking Partners inc., 2000]:

- Collaborative new products requirements definition
- Automating and streamlining process for gathering and assimilating input, directly from customers or those closest to the customer base
- Collaborative design/parallel design teams: this includes the division of the design and development activities within multiple highly-focused companies, integrating development processes and systems and the close involvement of manufacturing and service organizations in design activities
- Timely and thorough sharing of test results and quality information between companies
- Rapid efficient creation and adoption of industry standards for design inter-operability

1.4.2 Planning, forecasting, and replenishment

The effects of hard-to-predict demand and supply are compounded when there is pure communication and collaboration across the value chain. A main pressure is to reduce inventory. On the other hand, being out of stock can be very costly, from lost sales in the

short run to lost customer loyalty in the long run. The main strategies to solve these problems include [Benchmarking Partners inc., 2000]:

- Collaborative planning, forecasting and replenishment (CPFR): this includes the sharing of strategic, tactical, and operational plans. It also includes the sharing of forecast information with trading partners, mutual commitment and risk based on a common shared forecast, and the sharing of inventory and production data. This is not to forget the notification of supply allocation and the automated ordering based on a common forecast.

- Coordination of promotional activities between multiple enterprises and integrating customer-specific demand with total market demand.

1.4.3 Manufacturing

The main drivers in this E-Business function are cost, quality, schedule pressures, and capacity constraints. They also include the desire for customization where customers are demanding more individual choice without higher cost. High capital costs for physical plant and the need for optimum plant utilization are also main concerns. E-Business strategies to deal with these pressures include [Benchmarking Partners inc., 2000]:

- Collaboration on design-for-manufacturability throughout the design process. This makes possible the concept of outsourced manufacturing that includes factories" with supply-chain visibility

- Automation of hand-off manufacturing

- Collaborative supply capacity management

- Postponement: assemble-to-order at the distribution center instead of build-to-forecast at the manufacturing plant

1.4.4 Quality

High quality has become a minimum requirement for doing business. There is practically zero tolerance for poor quality. More important is that quality must be achieved at lower cost and with rapid design/test cycles. The main strategy to achieve this is through timely, thorough sharing of information on product or service failures and customer complaints with design and manufacturing partners. This requires remote testing and a collaborative sharing of information on process performance impacting product reliability and action planning to compensate for product, process, or service quality and returns.

1.4.5 Service and Support

The main drivers in this E-Business function fall under the customer service demands. These include instant, effective, continual service and extremely high product reliability. Other drivers are under the demand for total solution support. Whenever multiple products must work together, customers want a simple way to resolve issues. This requires that vendors detect and fix problems with no customer involvements. The strategic solutions in this E-Business function include [Benchmarking Partners, Inc., 2000].

- Online support community that acts like a forum for sharing of problems and solutions between customers, channel partners, manufacturers, and service providers.

- Integration of support processes, call centers and knowledge bases by multiple vendors: This is a high collaboration process that includes real time transfers of configuration, problem, and contact information. More importantly, this process consists of multi-company teleconferencing while viewing common customer/problem data and mutual cross/training of support personnel across partner organization.

1.5 Evolving Strategies for Achieving Collaboration

Immature technology, an unready market, and poor E-business strategies will see Internet only and traditional companies will fail as they attempt to become E-Businesses. Many organizations over-estimate E-business benefits and under-estimate the time, cost and effort needed to realize the benefits. Successful transformation into E-Business models requires new strategies and processes, as well as a robust and scalable application technology platform. With the right strategy and solid execution, an enterprise can transform itself to compete and grow in today's rapidly changing business environments. [EMC Corporation, 2000].

1.5.1 ERP: The Interconnected Transaction Layer

In the collaborative E-Business, an interconnected or integrated transaction layer such as Enterprise Resource Planning (ERP) inside each company in this value network is critical. If information is to flow around a value chain, whether it is high-tech, consumer product, or insurance etc., it must be able to flow without interruption across the "borders" of multiple companies that should be working together transparently to the customer. Today's best practices include the real time, internet-based flow of information, documents and processes across enterprises, system-to-system. Investments in ERP are a step to laying the foundation for further optimization and ultimately for cross-enterprise collaboration. However, while EPR is an approach that has many advantages, it has proven to be an inefficient strategy in meeting the following requirements and problems [Benchmarking Partners, Inc., 2000]:

- Technological requirements for supporting business connectivity: Technology forms the foundation for collaborative E-Business. The dynamic integration of advanced planning and optimization simulation models is essential. This requires full solution application, database, and information interaction perspective. This technology also has to cope with the closed-loop collaboration process that is much more sophisticated than communication, and has to achieve an integration of evolving best practices workflow, which is critical for speed to return on investment (ROI). In the

application of such technology lie several requirements [Benchmarking Partners, Inc., 2000].

- *Depth*: the underlying technology must be able to handle multi-enterprise exchange of complex documents, deep collaboration (collaboratively developing a design specification), and the management of multi-step processes.

- *Breadth*: companies are looking to broaden their reach to smaller customers – for whom current approaches are not cost effective – and eventually to end consumers.

- *Business Agility*: companies need to be able to engage quickly in new trading partner relationships in an environment of rapid change. One executive commented, " Our product life is all of eight months. Taking three months to set up a connection is just too long. We need to be able to go into business on a handshake."

- *Process Management*: when the steps in the process are designed and executed within the four walls of one company, the management of that process is also contained within the company. In a Virtual Extended Corporation, however, those steps are handled by different companies, and the overall process management executed from end to end successfully must be technologically supported as well.

- Importance of standards: Investments in ERP and the internet-based system-to-system technological connections provide deep connections and support collaborative work, complex document exchange and inter-enterprise processes. However, with no standard protocols, they are still custom developed connections that are expensive, take time to set up, and are difficult to scale. One major system manufacturer, for example, currently has custom connections in place with forty of its top customers. But, the manufacturer explained, "we can't afford it with our 112,000 suppliers or even our 1,200 key suppliers." Moreover, while current

approaches provide some management of the overall, end-to-end process improvements are needed here as well. These realities highlight the importance of having standard protocols in place. Standards bodies that are developing these protocols are widely recognized as critical to enable the rapid formation of business relationships needed in an E-Business environment. Standard protocols are not limited to technical standards. While those are very important, it is also necessary to have common frameworks and templates in place to facilitate and speed up the business negotiations that are necessary to work in a partnership. In the high-tech industry, there is a point at which the lack of those standards blocks further progress along the E-Business maturity curve [Benchmarking Partners, Inc., 2000].

- EPR strategy presents other problems that prevent it from becoming the solution for e-business application. Some of these problems can be summarized into the following points [Benchmarking Partners, Inc., 2000].
  - ROI (return on investment) does not justify integration
  - Global, Corporate Solutions have been proven unmanageable
  - ERP has never achieved best level of functionality
  - ERP turned out as information storehouses, not as decision support tools
  - ERP proved to be unable to make transition to e-business
  - ERP requires highly skilled staff for its implementation: The e-business organization should have dedicated full-time human resources allocated to coordination, strategy, and technical development. ERP implementation requires a credible point person within each function to coordinate functional Web activities. It also requires Webmasters who own the "keys" to all servers and firewalls and a credible Strategic Planning group to create and execute a corporate vision and to align, coordinate and drive firm wide strategic Web initiatives.

1.5.2 E-BIAS: E-Business Information Architecture Strategy

Evaluating the multitude and magnitude of potential e-business strategies and technology solutions can be daunting. Most firms cannot deploy all of these strategies at the same time, and many firms may not need to implement many of the available technologies. An important step in moving toward e-business maturity is to create an optimal roadmap for new initiatives. Decisions must be made to determine the most appropriate strategies and solutions, as well as the best sequence and priority for implementing e-business initiatives. Steps to take in the prioritization process include [Benchmarking Partners inc., 2000]:

- Define the overall goals of the business and the areas that are most critical to achieving those goals.
- Define the greatest competitive threats and the initiatives that are key to combating them.
- Define the greatest opportunities for competitive advantage and the initiatives/areas that are key to realizing them.
- Indicate the areas that align with and best support the company's core competencies.
- Indicate the areas of the company that are in greatest need of improvement.
- Analyze how a company and its customers, suppliers, and competitors fit in the total value network, today and in the future.

These steps provide the starting point for developing a multi-level e-business information architecture strategy (e-BIAS) [Benchmarking Partners inc., 2000]. E-BIAS is an architectural blueprint, tightly aligning a company's e-business value chain strategy with enterprise and cross-enterprise business processes that enable that strategy with their supporting applications, data, and technology. E-BIAS is a plan for achieving strategic corporate goals through information management, and for supporting all corporate and incorporate processes with needed systems. This strategy's initiatives are prioritized and based on

corporate needs and its architecture group includes IT and business process change experts. Table 1 [Benchmarking Partners inc., 2000] compares between ERP and E-BIAS, revealing the reasons behind the inclination towards the more flexible and efficient E-BIAS strategy.

Table 1. ERP v/s E-BIAS [Benchmarking Partners inc., 2000]

ERP	E-BIAS
Back Office	Trading partner/supply chain focus
Full integration, except for non-ERP systems	Integration as needed
Reporting and change come later	Information Management a Focus
Business processes changed by implementation team	Business process and systems change organic
Long, corporate projects ending with Go-Live	Information architecture plan is a living governance document

1.6 Outsourcing: A Business Model Launched by E-BIAS Strategy

The new e-BIAS strategy provides a framework for addressing and leveraging e-business drivers, not by merely enabling existing business processes with new technology, but by transforming organizational, process, and technology strategies to create new business models for the e-business era. Since e-BIAS focuses on "The right information to the right people at the right time" and on "pay only for the information services you need" [Benchmarking Partners inc., 2000], the most dominant business model launched by e-BIAS strategy today is "Information Technology Outsourcing".

1.6.1 Outsourcing defined

Information technology outsourcing is the transfer of components or large segments of an organization's internal infrastructure, staff, processes or applications to an external resource provider. Outsourcing encompasses the most rudimentary to the most sophisticated IT infrastructure, processes or applications. Oftentimes, outsourcing contracts are negotiated for the transfer of non-core information technologies or processes of an organization. [Cherry Tree and Co., 1999].

1.6.2 Acceptance of outsourcing

The concept of outsourcing is increasingly accepted in business today. Management gurus and investors alike emphasize the merits of concentrating on core competencies, and of bringing in outside specialists to perform all non-essential functions. Within the IT landscape, evolution in technology has enabled outsourcing to become much more selective. Many businesses now outsource specific elements of their total IT infrastructure to an outside service provider, including the provision and operation of the data network, the monitoring of service levels experienced by users, and increasingly the provision of specific applications themselves. Such developments have been encouraged by an increasing trend among IT departments to view themselves as internal service organizations, tasked with understanding key business issues and finding solutions to them. Outsourcing allows such groups to concentrate on delivering strategic business value, leaving everyday operational issues in the capable hands of an external provider. For smaller enterprises, the issue is a lack of knowledge and resources to deploy and operate the new technologies they need to retain their competitiveness. Outside providers can bridge that gap between the possibilities business owners perceive and the practical inaccessibility of today's business applications. [Farleit Limited, 1999].

Every major software category has a viable packaged software solution. Packaged software incorporates industry knowledge and best practices from multiple development experiences and customers. The result is a lower-cost, higher-functionality product.

Because it generally costs less and takes less time to develop and implement, packaged software has achieved deep penetration in the marketplace, particularly among large organizations. Despite the advantages of adopting packaged applications, many businesses especially the SMBs are not able to buy and install these products. For example, Forrester Research estimates that less than 5% of small businesses have automated basic internal operations like financials and Human Resources (this would compare with 100% at large organizations and 50%-plus at middle-market firms). Moreover, the high license cost causes many larger organizations to think long and hard before deciding to make an initial purchase and/or perform an upgrade. Even if an organization has the financial resources to buy the software, it may not be able to find the human resources to install and maintain it. Finally, many packaged applications, from email to ERP, require a tremendous amount of IT infrastructure and connectivity in order to run at optimum levels. Most organizations do not have the in-house talent or the financial resources to support the necessary infrastructure. Consider the following quote from a customer of Centerbeam, a business Internet infrastructure provider for SMBs: *" I have 25 people in my company; I have to pay a systems administrator $75,000 a year just to keep all the computers and my email system running."* [www.aspisland.com, 2000]

A recent Forrester Research (January 2000) [www.aspisland.com, 2000] study indicated that the number one reason companies choose to outsource business applications is the lack of in-house expertise (see Figure 5).

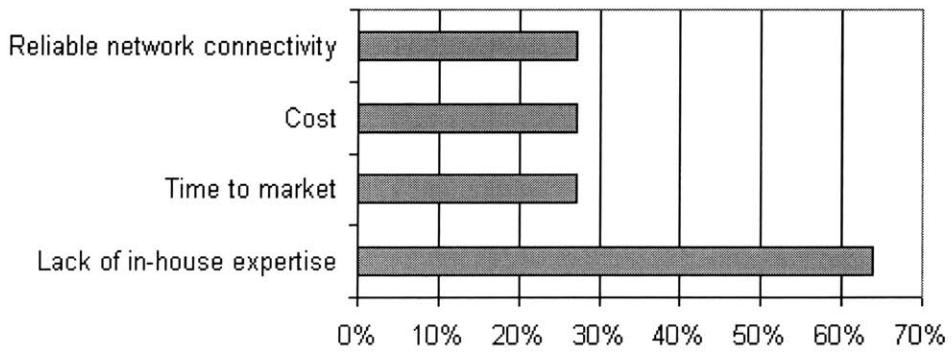

Figure 5. Reasons for Outsourcing Business Applications [Forrester Research, January 2000]

1.7 Conclusion

In this chapter, the main focus was on describing today's e-business landscape, pointing to the different business trends that emerged through the electronic revolution, from the virtual extended corporation to the value networks. It shows how these business trends, in all their functional areas, depend on collaboration as the main strategy in order to function and reach the highest level in business maturity. In achieving collaboration, however, several strategies have evolved. ERP strategy, though capable of providing deep connections and inter-enterprise collaboration, proves to be inefficient in meeting technological requirements and budget affordability. This gives way to the E-BIAS strategy that seeks a better, more flexible approach in achieving collaboration. In this, it highlights the outsourcing of IT services through application service providers as the best solution in applying e-business.

The following chapter clarifies the concept of application service providers and details their advantages and highlights the factors behind their emergence as an efficient and flexible IT service towards e-business application.

CHAPTER TWO

APPLICATION SERVICE PROVIDERS: A TECHNOLOGY TOWARDS COLLABORATIVE BUSINESS

Recently, a new breed of business computing provider emerged, the application service provider (ASP). This next-generation information technology services company delivers computing to customers from a network-based data center [Farleit Limited, 1999]. Enterprises no longer have to own or operate the hardware and software on which their business computing runs and through which they can collaborate with their business partners. Instead they pay a fee to the ASP according to usage, typically on a monthly subscription basis. This rapidly growing IT delivery channel is already entering a new phase of development. ASP technology has a strong impact on enterprise IT strategy and is currently making principal choices available to these enterprises. A very important achievement of ASPs is paving the way for small and mid-size businesses to compete in the e-business race. Several factors are behind ASP emergence and adoption. However, despite the many advantages in this technology model, several barriers have to be crossed while heading towards a successful ASP model.

2.1 Application Service Providers

A convergence of technology and business trends through the concept of IT outsourcing has brought a new means of acquiring computing within the reach of enterprises today. Application service providers are a revolutionary solution in the IT service industry.

2.1.1 What is an ASP?

An ASP, in its simplest form, is a third-party service firm, which deploys, manages and remotely hosts a pre-packaged software application through centrally located servers in a "rental" or lease arrangement. [Cherry Tree & Co. 1999] In exchange for accessing the application, the client renders rental-like payments. The ASP Industry Consortium [www.asp.org, 1999], a coalition of companies formed in May 1999 to promote and educate the industry, offers the following definition: *"An ASP manages and delivers application capabilities to multiple entities from a data center across a wide area network."*

The convergence of software and IT infrastructure toward an Internet/net-centric environment has enabled the ASP concept to emerge (see Figure 6).

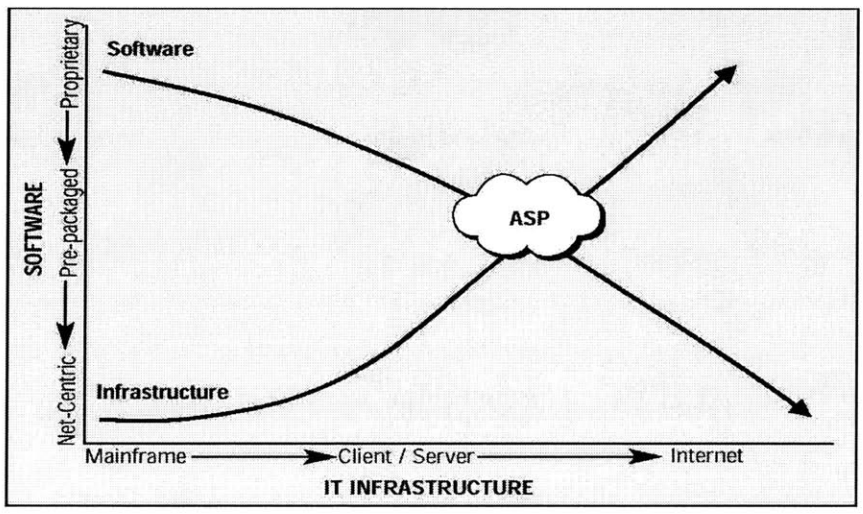

Figure 6. The New Application Model [Cherry Tree and Co, 1999]

Software has evolved from custom-coded, proprietary applications to pre-packaged or off-the-shelf applications and now to the development of net-centric applications. Net-centric software allows Web-enabled commerce, communication and the management of information content. Likewise, IT infrastructure has evolved from a closed, mainframe environment to distributed computing and now towards a net-centric infrastructure linking all stakeholders. An ASP acts as an intermediary by facilitating a remote, centrally managed "rent-an-application" service between the organization or client and the independent software vendor (ISV) (see Figure 7).

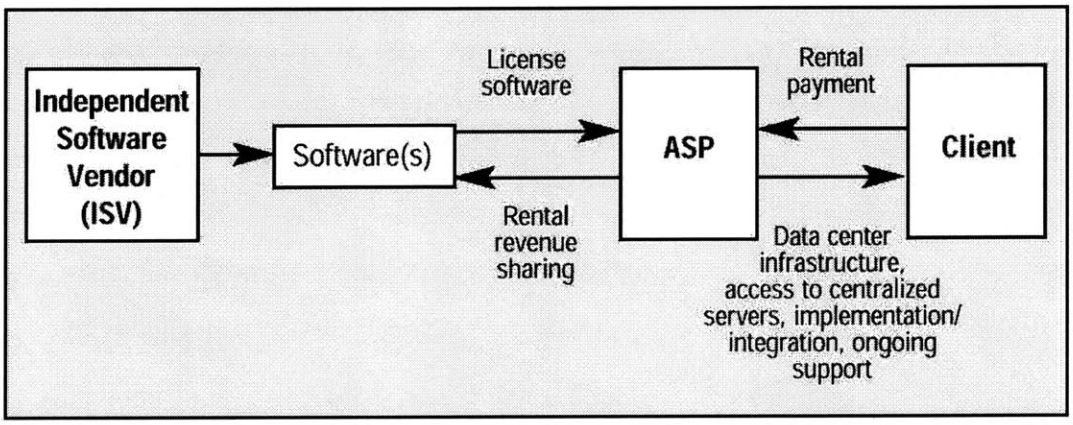

Figure 7. ASP Relationship [Cherry Tree and Co, 1999]

The emphasis is placed on the *use* not the *ownership* of the application. The end client no longer owns the application or the responsibilities associated with initial and ongoing maintenance. The client, either through an Internet browser or thin-client technology, accesses remote, centralized computer servers hosting the application. Only the client manages the results from the application locally. Typically the "pure" ASP aligns with a particular ISV (Independent Software Vendor), performing the initial application implementation and integration, controlling the data center management and providing continuous, uninterrupted connectivity and support. In this fashion, the ASP manages the client relationship acting as a complete end-to-end solution provider.

2.1.2 Characteristics of an ASP

ASPs provide a contractual service offering to deploy, host, manage, and rent access to an application from a centrally managed facility. ASPs are responsible for either directly or indirectly providing all the specific activities and expertise aimed at managing a software application or set of applications. The defining characteristics of an ASP are [International Data Corporation, 1999]:

- *Application centric.* ASPs provide access to, and management of, an application that is commercially available. This service is different from business process outsourcing (BPO), for instance, where the outsourcing contract encompasses the management of entire business processes such as human resources or finance. It is also different from basic hosting services, where the focus of the service is management of the network and servers, with minimal applications management.

- *"Selling" application access.* ASP services offer customers access to a new application environment without making up-front investments in the application licenses, servers, people, and other resources. The ASP either owns the software or has a contractual agreement with the software vendor to license access to the software. In contrast, under traditional applications management (AM) services, the customer already has acquired and deployed the application environment; the AM outsourcer takes over application management, sometimes bringing it into its own data center. However, both AMs and ASPs do fall under the broader category of application outsourcing. Under typical hosting contracts, the service provider sells (or resells) the application license to the customer on a one-to-one basis. In the ASP model, the service provider 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, such as 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 other vendors to package standardized offerings (providing for minimal or no customization) 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 organization.

- *Delivering on the contract.* The ASP is the firm that is responsible, in the customer's eyes, 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 trouble ticket, even if the ASP works with other companies to provide the actual support.

2.2 ASP Market Trends

Hosting enables companies to rent for multiyear contracts software applications that can be accessed over the Internet and/or a private network. These applications are implemented and maintained by the third-party ASP. The ASP model enables companies to purchase software applications as a service offering rather than the typical hybrid product/service purchase. As Figure 8 shows, an ASP takes the traditionally separate phases of an enterprise software implementation and bundles them together into a full-service offering.

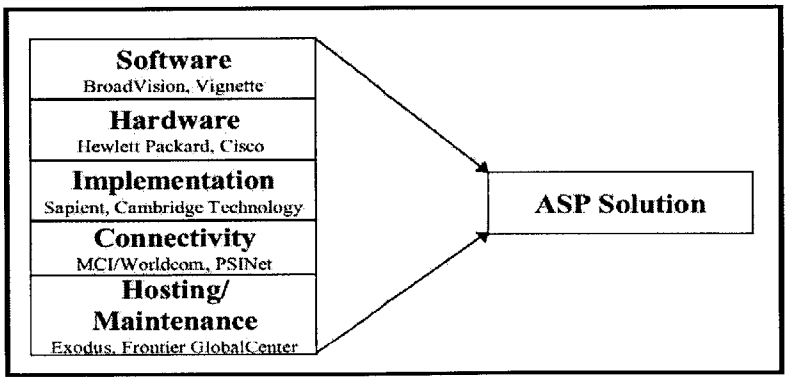

Figure 8. ASP Implementation Consolidation [Legg Mason, 1999]

Several drivers have fostered the emergence of online application services as a viable option in mainstream enterprise computing.

2.2.1 Need for Speed

The fast-moving pace of both business and technology today puts increasing pressure on scarce skills and resources. Applications are growing more complex, the business environment is more competitive, skilled staff become more difficult to train and retain, while costs continue to be under tight control. The IT industry's response to these factors has been to increase the extent to which it packages its products ready for use. Even high-end enterprise applications like CRM, ERP, and collaboration applications are now packaged and delivered with templates that provide an immediate starting point for implementation. The race is on to slash implementation timescales. Application service providers aim to devise methodologies and templates that short-cut implementation even further, down to weeks and days. This process drives applications towards an off-the-shelf, easy-configuration state that lends itself to online delivery as an Internet-based service [Farleit Limited, 1999].

2.2.2 Commerce Gets Wired

Businesses today fully accept the need to 'get wired'. The prevalence of e-commerce and e-business capabilities within enterprises, already well established in North America, is now spreading into Europe and the Asia Pacific region. This is not just about companies having a website from which they present static information or passively sell to consumers. Web servers have become dynamic, reacting to user input and providing an increasingly personalized experience, and in the process they have proven their ability to host a wide range of sophisticated applications. As a result, today many aspects of enterprise computing are moving to an Internet-centric model [Farleit Limited, 1999].

- *Electronic commerce* Electronic trading and communication with suppliers and customers up and down the value chain is allowing businesses to realize huge

economies and efficiency gains in applications such as electronic procurement, customer relationship management and supply chain collaboration.

- *Enterprise portals* Business applications are moving towards an enterprise portal concept, in which the user has access to relevant information feeds and other services as subsidiary applications running in a browser window alongside the core product.

- *Intranets* The company intranet is becoming the default platform for delivering enterprise computing. Many organizations are moving their entire computing infrastructure onto intranet architecture, using Internet technologies to distribute applications and information within the enterprise and achieve collaboration among the enterprise employees.

- *Extranets* Similarly, inter-enterprise collaboration and the move towards giving customers, business partners and suppliers access to company applications via a browser interface is making web-based delivery a growing feature of external communications. In this context, larger enterprises are themselves becoming application service providers to their suppliers and customers.

Many businesses rely on outside providers to operate the infrastructure for these new computing architectures. Internet service providers and web server hosting providers who started out hosting static Web servers have grown in expertise and scale as their customers' needs expanded.

2.2.3 Advantage for the SMBs

Historically, small and middle-size businesses (SMB) have been unable to afford high-end enterprise software applications, such as enterprise resource planning (ERP) applications, due to high license fees and long and expensive implementation periods. While license fees tend to be high, the true costs begin to mount during the implementation phase. A typical ERP implementation involves a significant up-front license fee and 3x–5x the license fee for

implementation costs [Legg Mason, Wood Walker inc, 1999]. Many mid-market companies cannot afford these heavy investments of dollars and time; therefore, enterprise software providers have had a difficult time penetrating this market. Additionally, even if these companies could afford the heavy up-front and implementation costs, many lack the in-house IT resources to manage and maintain enterprise software applications on an ongoing basis. Mid-market companies today find application hosting an attractive way to gain access to high-end software applications at a reasonable price, in a faster time frame, and at a lower risk as technology (hardware, software, and implementation) risks are shifted to the hosting provider. By having specialized service providers implement these systems, companies are able to utilize these applications without having to go through the pain and investment of a corporate wide implementation. Above all, these small to mid-size businesses can gradually adopt the e-business models and form partnerships with other companies, thus gaining the possibility to compete against the giants in their business fields. Through application service providers these small to mid size business partners can easily collaborate, adopt the newest strategies and applications serving the different functional business fields and catch up with the fast pace in e-business evolution at an affordable cost. While the application hosting model still will require some implementation with respect to integration with legacy systems, the work that will be required pales in terms of dollars and time when compared with a typical business application implementation.

2.2.4 Large Companies Have Been Early Adopters

While it was believed that mid-market companies would be the primary near-term demand drivers, the opposite has been the case to date in the ASP market. The near-term driver of demand for ASP solutions has been large companies. US internetworking's customer wins over the past two quarters, for example, have included XL Capital and Hewlett Packard [Legg Mason, Wood Walker inc, 1999]. The main reason behind large companies being primary drivers of ASP demand lies in one word: PAIN. Many large organizations are feeling or have felt the pain of implementing, managing, and maintaining complex enterprise software applications, such as ERP and electronic commerce software applications. While many large organizations already have implemented many of these applications internally,

their decisions to outsource new applications to ASPs, as well as, in some cases, the management and ongoing maintenance of existing applications, speak to the complexity and high cost of ownership that large organizations face in managing and maintaining these applications. While a value proposition an ASP provides is reducing the up-front capital requirements for enterprise software applications, the more important value proposition is lowering the total cost of ownership and IT requirements for companies of all sizes. As ASPs prove to be a secure service for inter-enterprise collaboration by providing an uninterrupted automation of companies' workflow, large organizations will continue to be an important source of demand for ASP solutions based on the "PAIN" factor, as well as the continued trend of IT outsourcing [Legg Mason, Wood Walker inc, 1999].

2.2.5 .COM Start-Ups Also Have Been Key Adopters of ASP Solutions

A significant source of demand for ASP solutions has been .com start-ups. As with larger companies, the .com crowd is experiencing its own "PAIN" factor, driven by rapid growth and time-to-market requirements. Being well funded with little time to build out their own IT staffs and infrastructures, many .com start-ups are looking to ASPs to fulfill this need. Early .com companies were extremely sophisticated with respect to technology, yet still utilized outsourcing for such concepts as Web site design and Web hosting. The new breed of .com start-ups, which tend to have more marketing savvy than technology expertise, will have to rely more heavily on technology outsourcing partners like ASPs. It is expected that this trend will fuel strong demand for ASP solutions from .com companies. [Legg Mason, Wood Walker inc., 1999]

2.2.6 Software Companies Are Supporting the ASP Model

Software companies are supporting the ASP model. Microsoft's announcement of offering *Office 2000* through an ASP model as a very big validation point that the ASP model is gaining traction in the market. Additionally, large software companies such as Oracle, BroadVision, Ariba, and CommerceOne also are offering their software through an ASP, providing further validation of the model [Cherry Tree and Co., 1999]. The ASP concept is a

significant departure from the current business model familiar to enterprise software vendors. Independent Software Vendors (ISVs) sacrifice the recognition of large, upfront license payments under the ASP model. Alternatively, as an ASP the ISV receives considerably smaller annuity payments, but accruing over much longer periods of time. Considering all the potential disruptions created by the ASP concept, it is astonishing that the biggest and best enterprise software vendors have so readily accepted this business model. However, there are several benefits recognized by the software vendors that should not be underestimated [Cherry Tree and Co., 1999].

- *New market opportunities.* The ASP is principally targeting small-to medium-size enterprises (SMEs). This is a market characteristically neglected by robust enterprise applications due to complexities and high costs. Furthermore, the growth for high-end ERP applications among Fortune 1000 companies has stagnated, as the Tier 1 market has become saturated. Therefore, the ASP creates a new software channel by facilitating a distribution network to lesser-exposed markets.

- *First mover advantages.* Software vendors might be motivated by first mover advantages. Establishing an early presence in the ASP market could potentially create a barrier to entry. Some of the earliest supporting software vendors have been PeopleSoft, Oracle, SAP, J.D. Edwards, Great Plains Software, Broadvision and Siebel. In fact, all of the Big 5 ERP software vendors, which, as a collective group, controlled 78% of the ERP market in 1998, have established strategies in the ASP market.

- *Predictability of business model.* It should not be overlooked that software vendors are likely motivated by revenue predictability. Nearly three-quarters of quarterly revenue for software vendors has traditionally occurred in the last few weeks of each quarter. The ASP model smoothes out back-end weighted quarters and essentially creates a revenue backlog.

- *Learning curve economies.* It is also conceivable that ISVs are learning from the experiences of their ASP partners with the ultimate objective of internalizing the

ASP relationship. The threat of software vendors entirely bypassing the ASP by developing their own ASP model is a serious danger and a potentially motivating factor for aggressive ISV participation.

2.3 Catalysts for the ASP Market

Some factors will always behave as catalysts for the ASP market and act as drivers for ASP evolution and application. These factors can be classified into three main categories: The enabling technologies, the technical drivers, and the business drivers. Figure 9 illustrates the enabling technical and business drivers shaping the ASP concept.

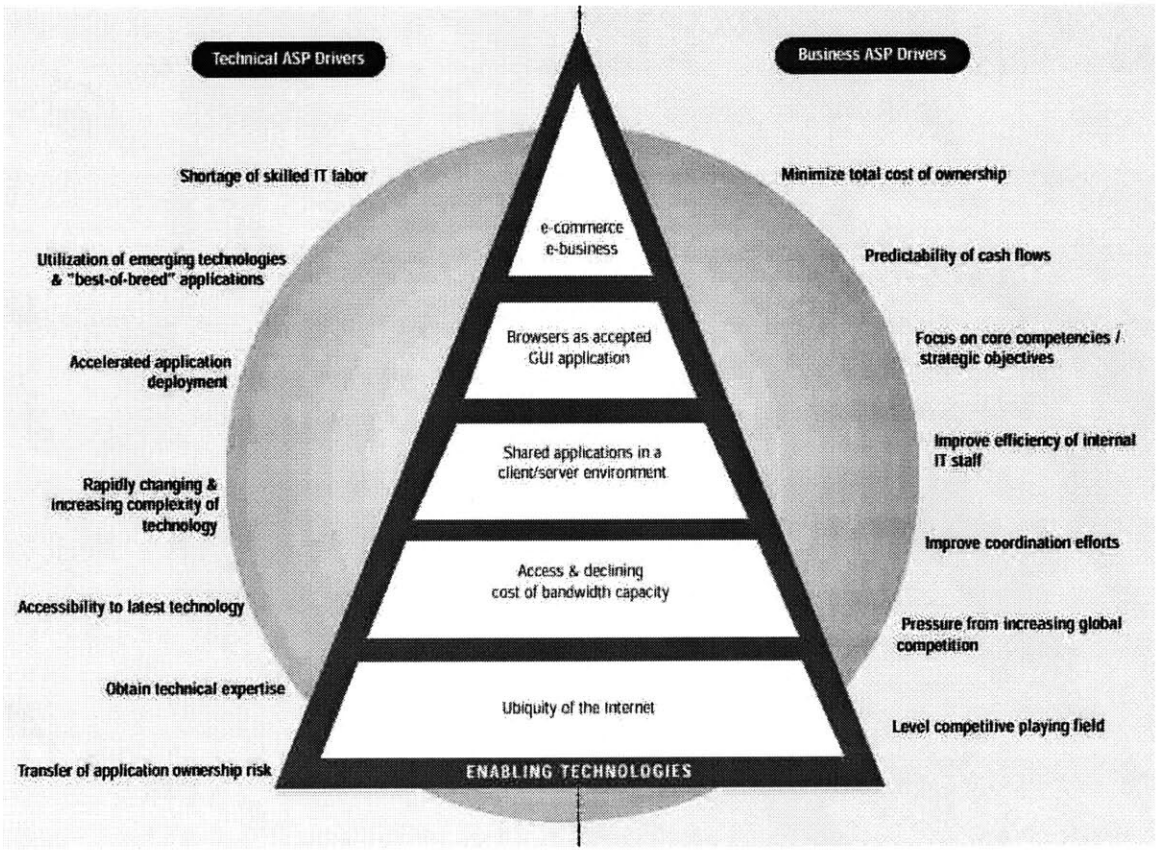

Figure 9. Factors Driving the ASP Industry [MSI Consulting Group and Cherry Tree and Co., 1999]

2.3.1 Enabling Technologies

Some of the key-enabling technologies that are reinforcing the fundamental ASP concept include the following [Cherry Tree and Co., 1999]:

- *Ubiquity of the Internet.* The migration from in-house application management to a hosted application solution has become feasible with the pervasiveness of the Internet and continuous development of Web-enabled solutions.

- *Access and declining cost of bandwidth capacity.* The combination of increasing accessibility and the continued declining cost of bandwidth enables a hosted solution delivered over the Internet or through thin-client computing to become a viable alternative as bandwidth capacity becomes a commodity.

- *Shared applications in a client/server environment.* The remote access of the ASP concept is not a radical departure from the application delivery that users have become accustomed to with client/server technologies.

- *Browsers as an accepted GUI application.* The acceptability of browsers as a functional graphical user interface (GUI) has increased with the growing popularity of Web-enabled and thin-client computing.

- *Potential of e-commerce and e-business solutions.* Comprehensive e-commerce and e-business solutions share many of the same business and technical concerns for security and reliability that presently threaten the ASP concept. The resolution of these issues in e-commerce and e-business will positively influence the perception of hosted applications.

2.3.3 Technical Drivers

The following technical drivers or factors also impact the viability of the ASP concept [Cherry Tree and Co., 1999]:

- *Shortage of skilled IT labor.* Organizations, particularly smaller entities, cannot afford the time and considerable expense associated with recruiting, training and retaining IT personnel.

- *Utilization of emerging technologies and "best of breed" applications.* The ASP, due to its favorable economics, allows smaller organizations to employ sophisticated applications such as supply chain management (SCM) and customer relationship management (CRM). Today these applications have only been affordable and manageable by larger enterprises.

- *Accelerated application deployment.* META Group research indicates the average duration for an ERP deployment continues to be over 12 months. Implementation periods become measured in days and weeks in the ASP model compared to months and years through traditional channels.

- *Rapidly changing and increasing complexity of technology.* Internal IT departments struggle with the rapid pace of IT development and its increasing complexity. The ASP concept resolves the internal uncertainty by assuming the application responsibilities and costs.

- *Obtain technical expertise.* Many ASPs currently focus on a particular vertical market, business function or application type. This focused approach becomes more valuable to an organization searching for a specific need.

- *Transfer of application ownership risk.* Internal IT departments have traditionally been very concerned about the viability and acceptance of an application among its users.

2.3.4 Business Drivers

Some of the important business drivers or factors influencing the emergence of the ASP concept include [Cherry Tree and Co., 1999]:

- *Minimize total cost of ownership (TCO).* The ASP alternative typically translates into a 30% to 50% annual savings, varying by the complexity of each application.
- *Predictability of cash flows.* The ASP concept introduces a degree of predictability by eliminating the uncertainties of post-implementation software-related expenditures.
- *Focus on core competencies and strategic objectives.* The transfer of the implementation and management of an application to a third party enables the organization to focus on developing its core competencies.
- *Improve efficiency of internal IT staff.* The elimination of application management enables the internal IT staff the freedom to develop processes and systems to leverage core competencies.
- *Improve coordination efforts on a global basis.* The ASP concept can equip organizations with the latest technical tools and systems necessary to coordinate internal and external global operations.

2.4 The ASP Advantage

The Internet is making possible unprecedented levels of electronic communication, collaboration, and commerce between organizations. Application service providers (ASP) are a critical component of the extended enterprise as they represent the continued evolution of the networked economy, facilitating the movement of business processes to the Net. The ASP model provides a viable solution to the three key friction points faced by most organizations when deciding whether to invest in a packaged software application:

- 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 out sources the Human Resources and infrastructure headaches to the ASP. The ASP is able to leverage its technical talent and infrastructure across multiple customers and thus creates an efficient, scalable model [www.aspisland.com, 2000].

2.4.1 ASP as a Budget Friendly solution

The concept is simple—software as a service. Customers have long been able to buy monthly access to every major utility (e.g. telephone, power, and water). Cable television and Internet access have converged around the idea of a service provided for a monthly fee. Why not software delivered as a service? Before the Internet, this simply 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 [www.aspisland.com, 2000].

Another reason software as a service matured slowly was the lack of software applications that could be efficiently deployed on the Web. The software and IT infrastructure markets have converged to create a new solution. As shown in Figure 10, these markets have reached the point at which Net-centric software is now delivered via the Internet. The provider of this solution is the application service provider, the ASP [Farleit Limited , 1999].

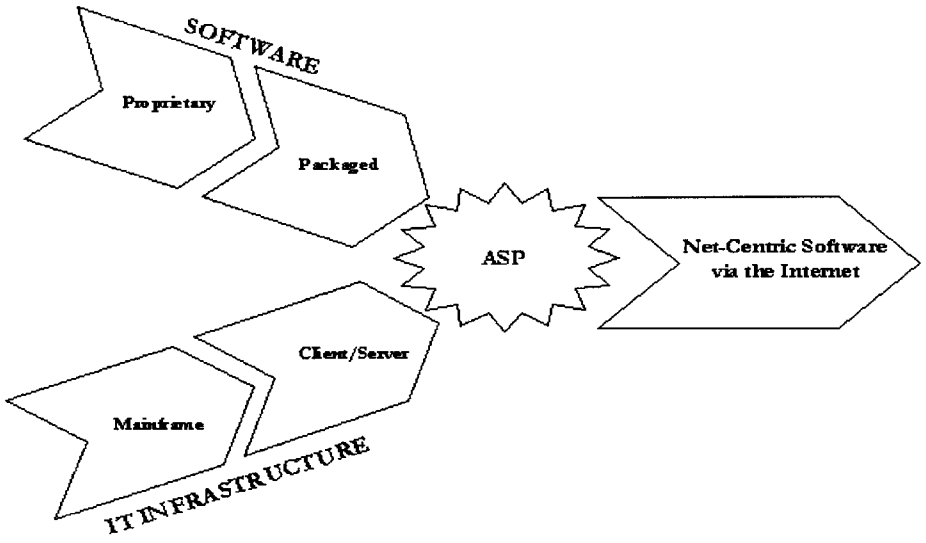

Figure 10. The Convergence of Software and IT Infrastructure to the Net [J.C. Bradford & Co, 1999]

2.4.2 The Ingredients of ASP

An ASP combines service offerings that are traditionally not offered by one company. The four primary ingredients are the following [www.aspisland.com, 2000]:

- *Packaged software applications.* Licenses to products developed by ISVs are sold for a sizeable up-front fee.

- *Systems implementation and integration.* These services are traditionally offered by systems integrators (SIs) or the service arms of ISVs.

- *Data centers and connectivity.* Data-center services are offered by hosting companies (e.g., Exodus), hardware companies (e.g., IBM), and telecom providers (e.g., MCI/UUNet). Telecom and business Internet service providers (ISPs) provide connectivity.

- *Application monitoring and ongoing support.* Application monitoring is typically offered by firms such as AmQUEST, Digex, and Andersen Consulting. Ongoing support is

typically offered at the first level by firms such as Support Technologies. SIs or ISVs typically provide second-level support.

Figure 11 graphically depicts how these four ingredients combine to form an ASP. An ASP can build, acquire, or partner to bring a complete portfolio of services to the customer. ASP can be defined as the organization that is on the hook for the customer's contract. Thus, an organization could outsource to deliver all four primary activities and still be considered an ASP.

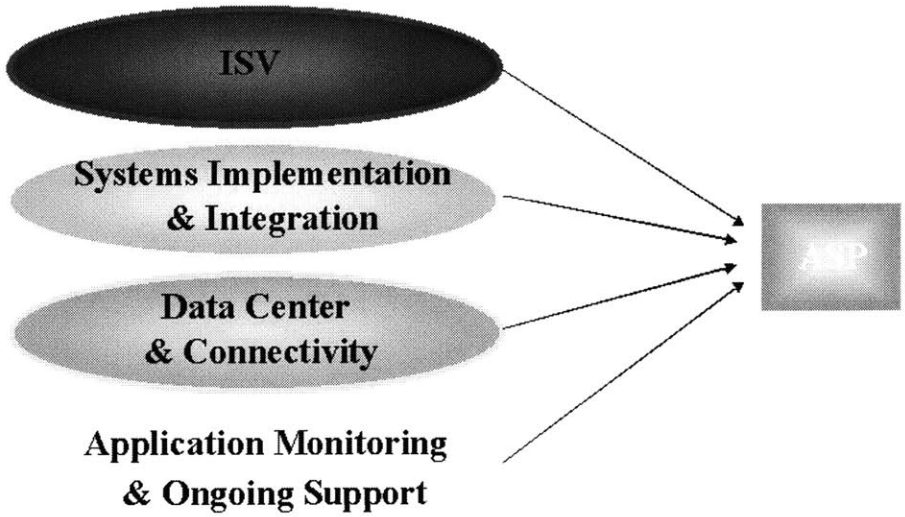

Figure 11. The Ingredients of ASP [J.C. Bradford & Co, 1999]

2.4.3 Benefits from ASP Implementation

The ASP solution to the three key friction points mentioned above [www.aspisland.com, 2000]:

- *Turnkey solutions.* ASPs bundle software, hardware, and 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 customization, 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. One is the fact that ASPs typically do not provide a deep level of customization. The second reason is 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 such as Corio and USinternetworking can 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.* Given ASPs do not typically perform a high level of software customization, 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.

- *Minimize 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.* Firms 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 or may not reduce the cost of IT, but they will allow for increased focus on a firm's core competencies.

2.5 ASP Barriers

Despite the clear appeal of ASP, there are some barriers to the market's growth. These barriers and their solutions are divided into the following different categories [www.aspnews.com, 2000]:

- *Ensuring security and reliability.* Given that proprietary information is at stake, clients must be 100% convinced applications and data are secure. On the reliability front, ASPs must deliver almost 100% uptime and network reliability. Even if the ASP delivers 99% uptime, there will still be key moments each week when the client is unable to access its mission-critical applications. As with any outsourcing arrangement, ASPs will need to use service-level agreements to establish client expectations and metrics at the outset of a relationship. Most ASPs will have to offer significant credits, particularly early in the relationship, for service failures.

- *Significant improvement in firm's computing infrastructure.* Sheldon Laube of Centerbeam argues that most SMBs do not have the infrastructure in place to fully utilize an ASP—that is, problems with their own printer network, browser interface, etc., render it difficult to utilize an ASP effectively. In fact, most ASPs with indicate that over 50% of their customer help calls have nothing to do with the application being provided. Rather, these calls deal with errors such as not being equipped with the

latest version of a browser (i.e., Java script error). In order for the SMB market to adopt an ASP solution *en masse*, it has to upgrade its infrastructure. Firms like Centerbeam and Everdream, which provide a lower-cost way to have a top-quality system with complete remote customer support, should ease this process. Centerbeam is even offering to pay firms $500 for every one of their existing PCs in order to get them to switch to its offering. These types of creative catalysts along with significant improvements in the reliability of operating systems such as Windows 2000 and Linux should serve to remedy this problem.

- *The continued evolution of packaged applications into a three-tier architecture.* Most packaged applications are designed using client/server architecture. Client/server uses a fat client – where the application resides on the PC client and the data resides on the server. Three-tier architecture uses a thin client, an application server, and a database. This three-tier structure is more suitable to the distributed, Web-based computing environment needed by an ASP. In addition, this architecture is better suited for maintenance and upgrades. Most major packaged vendors are in the process of rolling out Web-based versions of their software. ASPs will typically employ "band-aid" solutions such as Citrix software, which can Web-enable a client/server application using "screen scrape" technology.

- *More ISVs need to offer product under a subscription revenue model.* Many software companies will have a tough time weaning themselves off of the license revenue model. This may result in there not being as much choice in applications through an ASP as through a traditional license purchase. The move to a subscription model will likely reduce near-term revenues for the sake of a recurring stream. In particular, if a software firm is public and concerned about its stock price, it may face the near impossible task of trying to grow revenue while also making the shift to a subscription model. There are several solutions to this issue. One is through firms like AmQUEST, Digex, and Damango, which give ISVs a platform through which they can offer their products as an ASP. Another development that ultimately will resolve this issue is the design of new three-tier, ASP-ready applications by pure-

breed ASPs such as eALITY. Finally, at least some leading edge ISVs will "bite the bullet" and make the switch to the subscription model.

- *The need to achieve a happy medium between customization and standardization of offerings* Customization ultimately will be the biggest issue facing the ASP market. Specifically, the inability to customize enterprise back-office and front office apps may limit the ASP market's penetration to a minority share. This issue will be critical to firms such as Corio as they move beyond the high-growth customer that has dominated client rosters to date and into the middle market. Applications such as HR, email, collaboration, procurement, ecommerce, and others should reach significant penetration regardless of the ultimate level of customization. Another way to solve this problem is to continue to gravitate toward vertical industry solutions. A vertical-oriented ASP will be able to offer a fairly standard solution that also has a high degree of value add due to industry-tailored applications.

- *Determining an exit strategy at the beginning of a relationship.* ASPs must present clients with clear exit strategies at the beginning of a relationship in order to achieve large-scale penetration. Issues such as who owns the data and whether the client can purchase the software license at some point should be dealt with up front. In essence, a business and its ASP should work out a prenuptial agreement before signing a definitive contract.

- *More creative and lower-cost pricing schema.* At present, many ASPs are pricing their offerings at or slightly below the present value price of the total cost of an in-house implementation. In effect, they are providing a financing alternative and reducing the aforementioned IT headache. As new three-tier, ASP-ready apps come to market, more creative, lower-cost pricing schemes will begin to emerge that hold the potential to truly open up the ASP to a broad market. ASPs should be able, by the sheer power of their business models, to offer a solution at a lower cost than if purchased and installed independently.

- *Distribution.* In order to be successful, ASP will have to develop significant marketing and distribution partners. Utilizing channels such as telecom, ISPs, hardware, ISVs, SIs, and VARs will be critical. Alliances such as TSC/UUNet/AmQUEST, Qwest/KPMG, and USinternetworking/AT&T point to the type of distribution needed to reach the mainstream market.

2.6 Conclusion

Behind every new technology there are factors and problems that pressure its emergence as the required solution. This chapter focused on the definition of application service providers and the business and service characteristics of this new model. A big problem for the small and mid-size enterprises today is the high cost and great skills required to link to the currently wired and automated business world. Even large enterprises prefer to outsource the non-core competencies due to the "pain" factor in handling the new technologies. ASPs come as a flexible, and logical solution to this problem and eventually drive independent software vendors to adopt new strategies to cope with their existence. There are many business and technological drivers as well as many advantages that enable the ASP model to function and show dominance in the IT service industry. However, this chapter also revealed the problems of security, reliability, standardization and others to be solved before an ASP can function successfully.

Before application service providers could emerge as a new technological and IT service model, an evolution in technology had to occur and gradually lead to the sophisticated ASP thin client architecture. The following chapter tackles this subject and analyzes the ASP technology.

CHAPTER THREE

THE TECHNOLOGY LEADING TO THE ASP MODEL

The advent of the Internet has demonstrated the viability of a simple, open, platform-independent network protocol that delivers both content and applications to users cheaply and easily. Cheaper and more plentiful telecommunications have in turn encouraged the development of server-based computing architectures, which are designed for environments where client computers access centralized servers across a telecommunications link. The evolution in server based computing from the mainframe to n-tier architecture gradually altered the level of human resource efficiency and the computing resource efficiency of each of the computing models. This chapter explains this evolution and ends up proving the ASP as the best "resource efficiency model" [Mathewson, 2000].

3.1 ASP Technology Trends

Various emerging technologies over the past two to three years have combined to make application services a cost-effective and accessible option today [Farleit Limited, 1999].

3.1.1 Universal IP networking

The Internet's underlying inter-network protocol (IP) is becoming the default standard architecture for all forms of telecommunications. Meanwhile, the laying of high- capacity fiber optic networks throughout the developed world has created an oversupply of bandwidth that telecom providers are eager to fill. These two trends together have converged to create an all-purpose, global telecom infrastructure based on IP technology, for which the cost of access is falling steeply. The benefits of IP are not limited to cost and availability. Developers have had many years to create additional services to sit on top of the IP infrastructure, with the result that functions such as security, user profiling and network management are now highly advanced. Security is a particularly important consideration when users are accessing applications and data across the open Internet. Technologies such as the secure socket layer (SSL) in the web browser, public key infrastructure (PKI) to authenticate users and virtual private networks (VPNs) to secure transmissions, each provide varying levels of security to meet stringent user requirements. These technologies are now reliable, proven and affordable [Farleit Limited, 1999].

3.1.2 Development of server-based computing

In a server-based computing architecture, most of the data storage and application processing takes place on the central servers, while the client computers are mainly concerned with accepting instructions from the user and displaying the results. A welcome side effect of server-based computing architectures is that they tend to be easier to manage and less wasteful of resources than PC-centric client-server approaches. The most widespread example of server-based computing is the worldwide web itself, in which central servers hold all the content and applications, while clients access them using a web browser. Various technologies have been evolved to run applications centrally on the server including CGI, Perl and Java, but also Microsoft's Windows DNA (Distributed inter-Network Architecture) and a wide range of application server platforms [Farleit Limited, 1999]. Another variation on server-based computing is Windows terminal technology. This allows

Windows applications to run on a centralized server, sending just the user interface across the network either to a dedicated Windows terminal or to a general-purpose web browser.

3.1.3 Distributed systems management

Easier connectivity has revolutionized systems management, enabling computer systems to be monitored, managed and even repaired across a phone line. This has been a major contributor to the emergence of selective outsourcing, enabling reliable remote management from a centralized enterprise operations center [Farleit Limited, 1999]. Using today's application management solutions, it is now possible to track the application performance actually being experienced by a user from the opposite side of the globe, and to drill down and examine the performance of any of the individual routers, servers or applications that affect the overall experience perceived by the user.

3.2 ASP Architecture

A closer look at the evolution of computer architectural models gives a better understanding of the ASP model.

Before the late 80s and early 90s, mainframe computing was about the only computer choice for organizations that required heavy-duty processing and support for a large number of users. Mainframes have been in existence for over 20 years. Their longevity has lead to their reliability. The ability of mainframes to support a large number of concurrent users while maintaining a fast database retrieval time contributed to corporate acceptance of mainframes. Mainframe computing, also called host-based computing, refers to all processing carried out on the mainframe computer. The mainframe computer is responsible for running the Relational Database Management System (RDBMS), managing the application that is accessing the RDBMS, and handling communications between the mainframe computer and dumb terminals. A dumb terminal is about as intelligent as its name implies: it is limited to displaying text and accepting data from the user. The

application does not run on the dumb terminal; instead, it runs on the mainframe and is echoed back to the user through the terminal.

The main drawback of mainframe computing is that it is very expensive. Operating a mainframe computer can run into the millions of dollars. Mainframes are expensive to operate because they require specialized operational facilities, demand extensive support, and do not use common computer components. Additionally, the idea of paying thousands of dollars to rent software that runs on the mainframe is almost inconceivable for PC users who have never used mainframe technology. Rather than using common components, mainframes typically use hardware and software proprietary to the mainframe manufacturer. This proprietary approach can lock a customer into a limited selection of components from one vendor.

Network computing applied a giant chainsaw to monolithic (mainframe-based) applications and separated them into Client and Server (C/S) components. The Information Technology (IT) industry, have been practicing a simple form of Client/Server computing since the initial inception of the mainframe. That configuration, a mainframe host and a directly connected, (unintelligent) terminal constitutes a one-tier Client/Server system that was replaced by the more complex Client/Server models [Microsoft Corp., 1999].

3.2.1 Client/Server Architectures

Client/Server is a general description of a networked system where a client program initiates contact with a separate server program (usually on a different machine) for a specific function or purpose. The client computer, also called a workstation, controls the user interface. The client is where text and images are displayed to the user and where the user inputs data. The user interface may be text based or graphical based. The server computer controls database management. The server is where data is stored, manipulated, and retrieved. In the C/S database environment, all database processing occurs on the server. Business logic can be located on the server, on the client, or mixed between the two. This type of logic governs the processing of the application. Many corporations have turned to

client/server database computing as their computing answer. Following are some of the underlying reasons for its popularity [Microsoft Corp., 1999]:

- *Affordability:* C/S database computing can be less expensive than mainframe computing. The underlying reason is simple: C/S database computing is based on an open architecture, which allows for more vendors to produce competing products, driving the cost down. This is unlike mainframe-based systems, which typically use proprietary components available only through a single vendor. Also, C/S workstations and servers are often PC based. PC prices have fallen dramatically over the years, which has led to reduced C/S computing costs.

- *Speed.* The separation of processing between the client and the server reduces network bottlenecks, which allows a C/S database system to deliver mainframe performance while exceeding PC/file server performance.

- *Adaptability.* The C/S database computing architecture is more open than the proprietary mainframe architecture. Therefore, it is possible to build an application by selecting an RDBMS from one vendor, hardware from another vendor, and development software from yet another vendor. Customers can select components that best fit their needs.

- *Simplified data access.* C/S database computing makes data available to the masses. Mainframe computing was notorious for tracking huge amounts of data that could be accessed only by developers. With C/S database computing, data access is not limited to those who understand procedural programming languages (which are difficult to learn and require specialized data access knowledge). Instead, data access is provided by common software products that hide the complexities of data access. Word processing, spreadsheet, and reporting software are just a few of the common packages that provide simplified access to C/S data.

In the typical corporate environment, the server computer is connected to multiple client computers. The server computer is a high-powered computer dedicated to running the

RDBMS. The client workstations are usually PC based. The client computer and database server communicate through a common network protocol that allows them to share information. Several Client/Server Models emerged [Microsoft Corp., 1999]:

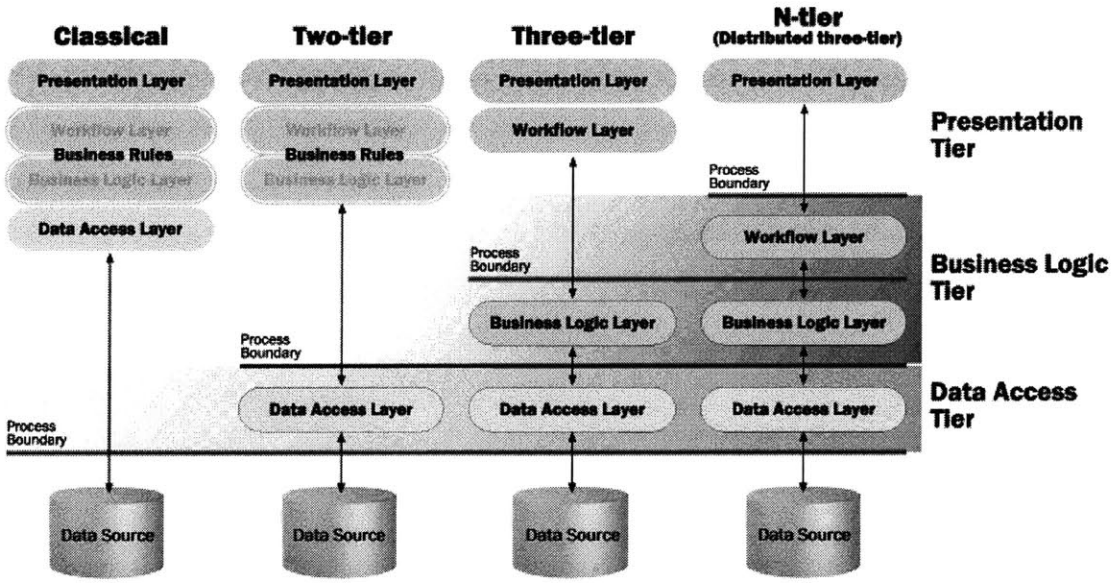

Figure 12. Architectural Models [Microsoft Corp, 1999]

- *Classic.* In the classic model, all layers are held within the application itself. This architecture would be very awkward to maintain in a large-scale environment unless extreme care was taken to fully encapsulate or modularize the code. It is easy to develop and, in a limited environment, easy to maintain.

- *Two-tier or Fat Client.* Breaking out the data access code into its own layer. By breaking out this layer, multiple-user access to the data is available. The developer does not have to worry about shared data, because all data access is encapsulated and controlled within the new tier. The two-tier model initially involved a non-mainframe host, and an intelligent "fat" client where most of the processing occurs. This configuration did not scale well however, to facilitate large or even mid-size information systems (greater than 50 or so connected clients). Then the Graphical User Interface (GUI) emerged as the dominant environment for the desktop. With it, emerged a new slant on the early two-tier architecture. The general purpose LAN

file server was replaced by a specialized database server. Much of the processing still occurred on the "fat" clients. The more complex the application, the fatter the client becomes and the more powerful the client hardware must be to support it. The cost of adequate client technology becomes prohibitive and may defeat the application's affordability. In addition, the network 'footprint' using fat clients, is very large, so that the effective bandwidth of the network, and thus the corresponding number of users who can effectively use the network, is reduced. [www.ntier.com , 2000]

- *Three-tier.* The business rules layer contains not only rules that determine what to do with data, but also how and when to do it. For an application to become scalable, it is often necessary to split the business rules layer into two separate layers: the client-side business logic, which we call *workflow*, and the server-side business logic. Although these layers are described as client and server–side, the actual physical implementations can vary. Generally, workflow rules govern user input and other processes on the client, while business logic controls the manipulation and flow of data on the server. In a three-tier or multi-tier environment, the client implements the presentation logic (thin client). The business logic is implemented on an application server(s) and the data resides on database server(s). A Multi-tier architecture is thus defined by the following three component layers [Microsoft Corp., 1999]:

    - A front-end component, which is responsible for providing portable presentation logic;

    - A back-end component, which provides access to dedicated services, such as a database server.

    - A middle-tier component, which allows users to share and control business logic by isolating it from the actual application;

Other advantages of Multi-Tier Client/Server architectures include:

- Changes to the user interface or to the application logic are largely independent from one another, allowing the application to evolve easily to meet new requirements.

- Network bottlenecks are minimized because the application layer does not transmit extra data to the client, only what is needed to handle a task.

- When business logic changes are required, only the server has to be updated. In two-tier architectures, each client must be modified when logic changes.

- The client is insulated from database and network operations. The client can access data easily and quickly without having to know where data is or how many servers are on the system.

- Database connections can be 'pooled' and thus shared by several users, which greatly reduces the cost associated with per-user licensing.

- The organization has database independence because the data layer is written using standard SQL that is platform independent. The enterprise is not tied to vendor-specific stored procedures.

- The application layer can be written in standard third or fourth generation languages, such as Java, C or COBOL, with which the organization's in-house programmers are experienced.

- *N-Tier.* As the Client/Server model continued to evolve, more sophisticated multi-tier solutions appeared, where client-side computers began to operate as both clients and servers. This latest refinement of the Client/Server model came when software developers recognized that the smaller, specialized processes were easier to design, faster to implement and cheaper to maintain. These same principles were in turn, applied to the server side of the equation, resulting in smaller, specialized server processes. N-Tier architecture does not preclude the use of the two-tier or three-tier model. Depending on the scale of the application and the requirements for access to

data, the two- or three-tiered model can often be used for departmental applications. It doesn't make sense to force a client's reporting needs to go through the application server when there is no requirement for transactional integrity in ad-hoc reporting. In this situation, the client should be able to access the data directly from the database server. Any Client/Server system can be implemented in an 'N-Tier' architecture, where application logic is partitioned among various servers. This application partitioning creates an integrated information infrastructure that enables consistent, secure, and global access to critical data. A significant reduction in network traffic, which leads to faster network communications, greater reliability, and greater overall performance is also made possible in a 'N-Tier' Client/Server architecture[www.ntier.com, 2000].

What three-tier and N-Tier client/server brings to the table is the ability to do two things that two-tier client/server can't do: funnel database connections and partition the application-processing load among many servers. In addition, by centralizing application logic in the middle tier, developers can update business logic without re-deploying the application to thousands of desktops. N-Tier computing accomplishes a synergistic combination of computing models, by providing centralized common services in a distributed environment. This multi-level distributed architecture employs a back-end host of some kind (mainframe, UNIX device, database/LAN server), an intelligent client, and one or more intelligent agents in the middle controlling such activities as transaction monitoring, classic This architecture typically leans heavily upon object oriented methodologies to effect as much flexibility and interchangeability as possible [www.ntier.com, 2000].

3.2.2 Thin Client Architecture

The thin-client/server computing model involves connecting thin-client software or a thin-client hardware device with the server side. The thin-client/server architecture enables 100 percent server-based processing, management, deployment, and support for mission-critical, productivity, Web-based, or other custom applications across any type of connection to any

type of client hardware, regardless of platform. The client hardware can include Windows-based terminals, PCs, NetPCs, network computers, Apple Macintosh computers, or UNIX devices. Applications execute 100 percent on the server. Thin-client/server computing extends the life of your computing infrastructure considerably. In thin-client/server computing, all your applications and data are deployed, managed, and supported at the server. The ASP model is a thin-client based model that may have several scenarios (see Table 2).

Table 2. User Scenarios [Microsoft Corp, 1999]

User	Devices	Tasks, or Job Titles	Application Type	Thin vs. Thick Client (%)
Mobile task-based user	Handheld or mobile thin-client device	Writing traffic tickets, monitoring car rental returns, taking restaurant orders,	Line-of-business applications	0% local/100% thin-client
Office task-based user	Windows terminal, or network computer	Bank tellers, telemarketers, insurance claim adjustors; fast food service; automobile service departments; information kiosks	Word processing, line-of-business applications, information applications	0% local/100% thin- client
Knowledge workers	Notebook PC and/or desktop PC, handheld devices	Project management, financial reporting, proposal writing, sales, presentations, e-mail, scheduling, contact management	Productivity applications; groupware and communications; Internet, intranet, and extranet information; documents and applications	50% local/50% thin-client
Power users with creative, analytic, or engineering task needs	Notebook PC and/or desktop PC, and/or high-end workstation; handheld devices	Knowledge worker tasks, with the addition of statistical or scientific analysis and research; periodical or book publishing; graphics; multi-media and Web authoring; software application development	All of the software used by the knowledge worker with the addition of desktop publishing applications, graphics software, and software development tools	70% local/30% thin-client

The thin-client/server architecture can bring the best of different computing models and architectures together. Several advantages become apparent [Microsoft Corp, 1999]:

- Access is instantly provided to virtually any business-critical application across any type of network connection to any type of client.

- Single-point control is possible for deploying, managing, and supporting applications, including enterprise-wide rollouts, updates, and additions.

- Users get the universal access to the applications they need, the exceptional performance they require, and the familiarity and ease of use they're accustomed to.

- IS administrators can optimize resources by providing thin-client/server solutions to task-based users via thin-client devices, or thin-client/server software solutions to knowledge workers and power users.

3.3 ASP Platforms

One of the reasons customers turn to ASPs is to benefit from service levels that are higher than those they can achieve on their own resources. ASPs have to operate an infrastructure that meets high standards of security and reliability. There are currently several leading platforms for application services [Farleit Limited, 1999]:

- *Microsoft/Citrix.* The most mature platform is based on technology developed by Citrix Systems for Microsoft's Windows NT server environment. This allows Windows terminals to access standard Windows applications running on the server. It was originally implemented on NT 3.51 as Citrix Winframe, and is now incorporated in Windows NT 4.0 Terminal Server (WTS). Citrix offers additional technology based on its ICA protocol that allows Windows apps on the server to be accessed from any browser. Microsoft is also developing its Internet platforms to improve support for browser access to server-based applications using its DNA (Distributed Network Applications) computing architecture.

- *Sun/Netscape.* Sun's Java is a powerful environment for developing and running server-based applications. It has also introduced Jini, an intelligent network

architecture for distributed applications. But both technologies are still maturing and have not yet developed the robust support infrastructure required for enterprise-class application services. Netscape has developed support for server-based applications on its Internet platforms for e-commerce, messaging and other applications. Following its acquisition by AOL, it has now formed an alliance with Sun and the two companies will converge their server products over the coming year.

- *Oracle.* The new Oracle8i database platform has been designed to act as a platform for Internet-based applications. It looks set to be a strong contender once developers have had a chance to get to grips with the platform, which shipped in March 1999.

- *Lotus.* Lotus was the earliest vendor to begin supporting hosted applications on its Notes and Domino server platforms, but its focus was on entry-level rented applications and therefore it has not prioritized development for enterprise-class application services.

- *SCO.* With more than 40% of the UNIX server market, SCO provides the most trusted business server systems in the world. Three hot markets for SCO Server Solutions are: Database, Accounting and Telecommunications. The Webtop application, available on UnixWare 7 provides users with quick and secure access to server-based applications and server-administration functions from a Web browser. It also gives system administrators and VARs the freedom to manage an entire business network from almost any location, anywhere in the world. Applications can be delivered to a high number of users , including remote offices, business partners, and customers. SCO supports Windows clients, UNIX System clients and Netware clients[www.sco.com, 2000].

All these platforms bring a common set of benefits that empower all the different types of businesses:

- Reduce cost and complexity of everyday computing

- Allows businesses to instantly Web-enable their applications
- Deliver more applications to a high number of users
- Follow users everywhere – on the road, at home, or at work
- Enable administrators to manage entire network from a central location
- Simplify installation and delivery of business-critical applications
- Eliminate need for costly end-user training
- Improves user efficiency and productivity

3.4 ASP Data Storage

General business computing is highly transaction-oriented. Transactions occur whenever customers order products and materials, send or receive shipments, and so on. The larger the number of transactions, the more critical the business computing solution becomes. The key technology behind efficiently managing transactions is the database engine and the data storage value. To help maintain data integrity, RAID (Redundant Array of Inexpensive Disks) technology is commonly used to prevent loss of data due to a simple failure of the hard disk drive. In the case of a significant disaster (fire, flood, stolen server, etc.), backups are also critical to the solution.

The server is the critical tool by which users access the data. As databases grow over time, it's important to select a server that will scale up to meet the needs of a business solution both today and in the future. The solution designer must provide a system that can scale up to handle additional loads as the organization grows. An adequate system for today may not even come close to what is required a year later, after an organization has grown. Therefore, data storage becomes a critical factor. One of the main suppliers for internet data storage is

EMC Corporation. EMC Storage Solutions are in control of today's internet info-structure, and one of the storage systems for application sharing is Celerra[www.emc.com, 2000]:

- *EMC Celerra Server.* EMC Celerra is a dedicated network file server running software optimized for sharing information over networks. It combines EMC Symmetrix enterprise storage technology with a specific software and hardware approach to bring high levels of availability, management, scalability, and performance to network file storage. This network-attached storage solution allows you to share information between heterogeneous networked servers and end-user clients as if that information were physically stored on the local workstation. Celerra simultaneously supports mixed UNIX and Windows NT environments of hundreds of concurrent users.

Another new technology that will help corporations and individuals move up the information food chain (from data to information and knowledge) is also emerging at EMC that is called the Universal Data Tone. Universal Data Tone is blending the best characteristics of data and voice networks with a software to create an intelligent, cost-effective, specialized storage infrastructure for managing, protecting, and sharing information. "We seek to provide with this storage infrastructure what we call a "universal data tone," much as today's telephone system provides a dial tone. " [EMC Corporation, 2000]. Universal Dial Tone was a concept that transformed the telephone from mere invention to a globally significant innovation. Today, the same principles — any-to-any communications, reliability, established and efficient global management, interoperability, security, standard access devices, scalability — are driving the rapid adoption of a new technology, Enterprise Storage, and the innovative idea of Universal Data Tone. With it, we can benefit from the value of information that lives to eternity if needed, that is always accessible, timely, updated, shared, and reusable for any number of purposes.

3.5 ASP Efficiency

After talking about the ASP technology and expertise involved, there should be a justification to how much this model is efficient. A main reason is the Total Cost of

Ownership that decreases considerably but there should be other reasons as well. An organization's resources are also affected when implementing ASP. These resources change considerably based on the type of computing environment an organization is using.

3.5.1 Resource Efficiency Model

The "Resource Efficiency Model" [Mathewson, 2000] addresses these issues. It focuses on two components, Human Resources Efficiency (HRE) and Computing Resource Efficiency (CRE):

- *Human Resources Efficiency* (HRE) a measure of end-user efficiency and productivity
- *Computing Resource Efficiency* (CRE) a measure of the efficiency and productivity of computing resources including hardware, software and the IT support staff

The Resource Efficiency Model is designed to demonstrate how efficiently an organization's resources are used in various computing models, with the underlying assumption that increased efficiency will translate into lower costs, improved productivity, etc. The Resource Efficiency Model looks at the levels of HRE and CRE for various computing models: Mainframe (host-based), Networked PC Computing, Client-Server Computing, Server-based Computing with Fat Clients and Server-based Computing with Thin Clients and the emerging Application Service Provider model using Thin Clients [Mathewson, 2000].

- *Mainframe (host-based).* Mainframe environments were dominated by legacy character-based applications that required a significant amount of end-user training. In addition, the high cost of mainframes limited the amount of CPU horsepower that organizations could afford, resulting in slow response times for end-users. However, since the majority of the physical computing resources (CPUs, disks, applications, etc.) were centrally located in the mainframe model, the ratio of IT support staff to end-users was relatively low. Given the high cost of these resources, organizations made very efficient use of CPU cycles and disk space.

- *Networked PCs.* Networked PCs introduced a Graphical User Interface (GUI) to the end-user's desktop (primarily Microsoft Windows), and along with it came a new generation of powerful, user-friendly applications. Training requirements were reduced, capabilities were greatly enhanced and each user was given a personal computer that could be customized to his or her specifications. The result was a dramatic increase in end-user productivity. As for CRE, The Networked PC model was a step back from the Mainframe model because it moved away from the efficiency of a centralized configuration and introduced a computer at each user's desk. This required a significant increase in total IT support staff required to install, upgrade, manage and support these decentralized systems. In addition, most users only use a small fraction of the total resources available on a desktop PC. For example, the CPU on a typical user's PC is idle more than 90% of the workday.

- *Client/Server.* The Client-Server model is often confused with the common PC network. True client-server architecture off-loads database query analysis and other compute intensive functions from the client to the server and it reduces network traffic. In the client-server model, HRE is improved slightly due to improved response times and in some cases more powerful applications. At the same time CRE is improved because we are making more efficient use of centralized server resources.

- *Server-Based Computing with Fat Clients.* Server-based computing solutions (Citrix MetaFrame, Microsoft Terminal Services, GraphOn Bridges, etc.) shift the applications and computing resources back to a centralized location (much like the mainframe model), while maintaining the power of Windows and UNIX applications [Mathewson, 2000]. End user efficiency may be slightly improved (depending on the environment) for two reasons. First of all, within the organization's network, users begin to benefit from device independence - the ability to access applications and personal information from a variety of devices. Secondly, when compute intensive functions are performed, they may be processed by more powerful server resources (compared to slower desktop resources). In many cases it is not intuitive that you

could achieve better performance in a server-based environment, but in a properly designed environment that is often the case. By centrally deploying and managing the applications, the associated IT labor is significantly reduced. New application rollouts and upgrades occur in a fraction of the time, and the traditional pre-installation planning (and the required desktop upgrades) become a thing of the past. Finally, since the applications are executing on centralized servers, the required resources can be efficiently allocated. Unfortunately, since we are still using fat clients (traditional personal computers) in this model at the desktop, the IT support staff needs to maintain and manage these devices that are susceptible to mis-configuration, viruses and a variety of component failures.

- *Server-Based Computing with Thin Clients.* In this model we have all of the advantages stated above, but we replace the fat clients (traditional personal computers) with thin clients (windows-based terminals, network computers, etc.). In most environments, the HRE is virtually unchanged. However, now that the desktop device is a generic device with a stable local configuration and a very low failure rate, client support becomes truly a centralized function. Most thin client manufacturers provide remote management software that can perform required firmware upgrades, etc.

- *ASP (Outsourced) with Thin Clients.* If you take all of the advantages of server-based computing with thin clients and move them to an outsourced ASP model, the result is improvement in both HRE and CRE. Additional end-user efficiencies (HRE) are derived from the ability to access applications and personal information form virtually any device with an Internet connection (assuming your ASP is providing services via the Internet). In addition, one of the benefits of the ASP model is the ability to use (rent or lease) applications that you might not have been able to afford to purchase or support with a traditional in-house solution. This can also lead to HRE improvements. Additional computing resource efficiencies are achieved through economies of scale that are inherent in the ASP model. Training issues become the problem of the ASP, and your IT staff is not constantly trying to "reinvent the wheel". In addition, the ASP is providing physical computing resources

(servers) for several customers, not just you, so they are able to cost effectively grow and allocate those resources. Table 3 shows how ASP with Thin Clients gets the highest score in HRE and CRE among the computing models.

Table 3. Computing Models Compared [Mathewson, 2000]

Computing Model	HRE	CRE	Total
Mainframe (host-based)	10	90	100
Networked PCs	60	25	85
Client-server	65	35	100
Server-based with Fat Clients	75	55	130
Server-based with Thin Clients	75	75	150
ASP (outsourced) with Thin Clients	85	85	170

Figure 13 shows the results of using the Resource Efficiency Model; this does not include customer specific considerations that need to be taken into account such as the applications used, user requirements, existing infrastructure, and security.

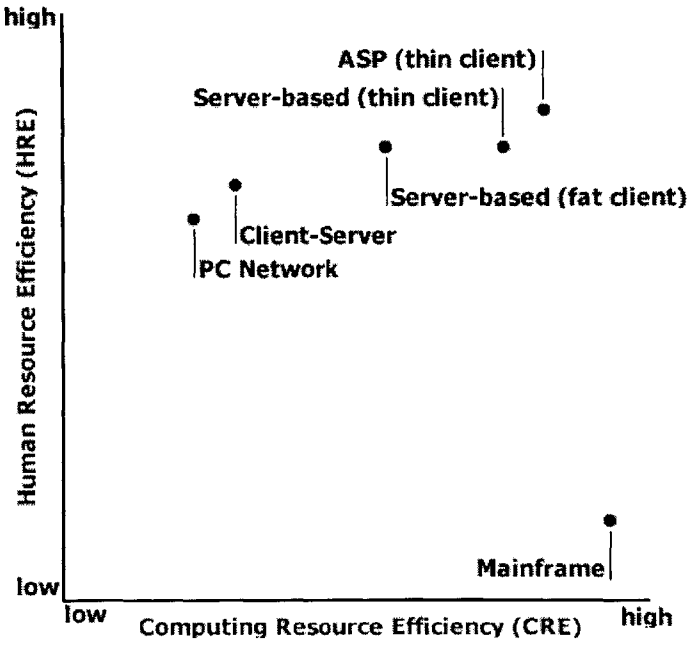

Figure 13. Computing Models CRE and HRE [Mathewson, 2000]

3.6 Conclusion

The aim of this chapter was to explain the evolution in computing technology. It analyzed the advantages and problems of the different computing models starting from the mainframe, to the classic PC model to the Client/Server architectures. The mainframe model failed as it proved to be extremely expensive and difficult to handle. The networked PC technology then gave way to the client/server architecture, a more flexible and affordable solution. With the emergence of three-tier and n-tier architectures the ASP model and the concept of outsourcing became technically possible. By using the Internet Protocol as the technological backbone, the thin client ASP model allows global collaboration and unlimited market potential. Collaboration at an enterprise level can be achieved efficiently and with considerable cost reduction using the ASP model.

By also analyzing the level of human resource efficiency and the computing resource efficiency of each model in this evolution, the ASP model proved to possess the qualities for becoming the "Efficiency Resource Model". A big part of this flexibility and efficiency of the ASP model lies in the variety of applications and services it provides for the customers as well as in the practical pricing models and business models it can adopt. The following chapter will tackle this important aspect of the ASP model that plays a part in the success of this technology.

CHAPTER FOUR

ASP APPLICATIONS AND BUSINESS MODELS

There will be as many ASPs as there are combinations of applications and service offerings. Even if two ASPs offer the same set of applications, there are many other ways in which they might differ, including the type and level of business expertise they offer, the SLAs (Service Level Agreement) they provide, the systems on which they run, the global reach of their business and IT infrastructure, and the type of services they provide. ASPs may also differ in their pricing models or may have different pricing models for different services. There are many ASP business models depending on the type of combination between service and applications an ASP provides. Each of these business models discovers its own advantages and disadvantages as it enters the market.

4.1 The Available ASP Applications

The range of applications available to enterprises form ASPs grows by the day, as more and more vendors and providers enter the market. Most popular applications available through the ASP fall into one of the following categories. Figure 14 shows the various types of ASPs in terms of the applications they offer and the services they provide around the deployment and management of these applications.

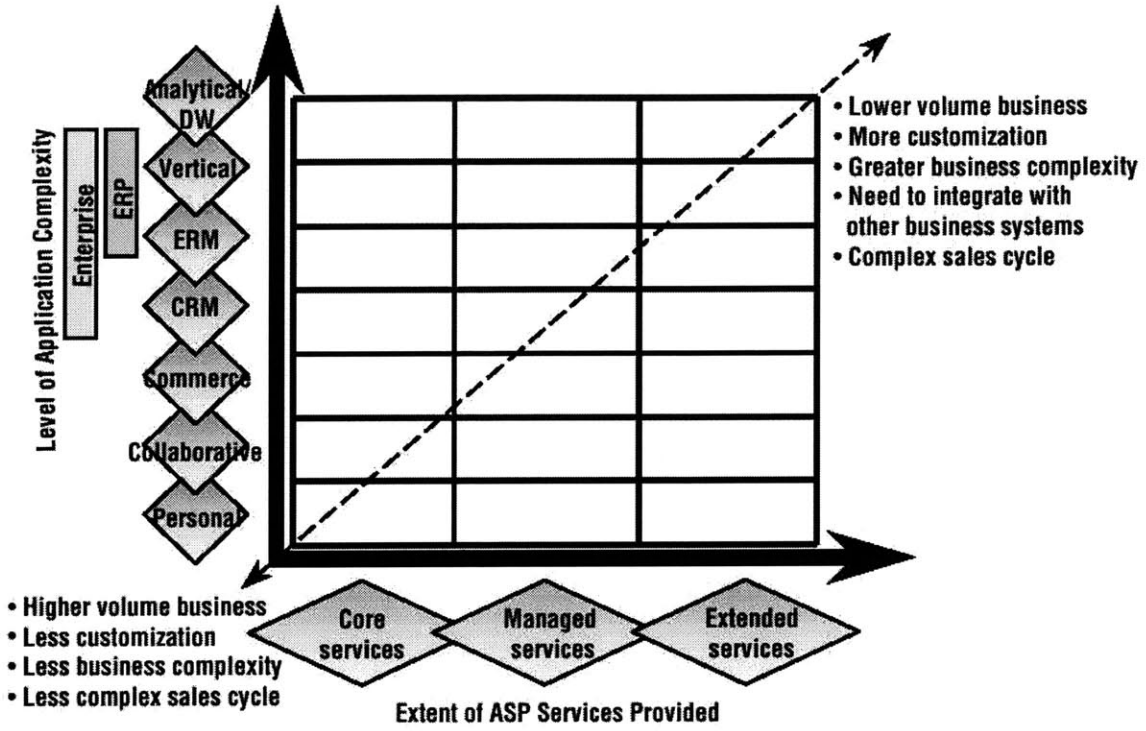

Figure 14. ASP Market Landscape [International Data Corporation, 1999]

4.1.1 Analytic Applications

These applications include any application built to analyze a business problem (e.g., financial analysis, customer churn analysis, Web site analysis, and risk analysis) [International Data Corporation, 1999].

4.1.2 Vertical Applications

These applications include any industry-specific application, such as MRP (Manufacturing Resource Planning) in the manufacturing industry and ERP (Enterprise Resource Planning) on an enterprise level, patient billing in the healthcare industry, construction, professional services, high-tech manufacturing, and claims processing in the insurance industry. Tapping into a shared skills and systems base allows participants to amortize the additional costs of

catering to their special needs across every member of the group. For example, Interliant is targeting its AppsOnLine.com particularly at vertical market groups [Farleit Limited, 1999].

4.1.3 ERP Applications

Most of the attention focused on the ASP industry to date has been concentrated on providers who offer ERP and accounting applications from vendors such as SAP, Oracle, JD Edwards and Peoplesoft at the top tier and such as Great Plains, Lawson Software and others in the mid market. The attraction is perceived to be the greater affordability of these applications when delivered using the ASP model, since the usual upfront investment in purchasing the software license and implementation can be amortized over the life of the contract [Farleit Limited, 1999]. For fast-growing companies and startups, there has been the additional attraction of moving directly to a top-tier application rather than having to pass through an interim stage, as the business grows, with all the disruption implicit in changing from one application suite to another. However it has been notable that ASPs offering this type of application have found it hard going to sign up customers. ERP applications have experienced relatively lower adoption rates to date compared to other types of application for the following reasons:

- First, ERP software has experienced weaker demand in 1999 because of the long and complex implementation cycles coupled with Y2K lockdowns at many companies [Legg Mason Wood Walker inc., 1999].

- Second, the client/server architectures of these applications could be contributing to difficulties with respect to implementation and delivery as an ASP solution. Many ERP software vendors are spending millions of dollars in product development efforts to web enable their applications.

- Third, many enterprises do not have sufficient confidence in the ASP model yet to entrust their core business systems to one of these new providers. It is only where the benefits become overwhelming that the balance tips decisively in favor of an ERP/ASP delivery [Farleit Limited, 1999].

4.1.4 CRM Applications

The range of customer relationship management applications, from sales force automation, marketing applications and customer service call centers, has been seen as a prime candidate for delivery via ASPs. There are two principal reasons for this. The first is that front office staffs are far more likely to be road warriors or distributed across branch offices than are back office staff. Thus as user groups they fall into one of the categories most suited to ASP delivery. The second is that CRM is a relatively new class of application and thus potential clients are more likely to be lacking the necessary in-house application skills. Alternatively a CIO may not have sufficient technical resources to allocate to supporting a brand new application, even if the sales director has already had the board's approval to go ahead with implementation. For example, Lotus Notes/Domino has been a popular platform for sales automation applications because of its suitability for use with distributed workforces. Interliant has had some experience with hosting this type of application. While the company has not yet introduced new CRM offerings, it has already forged relationships with two leading CRM application vendors, and firm announcements of application services based on their software are unlikely to be long in coming. The first ISV partner is Onyx Software, a leading sales automation and CRM vendor on the Windows NT platform that already has an established ASP channel [Farleit Limited, 1999].

It is becoming increasingly common for ASPs to acquire skills in a particular application by acquiring a leading integrator for the package. In some cases the ASP uses the acquisition to strengthen its own direct sales of the package. In other cases, the skills acquired are employed in developing and supporting the service for supply via channel partners of the ISV. It will be important to offer integration of CRM solutions with other applications and online services. One of the attractions for enterprises of turning to an application service provider for CRM - particularly one with a strong e-commerce background - is to have the ASP take care of integration between the two applications. Analysts have stressed the importance for any business of linking together e-commerce and CRM. This is an example of where ASPs can offer real value through combinations of applications. In due course, the value of broader aggregation of applications and services is likely to surface earliest in this

application area. For instance, an ASP who provided CRM applications would enhance its offering if it was also able to offer virtual call center services as an optional extra. Probably requiring an alliance with a separate call center provider, this is a useful example of the potential for enhanced service offerings through aggregating third-party services around a core set of applications [Farleit Limited, 1999].

4.1.5 E-Commerce Applications

Businesses of all sizes are looking for providers to host and operate their e-commerce applications. Many ASPs include vendors such as Microsoft, Broadvision and Vignette on their list of application services [Farleit Limited, 1999]. Some of these software vendors are beginning to introduce rental-style licensing into their relationships with providers and customers. By their nature, e-commerce sites are heavily customized to the individual needs of the client, rather than being a packaged service that is delivered to multiple customers. A much better example of an application service - and one that is spreading with great speed - is electronic purchasing. This business-to-business e-commerce application requires standardized links between buyers and sellers and thus lends itself to a third-party provider model. Vendors such as CommerceOne and Ariba who have been early entrants into this market initially began selling their solutions to large enterprises in a traditional manner. But they have quickly found that this slows the rate of adoption and raises a barrier because of the upfront investment required [Farleit Limited, 1999].

Since one of the keys to the success of their business model is achieving critical mass, they are turning to the ASP model to gain rapid market penetration. The dual combination of electronic purchasing with the ASP model has a dramatic consequence for enterprises. E-purchasing is acknowledged as a means of reducing administrative costs from up to $150 per purchase order raised by the typical organization down to just a few dollars, or even less. That was the rationale for large enterprises to make multi-million dollar investments in the technology. Using the pay-as-you-go ASP model, that upfront cost disappears, with the result that enterprises can begin to earn a return on investment (ROI) from day one. Since ASPs, like any other business, invoice at the end of each month, their customers may even

find themselves enjoying returns *before* investment (RBI). Enterprises renting access to e-commerce applications through ASPs can establish their contact with their customers and start making profit without having to make a big investment in the implementation and handling of these applications.

4.1.6 Collaborative Applications

These applications include groupware, email, and conferencing applications. Messaging should have been one of the first applications to be hosted. Since its purpose is to shrink distances, it has been deployed among distributed groups of users that are natural candidates for ASP delivery. In the largest organizations, it is also highly infrastructure intensive and vitally mission critical. If an email server goes down, messages get lost. Few enterprises have the data center resources available to keep servers running every minute of the day on a 24x7 basis. Early hosting of messaging has been a proving ground for application sharing. One of the challenges of the ASP model often overlooked by outsiders is the fact that mainstream client-server applications are designed to be owned, not shared. Most providers have only been able to offer it on dedicated servers, unable to realize the economies of scale that are available when a single server system can be shared by multiple customers. " It took considerable effort and development work on the part of Interliant to make Notes fully shareable in those early days when it first began Notes hosting. While the current version of the product includes features that make it easier to support operation in a shared data center, its architecture still assumes single-enterprise deployment, and it remains complex to set up as a shared system" [Farleit Limited, 1999].

Recently, Interliant has added a new variation on its Domino hosting service, called E-reach. In this delivery model, the ASP still provides the application as a hosted service, priced on a per-user per-month basis, but the servers are actually located on customer sites. In the real world high-quality telecommunications lines are not always available, and even where they are, they sometimes go down. Replication to a local server is often a more cost-effective means of providing for continued productivity than adding sufficient connectivity to guarantee the communications link. The ability to support satellite servers - and indeed

desktops - is likely to become a necessary part of an enterprise ASP's offering. Messaging and collaboration are obvious complementary applications to e-commerce and CRM, and the ability to offer integrated solutions will be another benefit of ASP aggregators. One of the evaluation criteria that potential customers of ASPs should take into account ought to be the range of applications available [Farleit Limited, 1999].

4.1.7 Personal Applications

These applications include office suites such as Microsoft Office and consumer applications (e.g., games, home productivity, and "edutainment"). The extent to which education and training is already delivered as an application service is often overlooked [International Data Corporation, 1999]. A hosting provider will typically provide its service to an education or training organization, which will use it to deliver content to trainees or students. Thus, the hosted organization is the provider of the main service, with the underlying computing simply being a delivery mechanism. However the provider should also have a direct relationship with the course recipients since part of its service is to register users and collect course subscriptions. This example illustrates that end users will interact with ASPs in different ways, sometimes directly, sometimes as an infrastructure provider or subscription management agent.

4.2 The Available ASP Services

The extent of services that an ASP delivers as part of its offering can be plotted along a continuum ranging from simple to complex. Because the ASP market is still emerging, this model is predictive. Most ASP service offerings are expected to fall into one of the following categories [International Data Corporation, 1999]:

4.2.1 Core Services

These services include the foundation services that an ASP needs to provide in order to manage the application environment and provide a base level of customer satisfaction. These services would include services such as application updates and upgrades, 7 x 24 x 365 monitoring of the application, network, and servers on which the applications run, and basic customer support.

4.2.2 Managed Services

These services include the entire core services, plus additional services and guarantees around support, security, application performance, and data redundancy. They would include services such as SLAs (Service Level Agreement) around application performance and data security, dedicated technical support personnel, and daily backup of the application and its data.

4.2.3 Extended Services

These services include all the managed services, plus additional professional services. Although the extended ASP services begin to border on a custom-delivery model, they are still delivered in the context of the ASP one-to-many model. Extended services include services such as application configuration and extension, strategy and planning, and training and educational support.

4.3 ASP Pricing Models

Pricing stands as a very important aspect of the application-hosting trend. ASP starters do not usually want to invest huge upfront sums for software, hardware and networking infrastructure before they even have any paying customers. And to attract those customers, the ASPs want pricing terms and models from both their platform providers and from ISVs

that give them the flexibility to support a range of pricing options while still making a profit at the end of the day.

The ASP receives a multi-year contract, normally ranging from 18 to 36 months. A typical client relationship includes a fixed monthly payment structure ordinarily based on the number of users. However, new technologies are permitting payment schemes based on variable terms such as the number of transactions, the number of screen clicks and amount of usage time. Pricing of the ASP service is a composite of each of the channel responsibilities and their relative costs. At the present time, there is a high degree of uncertainty regarding pricing structures and precisely where the market will assign a price ceiling. Cost and profitability will vary based on the complexity of the hosted applications. Current estimates place gross margins in the 30% to 45% range once economies of scale can be recognized [Cherry Tree and Co., 1999]. During the development stage, ASPs will require significant investments to put in place the various resources necessary to manage the ASP relationship. Consequently, pricing and direct cost relation-ships will vary substantially during this period. Pricing and profitability should improve as economies of scale can be achieved by spreading sunk costs such as data center expenditures across each new client.

4.4 ASP Business Models

The ASP market has evolved rapidly. There are now several business model characteristics on which investors should focus. The following business models are not either-or models but are evolutionary decisions every ASP must take.

4.3.1 One-Stop Shopping Versus Best-of-Breed

The first decision for many ASPs will be whether they will utilize a one-stop shopping approach or a best-of-breed approach to deliver their ASP solution. To understand the difference between these models, it is useful to view the ASP model from a value-chain perspective. Figure 15 shows the ASP chart transformed into a horizontal value chain.

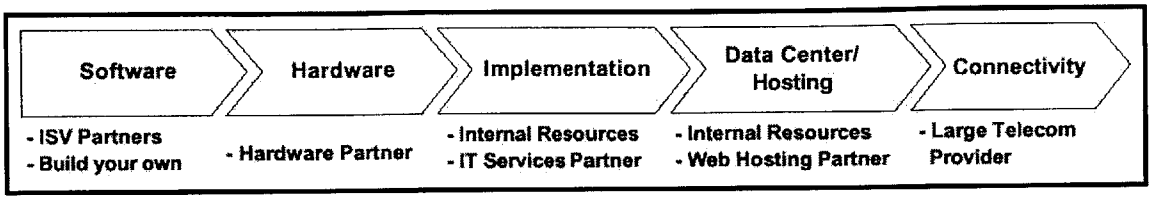

Figure 15. ASP Value Chain [Legg Mason, 1999]

The ASP value chain defines all the components necessary to deliver an ASP solution. These include software, hardware, implementation, data center/hosting, and connectivity services. In many instances, most ASPs will utilize existing packaged software applications, hardware from an established vendor such as Compaq or Sun, and connectivity from telecommunications companies such as Qwest and AT&T. The distinguishing characteristic between the one-stop shopping model and the best-of-breed model lies in the implementation and data center/hosting components of an ASP solution. In a one-stop shopping model, the ASP provides the implementation services through its own internal professional services organization and also hosts the application in its own internal data center. The best example of this model is USinternetworking. In contrast, the best-of-breed model utilizes partnerships for either the implementation or the data center/hosting components. Examples of this model include Corio, which utilizes Exodus and Concentric for data center/hosting services; Qwest Cyber.Solutions, which utilizes KPMG for implementation services and Qwest for data center/hosting services; and a joint venture of traditional IT provider CIBER, Inc. and Verio [Legg Mason, Wood Walker inc., 1999].

Each of these business models has its pros and cons. The pros of the one-stop shopping model are that the ASP has complete control over its customer's operations — providing a single point of control, manageability, and accountability. The cons are that it requires high capital expenditures for data center build-outs, as well as a need to have expertise in multiple areas including IT services and network and data center management. The pros of the best-of-breed model are lower capital requirements and that companies can focus on their core competencies while leveraging partners for other core competencies. The cons of this approach are that multiple vendors and relationships must be managed while providing a single point of contact for the customer.

While it remains too early to determine which of these models will be more successful, the data points indicate that the best-of-breed model will proliferate for the following reasons:

- First, there is a large supply of data center space set to come on-line over the next several years and Web hosting companies are targeting the ASPs aggressively as a mechanism to fill up this space.

- Second, there will be thousands of ASPs, particularly as traditional IT services firms and systems integrators look to evolve with this transformation of IT services. The majority of ASPs, due to the capital requirements and a desire to focus on their core competencies, will look to outsource the data center management expertise to hosting providers.

However that focusing on one model does not prohibit ASPs from taking a hybrid approach. For example, Usinternetworking has partnered in some of its larger contracts with large systems integrators, which are providing consulting and implementation work while leaving the hosting and ongoing management to USi. Also it is not out of reach for USi to look to leverage existing data center space over the next several years as a mechanism to satisfy what could be robust demand for ASP solutions [Legg Mason, Wood Walker inc., 1999].

4.3.2 Horizontal Focus v/s Vertical Focus

The next way to segment an ASP is by whether it is taking a horizontal focus or a vertical focus. A horizontally focused ASP seeks to offer a full suite of software applications that are common to all companies. These software applications could include electronic commerce, procurement, human resource management, financial management, e-mail, etc. In contrast, a vertically focused ASP offers software applications targeted to a specific industry vertical, such as health care/life sciences, financial services, manufacturing, etc. Figure 16 depicts these segmentations.

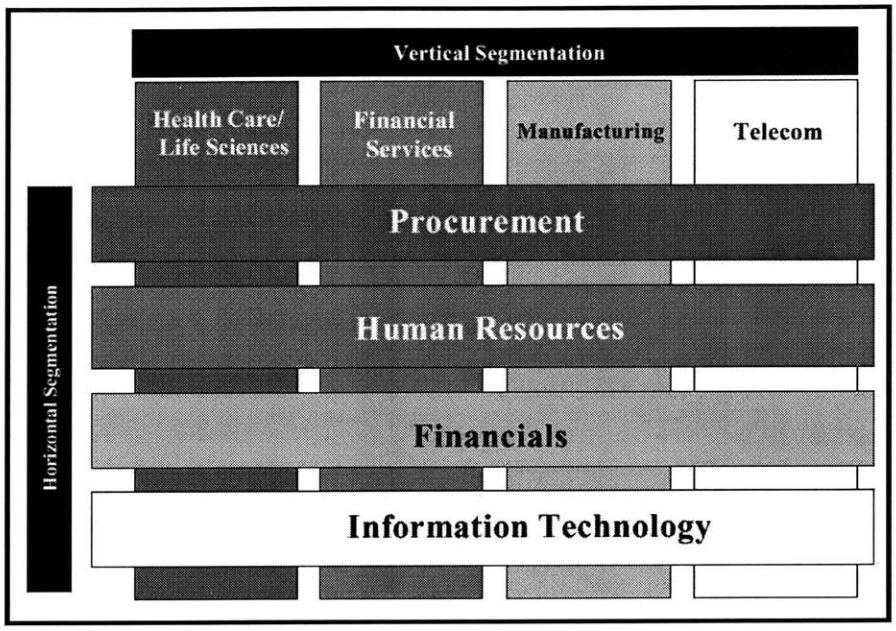

Figure 16. Horizontal and Vertical Segmentation of the ASP Industry [Legg Mason, 1999]

It is clear that horizontal ASPs are the first wave of the ASP market. ASPs like Usi and Corio are looking to be a single provider to companies for all their functional needs. The pros to horizontal ASPs are that companies can go to one vendor for a full suite of products. Additionally, in most cases, horizontal ASPs are choosing software applications from well-established and leading vendors. The cons of this approach, however, are that customers must select their choices from the menu and there is likely to be limited flexibility for companies to select off-the-menu applications.

Additionally, many companies may need applications that are geared toward specific industry requirements. A horizontal ASP will likely not have a solution in this area, as it looks to support applications with broad appeal rather than narrow niche appeal. With respect to the latter point, this is where vertical ASPs are coming into play. These companies look to offer applications that automate the business processes of specific industries. For example, Intralinks is providing communication and collaboration functionality through an ASP offering primarily to the financial services industry, specifically in the areas of loan syndication. Additionally, we believe that a company like Chemdex, while commonly viewed as a net market maker, also could be viewed as an ASP for the life sciences and health care

markets. The company offers both procurement and content management solutions that are specifically tailored to its target verticals. The benefits of the vertical approach are that these applications satisfy requirements of specific industries. However, the cons of a vertical ASP are that they may not meet the broader requirements of an organization, leading to a situation in which companies may be required to go to and manage multiple ASPs for a complete solution.

As a result, partnerships are expected between horizontally focused and vertically focused ASPs. For example, USinternetworking is dipping its feet in the vertical markets with its partnership with Niku, which provides an application targeted toward professional services companies [Legg Mason Wood Walker inc., 1999]. The best example of partnerships is in the procurement software area, in which horizontal procurement companies such as Ariba are partnering with companies such as Chemdex, which is offering procurement solutions to life/sciences and health care companies. While a small biotechnology department at a university may be satisfied with implementing a Chemdex procurement solution, a large pharmaceutical company may have broader procurement requirements and may need the functionality of an Ariba solution. The partnership between Ariba and Chemdex enables a large pharmaceutical company to have the broader functionality of an Ariba solution while benefiting from the domain expertise and content of a Chemdex solution [Legg Mason Wood Walker inc., 1999].

4.3.3 Existing Software Applications v/s new Web Applications

The next evolutionary business model decision an ASP must determine is whether it will offer existing packaged software applications or if it will develop its own proprietary software application.

ASPs that utilized existing software applications from established vendors have dominated the early phase of the ASP market. There are many pros to utilizing traditional software applications from vendors such as PeopleSoft, BroadVision, Siebel Systems, etc [Legg Mason Wood Walker inc., 1999].

- First, these companies are established vendors with large customer bases.

- Second, these companies, in many instances, have strong brand recognition and a large sales force and marketing budget, which can be leveraged by ASPs to help drive demand.

While traditional software applications/vendors have many positives, there are also several negatives. For example, in many instances these traditional software applications are client/server architecture rather than a Web-based architecture, which could lead to potential problems in deploying these solutions through ASP delivery. Many established software vendors are spending millions of dollars to Web-enable their applications, but one must dig deep to determine if companies are completely re-architecting their software or simply patching a Web front end onto existing client/server architecture.

Another potential issue for existing packaged software applications is that the functionality may be too rich for SME (Small and Mid-sized Enterprise) customers. For instance, while *Fortune 100* companies with large sales forces may want the functionality of Siebel System's enterprise software application, small companies with a 10-person sales organization would find Siebel's enterprise product complex and likely overwhelming. Many established software vendors recognize this issue and are taking steps to address it. For example, Siebel offers its Sales.com Web site for an individual, Siebel Sales for Workgroups for companies up to 100 people, and SiebelNet for large enterprise customers [Legg Mason Wood Walker inc., 1999].

While the early phase of the ASP market has been dominated by ASPs that utilized existing software applications from established software vendors, an influx of ASPs that seek to offer their own Web-based software architected from the ground up for ASP delivery is expected. While one cannot discount the position of established software vendors, we do believe that a few new powerful software companies will emerge from this ASP transformation.

These companies will represent a new breed of software vendors that no longer ship CDs and collect traditional perpetual license fees but, rather, offer their software application as

a service, garnering recurring subscription-based revenue streams. Additionally, these companies are combining their software with complimentary third party, value-added services. For example, Atyourbusiness, in addition to human resource management functionality, offers value-added services, such as payroll processing and disability insurance to small businesses. The ASPs that are developing their own Web applications will have several advantages over established software vendors.

- First, these applications are architected from the ground up to be Web-based and optimized for ASP delivery.
- Second, the functionality is geared to the SME market's needs, with functionality expected to increase over time based on customer demand.
- Third, these companies have a "New World order" mentality, as they are not hampered by a legacy customer base that must be supported.

While this new breed of Software Company will have advantages, it also faces several challenges versus established vendors.

- First, these software companies lack brand recognition and must invest heavily in sales and marketing in order to build brand equity and awareness. In contrast, an established software vendor such as PeopleSoft may find it easier to leverage its brand name with large customers down market to small and midsize businesses.
- A second major challenge will be intense competition. The new software companies not only will be competing with established high-end vendors, but will also be competing with many other companies trying to target a similar market.

"With low barriers to entry and a plethora venture capital funding available, thousands of ASPs targeting similar applications and markets to emerge are expected. For the new breed of Software Company, first-mover advantage and, more importantly, first mover to scale will be critical to long-term success." [Legg Mason Wood Walker inc., 1999]

4.5 Conclusion

This chapter focused on the different types of applications that today's service providers are making within reach. What used to be a very expensive application to implement like ERP and CRM can now be accessed easily through the web linked servers. However, many issues are under question like the importance of developing standard applications versus customized ones. ASPs are still experimenting with the types of services business models they can adopt and are gradually discovering the pros and cons of each approach. In all cases, the great potential in the ASP service, the variety of applications they provide and the flexibility in the pricing models they put forward to customers are gaining them more and more dominance in application hosting industry. Having analyzed almost all issues related to the ASP model, the following chapter will zoom on the collaborative ASP model as one with increasing potential because of the essential role it plays in today's e-business landscape.

CHAPTER FIVE

COLLABORATIVE ASP

In this high-paced, do-it-now world, if one is to gain that competitive edge, one needs to make his business communications tools work harder than ever. It is time to put collaboration to work. Collaboration solutions represent a new generation of business communications tools that leverage the latest in technology for reaching your employees, customers and partners with the highest impact in the greatest ease. Drawing on services like audio, video, and data conferencing as well as audio and video streaming, collaboration solutions streamline communications to support an endless variety of power-packed applications, from product demonstrations and shareholder meetings to sales presentation and training seminars. " Collaboration will liberate new bursts of productivity, creativity and growth. Collaboration is the next level beyond plain old communications. The convergence and integration of technology are the only means to this," said William T. Esrey, Sprint Chairman and CEO. Several factors led to the focus on collaborative ASPs as one of today's effective technologies to run the E-business world. The merging of ASP technology with the collaboration strategy gave way to the collaborative ASPs to be discussed in this chapter through the analysis of ie-Collab project and other collaborative application servers already competing in the market.

5.1 Factors behind Collaborative ASPs

" Does this sound like your typical week? You've got a sales meeting with the Northeast region, a product briefing for a customer in Chicago, then a contract negotiation with your west coast supplier. Well thanks to the abundance of communications options available today, you can do it all without leaving your office or even your desk." [www.sprintbiz.com, 1999]

5.1.1 Shift from Communication to Collaboration

Technological innovation is allowing significant changes to the traditional organizational and time-dimensions of the supply chain decision-making process. CPFR (Collaborative Planning Forecasting and Replenishment) uses Internet technology to unite multiple enterprises either simplistically, in a manner similar to but more efficient than e-mail, or in a more sophisticated fashion, where enterprises share access to enterprise systems to support enterprise process planning and execution. Robust application-to-application decision-making will require the closed-loop collaborative capabilities available through the Internet. These collaborative ventures are also beginning to enter the realm of contingency planning, to enable more efficient multi-enterprise responses to potential upsets in demand and in the value network. As organizations move from small-scale collaborative prototypes to full-scale inter-enterprise initiatives, the capabilities of the infrastructure must also become more robust [Benchmarking Partners, Inc., 2000].

5.1.2 Telecommuting

Telecommuting is part of the virtual workplace. Companies adopting the virtual extended corporation model often find it better to shift employees to a telecommuting mode instead of forcing them to work in the office. This phenomenon reinforces the idea of a virtual organization being able to acquire more skillful people not necessarily located in its offices.

Telecommuting involves working one or more days each workweek from home or from a satellite office, instead of commuting to the central workplace. Telecommuting is being used as a travel substitution, office space cost-saver, and means of bridging the family work-gap, which is increasingly an issue as more and more women assume full-time employment. Reports indicate that telecommuting is on the rise worldwide.

Benefits to telecommuting employees can include personal control over working time and working conditions, with one of the most obvious advantages being the time, energy, and stress reduction from not having to commute long hours to the office. For the employer, there are numerous advantages to offering the employees the choice of telecommuting. Such work arrangements can increase the organization's flexibility, and transfer from the employer to the worker the costs of the provision, maintenance, and running of the workplace and equipment. Achieving telecommuting can be done through technological facilities that can make collaboration possible when it is applied in this new E-business model.

5.1.3 Globalization

The concept of the virtual extended corporation is not limited to national boundaries. The various business entities of the virtual extended corporation could be spread over several countries. By distributing operations globally, the organization can exploit various features each country can provide. For example, the manufacturing plant can be located in developing countries like India or China where labor costs are low; Research and Development (R&D) in the United States where there is a strong foundation for research capabilities; and Finance in London, a world financial center. Thus, by exploiting the advantages of each location, virtual companies are able to acquire competitive advantages over their rivals. The achievement of this also requires a strong technology that can make collaboration possible beyond geographical boundaries.

5.2 Collaborative ASP Application: ieCOLLAB

ieCOLLAB is an Internet-based collaborative application service provider that is being developed by a joint university-based virtual team. ieCOLLAB is a tool for communicating information and sharing software applications in a protocol-rich Java meeting environment. By creating and managing virtual team, ieCOLLAB's collaborative solution will offer organizations new ways to leverage off-site expertise, improve communications and reduce project costs and duration. The customers for ieCOLLAB's ASP model are virtual teams in automotive, aerospace, construction, defense, and software industries. Typical customers will be project managers in charge of cross-functional teams working across geographical, temporal, organizational, and cultural boundaries. ieCOLLAB should allow for ease of use through:

- Sharing of ideas, models, simulations, calculations and drawings
- The possibility to edit documents at the same time
- Accessibility from any location i.e. virtual desktop
- No installation is required from the user
- Upgrades and maintenance are transparent from the user
- Accessibility to various applications
- The TCO (total cost of ownership) decreases considerably
- The storage happens on the server side therefore document sharing is possible

All these features will allow users from geographically distributed locations to meet synchronously in an Internet environment and enable them to generate and organize meetings. The final product will include the software package, the user's manual, and a

compilation of all reports generated during the project. Two fully operational versions will be developed during the project lifecycle.

5.2.1 ieCOLLAB Team

The team is comprised of graduate students from the three universities: MIT (USA), CICESE (Mexico) and PUC (Chile). Each of these students is pursuing degrees in Information Technology and Computer Science with undergraduate and professional backgrounds ranging from engineering to computer science. Teams were distributed into three types of activities that were required to fulfill the software development process (see Table 4).

Table 4. Major Work Activities [Arantes, 2000]

Development Activities	Analysis Design Code Test
Project Support Activities	Project Management Quality Assurance Configuration Management Knowledge Management
Marketing Activities	Business Management Marketing Management

The main advantage, disadvantage and challenge behind developing ieCOLLAB is the type of team that was created. Geographically distributed teams are collaborating together to come up with the product. What are the benefits, problems and solutions?

- Benefits:
    - The ieCOLLAB team has a combined experience of 25+ years in the collaboration field and 15+ years in software design and development.
    - The members' various ethnic and academic backgrounds bring unique strength to the team.

- Because of this cultural diversity, the team is more adept at formulating global strategies, capitalizing on several global markets.

- The team is being aware of the problems facing collaboration between dispersed teams in the process of developing ieCOLLAB.

- Problems: The main problem that the team faced is bad communication and collaboration between members, other problems include lack of IT knowledge as well as inefficient Time Management (see Table 5).

Table 5. DSES (Drivers, Strategies, Enablers, Solutions) Table [Limansky, 2000]

DRIVERS	STRATEGIES	ENABLERS	SOLUTIONS
Bad Communication between geographically distributed team members	Balanced Number of Distributed Team Members	Equivalent Institution Interest (i.e. MIT and CICESE)	Joint Programs and Student Exchanges between Institutions
	Trust Between Distributed Team Members	Early Meeting before Project Start	Modifying Class Curriculum and Schedule
	Overlapping Class Schedules between Distributed Team Members	Preset Distributed Class Schedules	Higher Collaboration between Institutions on Departmental Level
Lack of IT Knowledge by part of the Team	Developing More Programming Skills	Intensive Programming Course Work	More than One Course in Programming during Early Phase of Project
Inefficient Time Management	Setting Benchmarks and Meeting of Deadlines	Enforced Project Schedule	Project Schedule set By Class TAs / Professors for Early Phase

Publicly available communication tools were used, which makes the team directly aware of the limitations of their use:

- Asynchronous tools:
    - E-mail
    - Web-based Repository for collecting documents
    - Web-based CVS Repository for code updates
- Synchronous tools:
    - Microsoft NetMeeting & Mirabilis ICQ
    - CAIRO software developed by the DISEL MIT team

The use of these common sets of tools creates a critical attitude from day one in the project as the first problem is achieving team coordination using these limited resources.

5.2.2 ieCOLLAB Process

The process includes the software development cycle that requires a specific team division that is common to industry software development projects. Teams always included members from all three universities to increase awareness of collaboration problems (see Figure 17).

The project consisted of four separate versions:

- Transaction Management (Version 1)
- Meeting Management (Version 2)
- Collaboration Server (Version 3)
- Application Server (Version 4)

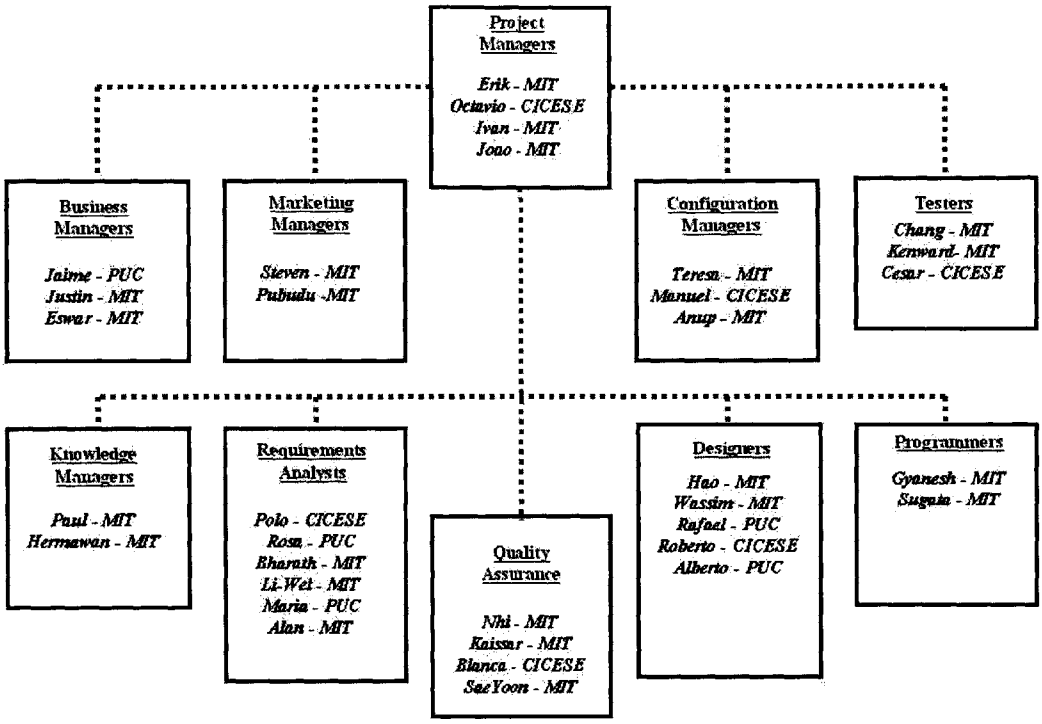

Figure 17. Team Distribution [Limansky, 2000]

As part of the Project Management team, our team decided to reduce to scope of the project to developing only two parts of the whole software to satisfy milestones and achieve high quality instead of quantity. The team addressed meeting Management and Transaction Management. We adopted the incremental model for software development to maximize the use of human resources in a relatively short period of time (see Figure 18). This model allows the concurrency of several activities together, such as having the Requirements of version 1.0 ongoing with the Design of version 2.0.

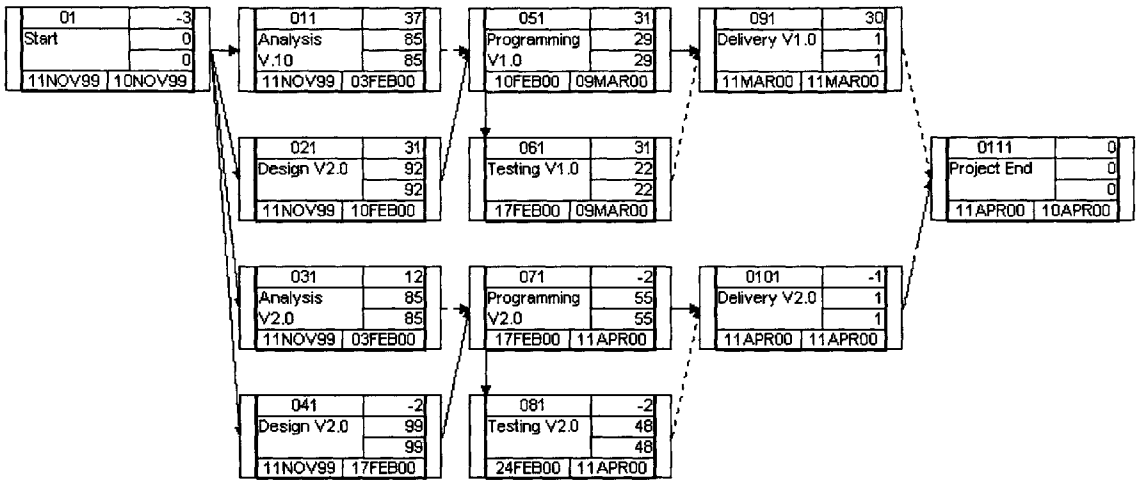

Figure 18. Incremental Model [Arantes, 2000]

5.2.3 ieCOLLAB Technology

The technology used for building a thin-client ASP application is based on a three-tier computing model. The ieCollab system comprises of three layers: user services (front end user interface), business services (business logics), and data services (back end database). The fist layer is linked to the second layer through CORBA connection and the second layer is connected to database via JDBC (see Figure 19):

- Client: The client was developed using Java language.
- Server: the server was built using Java language.
- Database: the database was built on Oracle 8i.
- Interfaces: one between the client and the server where CORBA language was used, the other interface is between the server and the database that was developed using JDBC (Java Database Connectivity).

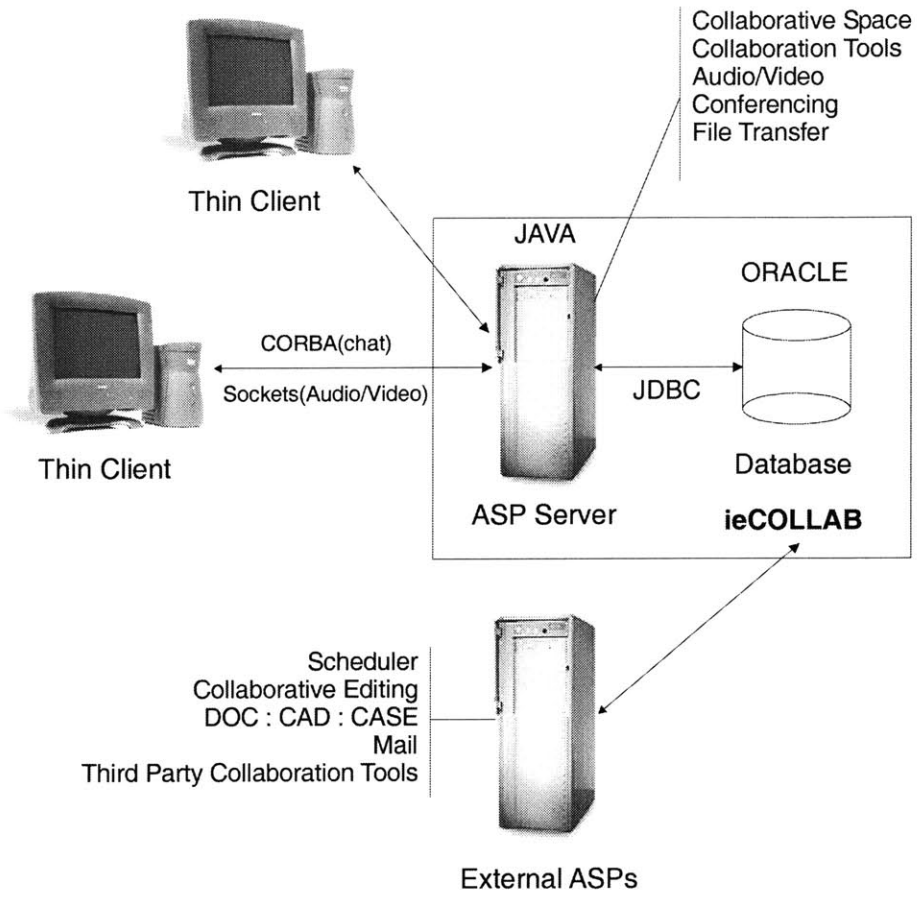

Figure 19. ieCOLLAB Architecture [Limansky, 2000]

The adoption of an ASP model also allowed ieCOLLAB to connect to other ASPs on the Internet thus expanding the possibilities of applications endlessly. Java was used for this project due to the multi-platform capabilities it possesses as well as the web-embedded applets. This also allows a flexible server and database end unlike using Microsoft COM technology, which requires a full Microsoft Suite even sometimes for the browser itself. Also as compared to C++ language, java requires less number of lines of code especially for the GUI (Graphic User Interface).

5.2.4 ieCOLLAB Development

ieCOLLAB's Internet-based meeting tools solve the problem of personnel relocation with reliable forums for communication among distributed teams. IeCOLLAB will develop

virtual team management and execution tools to be deployed via the Internet, to allow easy access from all collaborators. Not only will participants communicate via a structured environment, they will also have access to commonly used tools specific to their industry. This unique blend of traditional communication tools such as audio, video and text-chat and meeting protocols results in smoother meetings that finish on time and accomplish their goal. IeCOLLAB's application service provider model solves the most common problems facing virtual teams:

- Event notification to all users when data changes and control protocols to handle simultaneous changes to the same piece of data.

- Customized profile information stored in the ieCOLLAB system will be made available to online personal assistant technologies, such as online calendars, providing end users with a richer online experience.

- Finally, ieCOLLAB will make the entire meeting solution, environment and applications, available to organizations interested in Intranet/Extranet deployment, thus maximizing security and personalization.

IeCOLLAB will deploy two pricing schemes for the application servicing: a pay per use option and a subscription option, which permits users to sign up for unlimited access. When used in conjunction with the meeting environment, pricing for the applications will be assigned to particular meetings to allow all participants to have access

Commercially available ASP's allow users to interact with an application associated with a data source that is tied to that instance of the application. Users benefit from the ASP model, but have no way of sharing their data unless they physically send it to others. Collaborative tools have traditionally been difficult to develop because of the complex event notification scheme that must exist to allow all parties to work with and see the most up-to-date data. By leveraging event notification process already developed for the meeting environment, ieCOLLAB will be able to transform these traditional applications to highly effective collaborative tools.

Some existing meeting tools have functionality similar to that of an ASP, giving participants the ability to share their desktops and associated applications with other collaborators. Problems still exist when both participants try to work simultaneously, resulting in system control conflicts, because the system is not able to handle multiple users' input concurrently. Most online meeting applications only provide communication tools, with little if any control. Take for instance Microsoft's NetMeeting in which the meeting creator can grant higher permissions to other participant giving them more control. The control they gain is only to remove participants from the meeting, lacking in the area of meeting management issues such as side conversations.

The ieCOLLAB solution will give organized collaborators structure and order to the meeting environment starting them off in the right direction.

5.3 Present Collaborative ASPs

The ASP market is young but growing fast, taking advantage of technologies developed by a number of leading IT vendors. Several collaborative ASPs are already competing in today's market. Collaboration includes synchronous applications such as Microsoft's NetMeeting and asynchronous applications such as e-mail. Due to the variety of possible applications that falls under collaboration, different collaborative ASPs focus on different or a combination of different collaboration services.

5.3.1 X-Collaboration

Boston-based X-Collaboration Software Corporation provides efficient workflow of knowledge, project, resource and document management capabilities to I/T and management consulting organizations, law firms and other business-to-business industries via X-Community.com. The service reduces the mechanics and redundancy associated with gathering, assembling, editing and "packaging" information. X-Community's outsourced Application Service Provider (ASP) model enables end-user teams and/or corporations to

manage the complex workflow processes between information and users – at a fraction of the cost of LAN-based collaboration, groupware or file server solutions.

X-Community is the hosted service of X-Collaboration that increases efficiency and profitability by improving workflow, project, document, and knowledge management within and across company boundaries. X-Community streamlines the work process by transforming the Web into a business workspace. Adding to X-Community's existing relationship with Microsoft Office 2000, X-Community will enhance Microsoft Project users' ability to integrate B2B services with collaboration via the Web. By integrating X-Community's Web-based service and Microsoft Project Central, Microsoft Project users will be able to collect information, view the project status, delegate tasks, and share information from anywhere in the world. Doug Levin, president and CEO at X-Collaboration. "By combining the extranet capabilities of X-Community with the comprehensive project management capabilities of Microsoft Project and Microsoft Project Central, companies can now use the Web to gather knowledge and coordinate geographically dispersed teams with internal processes for seamless project execution."

Benefits of using X-Community [www.X-Community.com, 2000]:

- *Smart team management.* Team meetings to satisfy critical deadline. A clearer view of the big picture without missing the important details. Working with the most recent file version. All information is in one place that's accessible 24 hours a day.

- *Security and reliability.* Support for authentication, authorization, accounting, and encryption and monitoring, archiving, maintenance, and security protection.

- *Single point for information gathering.* Centralized Information services.

- *Resource options.* Telecommuting is made possible.

- *Neutral operating environment.* Integration with popular desktop applications.

- *Web technology.* X-Community is constructed from the ground up with an open platform that incorporates Java and XML.

- *Fast information transfer.* Compression technology makes data transfers fast.

5.3.2 WebEx

WebEx Interactive Services for Businesses require only an ordinary browser and telephone to provide sophisticated, real-time visual and verbal interaction across the Web. The primary WebEx Interactive Services for Businesses include [www.webex.com, 2000]:

- *Meeting Center.* Meeting Center virtual meetings match the productivity of face-to-face meetings by incorporating audio, data and video in a full-featured on-line meeting room.

- *Business Exchange.* Business Exchange is a personalized, virtual office space and directory on the Web for your organization's sales, marketing, and customer support professionals.

- *WebEx OnCall.*- WebEx OnCall enhances the effectiveness of traditional telephone-based customer support by adding real-time communications that enable customer support organizations to quickly resolve customer problems.

The main features delivered by WebEx are:

- Give any presentation to anyone, anywhere

- Demonstrate software, live

- Allow anyone in the meeting to view, annotate, and edit any document electronically

- Share an application on your system or share the entire desktop

- Use remote control to provide support on the web Take meeting participants on a web tour.
- Integrate teleconferencing into your meeting
- Add video to personalize your meeting

Workgroups can collaborate on any project-any time-from anywhere. WebEx Meeting Center merges the entire range of digital visual media and voice to provide an on-line forum that matches the productivity of face-to-face meetings.With the ability to personalize meetings as well as provide complete communication options including Chat, Voice over IP, PSTN teleconferencing, and video, WebEx Meeting Center provides all the capabilities necessary to support real-time meetings on the Web [www.webex.com, 2000]. WebEx is a Web-based meeting and collaboration service with flexible customization options and features designed to increase communications and workflow.

5.3.3 HotOffice

HotOffice also creates an affordable Web-based intranet for your organization using the easy accessibility of the Internet. Adding employees, colleagues, customers and suppliers to your HotOffice is possible and this allows sharing information and collaborating in real time. The main features are [www.hotoffice.com, 2000]:

- *Document Management.* Securely store all your company and personal files in a central location for remote access, revision control and keyword search
- *Group Calendar.* Organizing your group's schedule and prioritize tasks
- *Private Bulletin Boards.* Share ideas on your private company bulletin boards
- *Web E-mail.* Consolidate all your e-mail into one Web-based service accessible anywhere without computer reconfiguration; use search and sort functions and view HTML pages

- *Web Publishing.* Securely upload files and documents to your HotOffice. No software download is required.

- *Group Contact Manager.* Give your whole team access to shared contacts while maintaining a private list, as well

- *Intellisync® for HotOffice®.* Easily synchronize your HotOffice Contact Manager with your Outlook 97/98 and PalmPilot

- *Online Document Viewer.* View documents, spreadsheets, presentations and graphics without downloading or needing original software

- *Online Conference Rooms.* Hold private online meetings in your company chat rooms

- *Reminders.* Schedule group or personal electronic reminders for today or anytime in the future

5.3.4 Centra

Centra eBusiness collaboration solutions was designed to support the full spectrum of live Internet event formats to expedite critical business processes, such as collaborative selling, Web-based marketing, channel enablement, and enterprise application deployment. Centra's key drivers for eBusiness collaboration are [www.centra.com, 2000]:

- Eliminating the expenses associated with live gatherings, telephone conferences, and document distribution

- Increasing revenues, by rolling out new products faster, conducting virtual sales and marketing, and providing support for other customer-facing events

- Improving the ability to interact with customers on a high-touch basis, maximizing customer satisfaction, loyalty and retention.

To accomplish this broad reach, Centra's software "Centra 99" includes two clients that use the same server, same content, and same management/administrative tools. Several tools are used to achieve an efficient internet collaboration and the main features they possess are [www.centra.com, 2000]:

- *Streaming Audio and Video.* Centra Symposium is a live Internet collaboration software to offer fully integrated, multi-way audio conferencing as a standard feature accessible to all users on a LAN, Internet, or low bandwidth dial-up connection. In addition, Centra 99 is compatible with all the latest streaming video and audio technologies, including G2 from Real Networks® and NetShow from Microsoft®.

- *Live Application Sharing.* Centra Symposium is a live collaboration environment to deliver high-performance application sharing with integrated multi-way audio conferencing. Centra's flexible application sharing capabilities allow a user to deliver applications three different ways to participant desktops - group interactive, individual hands-on labs, and broadcast - from any PC over low-bandwidth network connections.

- *Uses All Dynamic and Packaged Content.* Centra 99 is compatible with all major content formats including video, audio, Microsoft PowerPoint, graphics and animations, simulations, interactive multimedia, packaged content, live applications, and other Web friendly content. Using Centra Agenda Builder, anyone can quickly organize content and agendas for any structured online event. Content is then displayed on desktops through simple point-and-click delivery by the session leader. Alternatively, the content can be sequenced, as needed, just before or during a live session.

- *Centralized Management.* Every Centra 99 software solution is supported by an underlying system for centralized login, management, administration, and reporting and content delivery. In addition to capabilities for live and recorded group collaboration, Centra 99 can be easily integrated with other Web-based systems for e-commerce, self-paced content delivery and knowledge management.

5.3.5 Placeware

Placeware also offers a virtual environment for all types of meetings including new product launches, brainstorming, online seminars, training, sales meetings, investor relations, press/analyst briefings, corporate announcements, and HR benefit meetings. Placeware has a complete virtual conference center for users to hold live interactive meetings and present visually rich materials over the Internet with only a Web browser and a phone. Their competitive advantage comes from several features such as [www.placeware.com, 2000]:

- *Rich Visuals and Live interaction for effective meetings.* PlaceWare lets a user select from several types of virtual conference rooms (whether for a large presentation or a smaller collaborative meeting). The user can share all types of graphical content with the audience, broadcast applications from your desktop, stream audio and video, take the audience on Web tours, collaborate using whiteboards, conduct instant audience polls and create on-the-fly content. The result, according to Placeware, is higher audience retention, more productive meetings, and a tremendous competitive edge for your company.

- *Simplicity.* provides a single point of entry (one URL) to access all options: from scheduling a meeting, inviting others, presenting, recording, generating usage reports. A user has instant access to a virtual conference center where he can easily communicate with any size audience regardless of their location.

- *Reliability, Scalability, and Security.* Placeware offers multilevel access options in their product to prevent unauthorized parties from accessing a user's content and viewing his material. It comes automatically with PIN-based passwords and security, which defines access for the audience and presenters. To increase security, a user can set up Access Control Lists to define who has access on a per meeting basis. Placeware can service up to 2,500 users in one meeting.

5.4 Collaborative ASP Advantage

All these possible tools that are increasing in number on the Internet today have mostly similar features and are competing at the level of reliability, scalability and security but more important are the advantages they provide a user or a business:

- Enhance Team Productivity:
    - Access important files from the road easily.
    - Manage document revisions automatically.
    - Collaborate with team members from anywhere.
    - Share calendar and contact information instantly.
    - Schedule reminders for the whole team.
- Save Money:
    - Save thousands of dollars over other intranet options.
    - Reduce time-consuming meetings, phone calls and travel expenses.
    - Avoid expensive overnight mailings and couriers.
    - Get updated versions automatically.
- Share Ideas and Information:
    - Organize company information in a central location.
    - Gather instant feedback with real-time online conferences.
    - Brainstorm using online bulletin boards.

- Pick up phone messages after office hours.
- Receive alerts when new documents are posted.

- Safeguard Data:
  - Backup important documents in a secure, encrypted off-site location.
  - Reduce risk of loss due to computer damage or theft.
  - Ensure remote access anytime.

- Stay Current:
  - Use the latest Web technology without having to upgrade.
  - Never buy new server hardware or software.
  - Stay connected to the latest Internet business services.

- Enjoy One-Stop Access:
  - Keep all your reminders, messages and files in one place.
  - Conduct online business from one central location.
  - Access all your e-mail accounts from one inbox.

5.5 Conclusion

The shift from coordination to collaboration in the e-business application, the acceptance of the telecommuting concept, and globalization as a business strategy, can all become real and applicable through collaborative ASPs. The aim of this chapter was to zoom on this specific type of ASPs and detail the characteristics of applications that they provide. To do this it focused on ieCOLLAB as a collaborative application designed to cope with the ASP

technology and, thus, act a tool for enterprise collaboration. This chapter revealed the advantages of this application, the goals it can achieve and the technology behind it. Other collaborative applications like WebEx, X-Collaboration, and HotOffice were also discussed in this chapter defining the specific services each offers to compete in the race of achieving deep collaboration.

Now that ASPs have been proven inevitable for achieving collaboration and for an easy blending of enterprises with the e-business world, what remains is to wrap up this study with some future expectations for this technological model after revealing the great impact it had on the different sectors of the IT industry.

CHAPTER SIX

ASP FUTURE MARKET

The future ASP market is a direct reflection of how strong an impact this new model has on the IT industry. Now that the business world is becoming globally wired and automated, the ASP model proved capable of answering the question: "how do we collaborate?" Through its reliable technology, the variety of applications it provides, and the practical pricing models it offers, the ASP was able to shake the foundations of the different service sectors in the IT industry. Now these sectors, the software, hardware, services, and telecommunication industries are developing new strategies to cope with the invasion of application service providers. A serious decision for them to take has become whether to partner with an ASP or themselves become an ASP. Some expectations for the ASP future market have already been calculated and come as a concluding evaluation for this revolutionary solution in the IT industry.

6.1 ASP Influence on IT Industry

Because of the broad range of skill sets and products that an ASP needs in order to deliver its services, the ASP has proved to significantly impact multiple parts of the IT industry.

6.1.1 Impact on Software Industry

The first issue influenced by the emergence of ASP is that of the customer for the software vendors. The answer to this depends on the type of software vendor: applications, tools, and systems infrastructure. Of course, other variables need to be considered. Generally, the tools and infrastructure software vendors should target the ASPs as their customer. Companies like Marimba, Epicon, Citrix, and Progress Software have publicly committed to help make their ASP partners successful. It is more difficult to generalize the logical path for applications vendors. A defining criterion of an ASP is "holding the customer relationship." Therefore, an applications vendor must give up the customer to work with a third-party ASP. However, it is different from other channel decisions because it is not just about a new channel to sell more products; it is equally about giving the customer an alternative way to "acquire" or access the product. As ASPs become more popular, application vendors may not be able to relegate the ASP offering to the markets they were unable to reach with a direct sales force. In the end, they are faced with the decision: Do we become an ASP or are we willing to give up the customer over time? Some applications vendors, such as Siebel, try to have it both ways — acting as the ASP for larger customers and selling through USi for others. Applications vendors should consider many risk factors before becoming the ASP, such as diluting their core focus and contending with channel conflict [International Data Corporation, 1999].

ASP operation requires application competencies. For the applications vendors to excel as ASPs, they would need to have equally strong competencies in networking and professional services. Unless an application vendor is committed to becoming a services or a networking company, it is generally better to outsource these components or partner with ASPs. With respect to the ASP opportunity, infrastructure vendors have a couple of logical paths. The first is partnering directly with the ASPs, and the second is to partner with other ASP suppliers when the software can strengthen their offering. Tools vendors will most often need to partner with the ASPs or be flexible in their licensing to accommodate ASPs through their application vendor arrangements. In the ASP world, brand won't carry the database vendors as far because the end customer shouldn't care what the underlying

database is and the ASP should be more expertly trained to make the right technology and quality-of-partner decision, independent of brand.

Today, the applications vendors have done well to preserve their traditional pricing (e.g. Oracle and Siebel have been successful at getting the end customer to buy the application up front, but then finance it with monthly payments to track with the monthly services fees), but this traditional pricing is not likely to be sustainable. Some applications vendors sell the application outright to the ASP with a license that allows them to "rent" access to the application. Ideally, the ASPs need software and other suppliers, to allow them to buy product and services according to how they sell, which typically involves monthly fees based on some usage metric. Today, per-user pricing prevails. If all the suppliers to ASPs try to preserve up-front fees, the ASPs will be cash-squeezed. Early signs of pricing policies beginning to turn in favor of the ASPs as they gain influence in the market and as new software companies that are based on the annuity model from day one begin to threaten the incumbents.

The biggest single question in the development of the ASP market is: Who owns the end-customer relationship? IDC's Software Channels and Alliances group reports that systems infrastructure and tools vendors are generally better at structuring and managing partnerships and sell more software through channels. For the application vendor, it is hard to separate opportunity from threat. Applications vendors are threatened if they embrace application service provision as a way to deliver product and threatened if they don't. As momentum builds, they will not have a choice — they will have to go forward. The multibillion-dollar question is: To be the ASP or to be a partner to the ASP? The answer is situation dependent [International Data Corporation, 1999].

6.1.2 Impact on the Hardware Industry

The impact of ASPs on the hardware industry could be immense. On the one hand, the new model is likely to intensify current trends, placing even greater weight on total-cost-of-ownership (TCO) imperatives and on RASability standards (e.g., reliability, availability, and

scalability), as defined by IDC [International Data Corporation, 1999]. On the other hand, for vendors that meet these criteria, new service provider markets will significantly alter business models and market strategies. Vendors will be pressed to conceive of their value propositions less in terms of standalone products and more in terms of solutions or services. Hardware platforms will be crucial to an ASP's ability to leverage a one-to-many delivery model. Therefore, ASPs may become catalysts for server and storage consolidation and server clustering. ASPs will also require advanced functionality, such as physical or logical partitioning of server and storage resources. This capability, which is typically found in high-end servers and storage systems and is now being introduced into midsize Unix servers and storage systems, is necessary to provide effective resource sharing and protection against failures. ASPs that fail to make a significant investment in highly trained IT operations staff to oversee complex server and storage farms will have difficulty delivering on SLAs (Service Level Agreement) and profitability. Given the shortage of staff qualified to operate sophisticated environments, they will need hardware that is highly scalable. Because ASPs will possess significant application expertise but lack depth of experience in efficient hardware management, many will benefit by outsourcing components of the hardware infrastructure to services companies.

In the ASP market, hardware suppliers will need to develop relationships with new decision makers. They are accustomed to focusing on the enterprise data center, where the customer has typically been in IT. Instead, the ASP or ISP will become the data center, and the enterprise customer will be harder to find. Hardware will increasingly be seen as one part of an application platform developed by ASPs, independent software vendors (ISVs), systems integrators, or hosting companies — all of them potential customers. A major implication is that server vendors will be challenged to support more complex and sophisticated customer service practices.

Hardware suppliers will need to partner with companies that have the ability to put together total solutions. Increasingly, the focus will be on systems integrators that also have the ability to reach the appropriate outsourcing decision makers. These key partners will be looking to

hardware suppliers for robust platforms that are capable of supporting more demanding SLAs and for willingness to share risks as well as rewards.

Perhaps the most revolutionary aspect of the new market will be that ASPs will drive a new "risk/reward" model for their business partnerships. They will expect their vendors to provide hardware solutions with little up-front costs, receiving instead annuity payments based on end-user revenue. Consequently, hardware vendors will need to develop new value propositions and fees based on transaction models. To price this "service" appropriately, sales and marketing staff will need to understand the application mix running on the hardware. Without a solid understanding of workloads and variability in transaction rates, ASPs risk meeting service levels — a surefire recipe for losing customers and market share.

ASPs will be totally service driven and focused on reducing their server hardware costs as much as possible. The hardware suppliers that succeed will provide the richest RASability quotient, keep the hardware component out of the TCO model, and become a seamless part of the application delivery model. In the long run, hardware suppliers are likely to find that alliance partners will be the key that can make or break a strategy in the ASP market. [International Data Corporation, 1999].

6.1.3 Impact on the Service Industry

Many service companies have grown their revenue and made their profits over the years from conducting multiyear, often multimillion-dollar implementations of software packages. The question is: Will the ASP, with its rapid deployment of standardized applications, disrupt the service firm's way of doing business? While IDC expects the ASP to appeal to the middle-market customer, we believe customized application deployments will still be needed. However, the ASP will be a disruptive force in the sense that its rapid deployments, standardized offerings, and annuity pricing model will put pressure on traditional service firms to offer elements of an ASP service within their own offering. Service companies such as consultants, integrators, and outsourcers can head down one of two courses with respect to the ASP: to be an ASP or to be a partner to the ASP. As an ASP, service firms will

directly deliver ASP services to customers. As a partner to the ASP, service firms would provide application deployment services to the ASP's customers.

Service firms that elect to be the ASP will target the middle market. For large firms that typically target organizations with 1,000+ employees, this will be a significant departure from traditional sales and marketing efforts. As more large enterprises deploy ERP packages, however, the ASP may be an opportunity to reach a new customer.

Service firms that plan to be the ASP will bring the "services" skills to the equation. However, they will likely need to partner for the application or network component. Systems integrators, which typically have application implementation and integration experience, will need to partner with a network company that can provide not only the data center but also the network infrastructure. They will also need to partner for the application license and to obtain personnel with application management expertise (unless they elect to build up this expertise in house). Outsourcers already have many business components in place that can be leveraged for the ASP market. Within their IT or business processing outsourcing practices, these firms already have application and operations personnel, a data center, and a network connection. Outsourcers will need to partner for the application licenses that they plan to "rent" to customers. For smaller integrators or VARs that partner with an ASP to provide the application integration and deployment services, the ASP will serve as another channel for reaching more of their target customer.

IDC expects the ASP option will put pricing and time pressures on the traditional service firms. Many service firms price their application deployment and integration services on a time and materials basis, often resulting in lengthy, and multimillion dollar customized projects. Under the ASP pricing methodology, the application deployment part of the project is expected to be short and completed at minimal expense, as application customization is avoided. Although customers will continue to demand customized services, they will have higher expectations for their traditional service firms to deliver their work rapidly and at less cost.

The ASP provides an opportunity for service firms traditionally focused on larger customers to expand their reach to the middle market by delivering ASP services. We expect smaller integrators or VARs to find an opportunity in partnering with ASPs to provide the application deployment and integration services. The biggest threat that a service firm faces from the ASP is ignoring it. We believe ASPs will force a fundamental change in the way in which services are delivered: more standardized, quicker, and with an operations component. Service firms that refuse to see this shift coming will likely find themselves ill equipped to compete against the ASPs [International Data Corporation, 1999].

6.1.4 Impact on the Communications Industry

For network service providers (NSPs) and network equipment vendors, the ASP "phenomenon" takes the industry closer to the vision in which the hosting center for data services will play the role that the central office has played for voice services. The idea is that robust, network-based applications and E-business solutions will be available on a model like that of a traditional utility — something users can tap into and pay for based on usage. NSPs may play different roles in delivering solutions, depending on the market strategies they choose. Between the extremes of pure vertical or horizontal approaches, variations will depend on who takes the lead, bears the risk, backs the SLAs, and manages the customer relationship. Because applications services are network- based and network-delivered, NSPs willing to step up to the challenge are well-positioned to play a leading role in putting the pieces together.

NSPs taking a vertical approach will position themselves as the ASP, targeting specific markets, selecting applications and platforms, implementing solutions, and providing ongoing end-user support. The provider will need internal resources for systems integration and customer care. NSPs taking a horizontal approach will deliver the access, transport, and management services that ASPs need to deliver solutions to end users. The focus will be on facilities and collocation services. Some NSPs are establishing a middle ground by developing a "platform" strategy based on robust hosting facilities, sophisticated architectures, and middleware services. Capable of hosting multiple ASPs, they will offer

customers high-performance networks and modular components for provisioning, billing, security, service assurance, network management, and applications development environments. IDC expects that market forces will push horizontal players in the direction of platform strategies. Regardless of their positioning, NSPs will need strong partnering alliances with hardware and software vendors and professional services companies. Their key challenges will be to integrate solutions and provide seamless customer management services. Service providers should avoid exclusive deals, but they are expected to focus on a limited set of preferred providers, aligned with certain solutions and services.

Over time, NSPs will need to refine their services and billing options to meet the unique requirements of ASPs. Major development areas include robust and incremental SLA packages that extend across multiple NSP networks, pricing models based on usage and all-inclusive fees, and revenue-sharing options where the carrier shares in the risks and rewards with its hardware, software, and services partners. Support for these infrastructure services should be a major opportunity for network systems and management vendors. As for the applications services themselves, IDC expects that NSPs' sales staff will not be prepared to market and sell ASP services and that service providers will look to their ISV, systems integrator, and channel partners to drive demand onto their networks.

The ASP business model is a tremendous opportunity for network companies because the whole point of this approach is to use high- speed network connections to reduce internal spending on systems, software, and support staff. NSPs and their suppliers must prove that their networks are up to the task in terms of performance, reliability, and customer service. The emergence of ASPs will spur greater emphasis on providing robust end-to-end performance monitoring and service management solutions [International Data Corporation, 1999].

6.2 ASP Market Potential

Although the application services market is relatively young and undefined, and thus all but impossible to size with any precision, there is a consensus among analysts that it is growing at high speed.

- According to IDC, the worldwide spending for outsourcing services was $89 billion in 1997 and should reach $142 billion by 2002, a 10% compounded annual growth rate. IDC estimates the application outsourcing (AO) market, which comprises both application maintenance outsourcing and ASPs, will grow to $16.2 billion in 2003 from $7.0 billion in 1998 [Cherry Tree and Co., 1999].

  Forrester Research estimates more aggressive growth for AO .In the report *Packaged Apps Outsourcing,* published January 1997, Cambridge MA-based Forrester Research projected rapid growth for outsourcing of enterprise applications. It still stands by those figures today, which projected a total market more than doubling each year to reach $21bn in 2001. Within that figure, it projected over 400% average annual growth for what it called apps rental, to reach $6bn in 2001. This is often interpreted as the total size of the application services market, but in fact ASPs will also take a share of the remaining $15bn [Cherry Tree and Co., 1999].

- The report Worldwide Application Service Provider Forecast, 1998-2003, published March 1999 by IDC of Framingham MA, sized the market for high-end ASPs, which it defines as those who deliver complex applications with sophisticated supporting services. It estimated average annual growth at 91%, and sized this part of the market at $150m this year, rising to $2bn in 2003. (See Figure 20) [Farleit Limited, 1999].

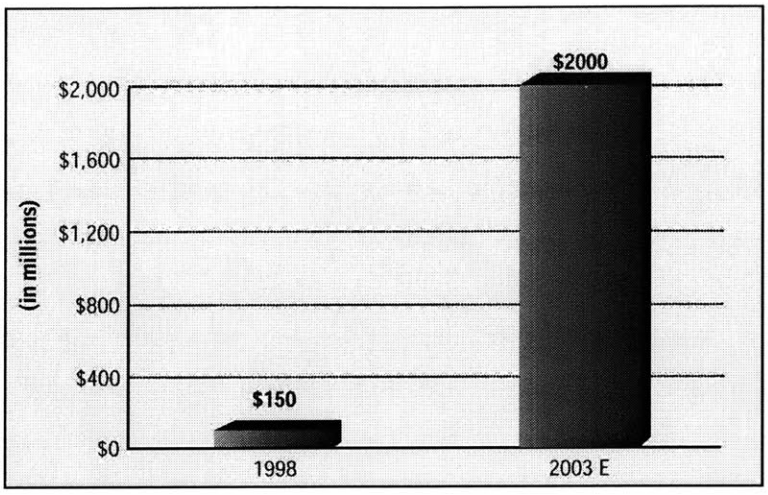

Figure 20. Enterprise ASP Market Estimate [International Data Corporation, 1999]

- According to IDC, application services activities by ISPs, including web hosting, already add up to a $3.9bn business this year. IDC believes application services will be the main contributor to an average annual growth rate of around 40% for this element of the ISP business, taking it to a $12.9bn value in 2003 (out of a total market value of $37.4bn) [Farleit Limited, 1999]. Forrester projects the market for application hosting will reach $11.3 billion in 2003, representing compound annual growth rate (CAGR) of 86% (see Figure 21). Moreover, this market forecast only includes applications for e-commerce, CRM, manufacturing, HR, finance, supply chain, and product development [www.aspisland.com, 2000].

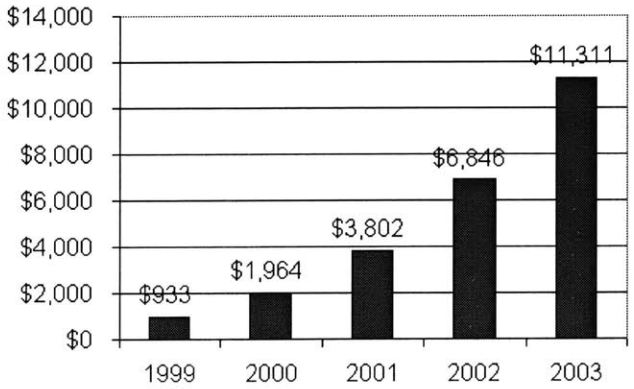

Figure 21. Market for Application Hosting [Forrester Research, 1999]

- By 2002, the total collaboration market estimated by IDC Research at $4 billion dollars per year.

- The early adopters and targeted markets for the ASP alternative have been small to medium size enterprises (SMEs). Highlighting this is Giga Information Group's forecast that up to 75% of SMEs might obtain their applications through an ASP arrangement in five years Forrester Research estimates that there are 300,000 emerging enterprises in the U.S. with revenues between $40 million to $500 million and IT budgets of $5 million or less. Based upon IDC's projections, less than 5% of the emerging enterprises in the U.S. will need to utilize an ASP solution to achieve this projected market size. (see Figure 22) [Cherry Tree and Co., 1999].

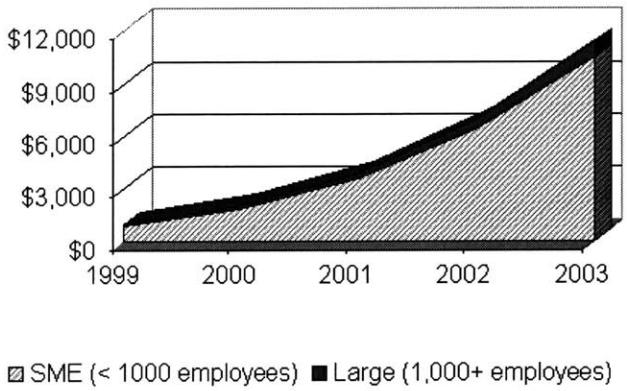

Figure 22. SME Market Projected to Dominate Application Hosting [Forrester Research, 1999]

The ASP industry is highly fragmented as is customary in many early stage industries. The prospects for the ASP market have captured the interest and commitment from a large number of companies and industries. Some of the industries that are establishing a presence in the ASP market include "pure" ASPs, Internet Service Providers (ISPs), telecommunication providers, ISVs, and IT ser-vice providers (see Figure 23). By all accounts, the ASP concept will be a formidable alternative to traditional methods.

Consequently, numerous companies and industries have begun formulating strategies in this emerging market. The ASP Industry Consortium, initially formulated by 25 technology companies in May 1999, was developed with the explicit purpose of promoting the ASP industry and educating the marketplace, developing common definitions, facilitating industry discussion, stimulating research, encouraging open standards and promoting "best" practices. Additional companies have since joined the ASP Industry Consortium with membership currently totaling roughly 120 companies [Cherry Tree and Co., 1999].

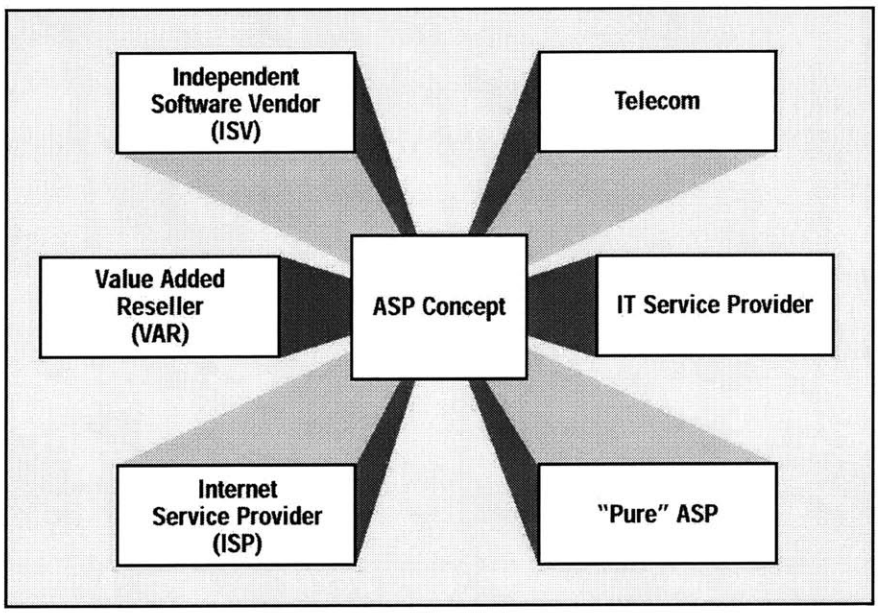

Figure 23. Industry Participants and ASP Convergence [Cherry Tree and Co., 1999]

- In mid-Augustm, 1999, the Internet Application Service Provider (IASP) conference, held in conjunction with Hewlett-Packard ERP World in San Francisco, was the first seminar devoted exclusively to the ASP concept. There were representatives for the 700 members participating in the two-day conference. Guest speakers included representatives from industry giants Cisco Systems, Hewlett-Packard, IBM, Lucent Technologies and Sun Microsystems. ASP companies presenting to attendees included **Celarix, Corio, Employease.com, FutureLink Distribution, Ten North** and **USinternetworkin**g. Roughly 33% of all attendees expressed an interest in developing their own ASP model [Cherry Tree and Co., 1999].

6.2 Conclusion

Unquestionably, there is an enormous amount of interest in the embryonic ASP industry from startups and well-established companies alike. The ASP market is expected to show dramatic growth over the next three to five years. The definition of the market adds email, collaboration, and desktop applications, which would push the forecast north of $20 billion in 2003.

With a multibillion market on the horizon, leading information technology vendors — whether application, services, telecommunications, storage, systems, or network vendors — are rapidly developing ASP market-entry strategies. IDC believes the ASP model will function like a "disruptive innovation," threatening to encroach upon and displace existing ways of doing business for all sorts of IT services [International Data Corporation, 1999].

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