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The Insider's Guide to Building Markets on the Net

DIGITAL MARKETPLACES: ENABLING THE INTERNET ECONOMY

APRIL 1999

Digital Marketplaces: Enabling the Internet Economy

Executive Summary

The emergence of an "Internet economy" is unarguable: explosive growth in net-based buying, selling and customer service operations has radically realigned traditional buyer-seller relationships. Consumers now shop the world, enjoying unprecedented opportunities for price and product comparison, often completely bypassing the local storefront retailers who once defined their shopping horizons.

As sweeping as these changes have been, they are rapidly being dwarfed by the Internet's impact on business-to-business commercial operations. Sensing the potential for streamlining and automating product information transfer, price negotiations, order entry, shipping data and billing and collection cycles, many enterprises are eagerly embracing the electronic marketplace model. The model calls for the aggregation of catalogs and other buy/sell information at a central online location, with open access to all enrolled users via the Internet. Some of the Internet entrepreneurs who are embracing this new marketplace model include Global 2000 companies, purchasing corsortia, large distributors, franchises, trade associations, and third-party service providers.

How important will business-to-business (eCommerce) activity be to the over all Internet economy? Consider these projections: in a February, 1999, report, Forrester Research estimates the value of Internet sales at $1.3 trillion by 2003. Again according to Forrester, *almost two thirds* (some $800 billion) will stem directly from business-to-business interaction.

For the forward-thinking manager, the message here is clear. The advent and proliferation of electronic marketplaces is simply too important to be ignored. This is a phenomenon that promises to richly reward early adopters and severely penalize latecomers. The stakes may be nothing less than survival, as traditional sales and distribution channels crumble and the new electronic processes succeed them.
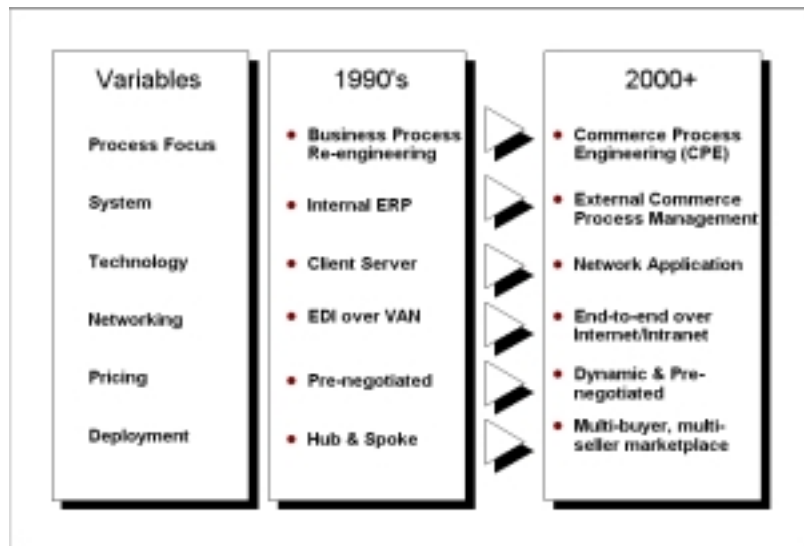
This paper is intended as a guide for managers who are presently planning for entry into eCommerce, either as marketplace hosts or as enrolled tenants in one or more marketplaces. It will detail some of the pitfalls and offer constructive guidance for implementing the appropriate technological infrastructure as the enterprise prepares to enter this new and promising arena.

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The Emergence of the Internet Economy

The much-talked about and sometimes feared millennium is upon us, and it will bring one fundamental change that will almost certainly exceed everyone's expectations. It is the development and growth of the Internet economy. According to the February 1999 report, *New Marketplace Models,* Forrester Research estimates that the Internet Economy will exceed $1.3 trillion by the year 2003. Today, the stock market continues to reward early Internet visionaries, but for most companies the Internet economy remains an uncharted frontier. It offers endless opportunities to those who stake their claims and certain disaster to those who do not fully understand its importance.

The Internet will, perhaps, have its strongest impact on the conduct of business-to-business commerce. To date, commerce processes--the critical links between buyers and sellers--have remained basically unchanged. Faxes, phones calls, and endless paper trails continue to clog the communication channels between businesses, creating inefficiencies at every point in the commerce chain. Now, the Internet offers innovative new ways to streamline commerce processes, reduce costs, and increase revenue. The opportunities are so large that Forrester Research estimates that business-to-business Internet commerce will skyrocket from approximately $43 billion in 1998 to more than $800 billion by 2002.

As illustrated in the diagram below, the emerging Internet economy is forcing companies to shift their focus from internal back-office processes to external commerce processes that automate interaction and collaboration among customers, suppliers and even competitors. With this shift come several related changes, including a move from EDI to IP-based communication, an evolution from client/server to network applications, and a shift from ERP to a new generation of commerce management applications.

Variables	1990's		2000+
Process Focus	• Business Process Re-engineering		• Commerce Process Engineering (CPE)
System	• Internal ERP		• External Commerce Process Management
Technology	• Client Server		• Network Application
Networking	• EDI over VAN		• End-to-end over Internet/Intranet
Pricing	• Pre-negotiated		• Dynamic & Pre-negotiated
Deployment	• Hub & Spoke		• Multi-buyer, multi-seller marketplace

Business Process Shift

Corporate America is rapidly recognizing the opportunities inherent in this shift. Throughout the 1990s, companies primarily focused on re-engineering internal business processes, using client/server computing technologies and integrated ERP systems to streamline back-office operations. Today, as the flurry of Y2K and ERP activity subsides, companies find themselves with a wealth of available IT resources and a stack of reports highlighting the importance of the Internet. These companies are now asking themselves how they can ".com" their business models, and avoid being "out-Amazoned" by their competitors. Today's challenge is to understand the competitive changes that will occur within the Internet economy, to anticipate the various new business models that will be developed, and to adopt the right technology to support the rapidly changing landscape. Perhaps most importantly, businesses must understand how buyers and sellers will come together in new ways via digital marketplaces and exchanges.

For business-to-business commerce, the Internet tears down geographical boundaries, providing buyers with access to new suppliers and opening new channels of distribution for sellers. It dramatically accelerates the speed of commerce, increasing the rate at which companies must disseminate information and process transactions. And, it forms entirely new Internet-based markets by implementing new methods of dynamic trade, such as online auctions. In short, the Internet creates fundamental changes for all participants in the commerce chain.

Regardless of whether it is seen as opportunity or challenge, the Internet *will* reconstruct the commerce chain, changing market models at every point in the process and impacting all participants.

The Evolution of Business-to-Business Commerce Models

The emergence of the Internet economy as resulted in an accelerated evolution of commerce models. Early adopters (both buyers and sellers) have experimented with a variety of new business-to-business commerce models, technologies and application designs. Examples have included online supplier catalogs, buyer-hosted eProcurement front-ends, OBI-based systems, push technologies, and HTML parsing tools. At the same time, there has been a growing demand for new standards to facilitate the exchange of information, catalog content and transactions between buyers and sellers. While the methods have been numerous and complex, the underlying goal has remained the same: to bring buyers and sellers together with an automated flow of information and transactions, while still supporting individual business and contractual relationships between trading partners.

First- and second-generation commerce solutions providers have fallen short of this goal. They have limited their focus to either the buy-side or sell-side of the equation, without truly understanding how to bring buyers and sellers together. This lopsided view of the commerce process has usually resulted in one participant (the buyer or seller) inappropriately dictating proprietary solutions or standards to the other. And, in most cases, this strategy did not scale. Perhaps the best way to understand the need for digital marketplaces is to examine the evolution of Internet commerce solutions to date.

First Generation: Sell-side Solutions

Suppliers created first generation sell-side solutions to lower the cost of sales by automating the order entry and fulfillment process. These solutions aimed to create an online "storefront" which stayed open 24 hours a day, offered the latest inventory, and enabled self-service ordering and tracking. In short, suppliers tried to capitalize on the Internet's potential by bringing their existing business relationships and processes online.


First Generation: Sell-Side Model

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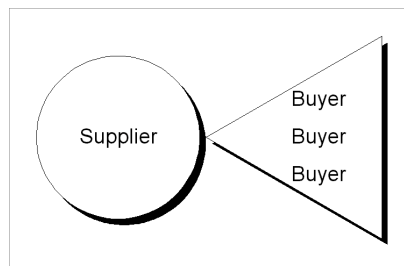
Unfortunately, suppliers soon discovered that most corporate procurement organizations (who control a majority of business-to-business expenditures) were unwilling to permit shopping across different supplier web sites without regard to vendor relationships, pricing, or pre-negotiated company contracts. Additionally, customized supplier sites often required customers to learn unique passwords and procedures. While they found limited sell-side solutions unsatisfactory, corporate buyers recognized the power of the new online medium and soon began to explore new ways of applying similar techniques, utilizing their corporate Intranets.

Second Generation: Buy-Side Solutions

Focused on cutting costs within a single enterprise, second-generation electronic procurement applications operated as a browser-based front-end for back-office ERP and legacy purchasing systems. They allowed corporate procurement organizations to combine multiple supplier catalogs into a "universal" enterprise catalog and to deploy self-service requisitioning and order processing to the user desktop. Unlike supplier-hosted catalogs, these solutions allowed companies to deploy their proprietary processes and procedures while aggregating enterprise-wide expenditures across a consistent supplier and product portfolio.
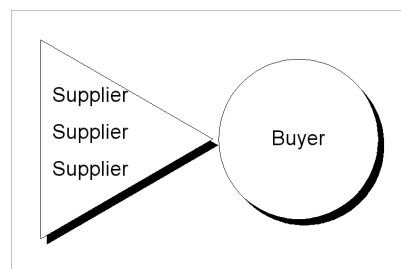
Second Generation: Buy-Side Model

The success of early buy-side procurement adopters, such as Raytheon Systems Company and Nippon Telegraph and Telephone Corporation (NTT), demonstrates the dramatic cost savings that can be realized with online solutions. By using a buy-side procurement application, Raytheon has reduced their cost per purchase order from more than $100 to less than $3. In November 1998, the Aberdeen Group released a report stating that organizations using buy-side eProcurement applications reduced their processing costs by an average of 70% per order.

At first glance, the buy-side market appears to be fueled for meteoric growth. But, things are not always as simple as they seem. Implementing leading-edge eProcurement solutions requires a detailed understanding of many new technologies, such as network application architectures, catalog content management strategies, ERP integration methods, and dynamic data interchange standards. Unfortunately, the resources and expertise to implement these systems are not within the reach of many of today's enterprises, especially medium-sized and small businesses.

So, while the implementation of stand-alone buy-side solutions may work for today's largest and most technically sophisticated companies, it does not meet the needs of the other 95% of buyers along the commerce chain. These companies cannot afford to aggregate catalog content, to link to individual suppliers, or to develop comprehensive Internet commerce applications themselves. Instead, they need a third-party "hosted" marketplace that brings together their suppliers and other, similar buyers into an organized trading community.

Next Generation: Digital Marketplaces

Digital marketplaces and exchanges offer the next generation of Internet commerce solutions. Unlike single-sided solutions, they are specifically designed to enable multi-buyer/multi-seller interaction and collaboration. They provide a common trading hub, where multiple buyers and sellers can come together and conduct commerce **without compromising individual processes and relationships among the participants**. Marketplaces can be created or "hosted" at any point along the commerce chain. Key examples of typical market hosts and models include:

- A large distributor who seeks to automate processes among several buyers, suppliers or manufacturers.
- A franchise or trade association that wants to aggregate its members' orders from approved suppliers by providing online procurement services.
- A new market maker that is trying to replace existing distribution channels by offering online information and services to a specific industry.
- A third-party service provider who wants to create a common marketplace by providing hosted procurement services to a specific set of suppliers and their customers.

The formation of new digital marketplaces and exchanges will change the way we think about business-to-business commerce and will play a major role in the growth of the Internet economy. The Gartner Group predicts that, by 2001, 70% of distributors who operate online will reap more than 80% of their sales through online marketplaces.
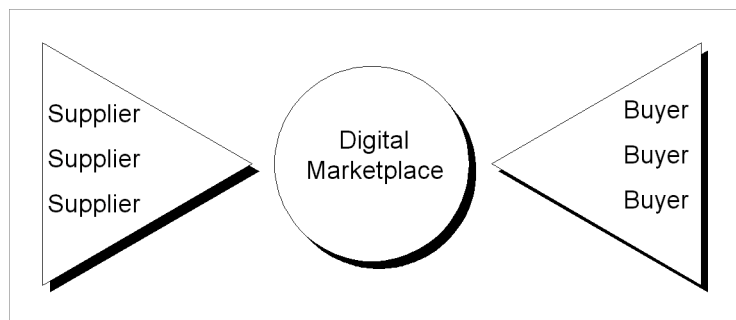
Next Generation: Digital Marketplaces

It is clear that that the formation of these shared marketplaces is necessary for Internet commerce to reach its full potential. A useful analogy can be drawn between Internet commerce and other, more mature services, such as electrical power and water utilities. There was a time when, if you wanted water, you drilled your own well. Water eventually moved to a shared network model, where a number of providers tapped a major water supply and delivered it to end-users through a common network and delivery mechanism. A similar model is developing within electronic commerce, where many different distributors, buying groups and new service providers are developing shared marketplaces, or portals, that deliver online commerce services to customers through the Internet and browser.

Equally important, the creation of digital marketplaces enables innovative new methods of dynamic exchange. Many first-generation solutions are little more then web front-ends for traditional business applications. They have done little to advance commerce to the new Internet paradigm. Conversely, digital marketplaces create entirely new methods of commerce, such as online sourcing, auctions and negotiations. They also enable trading communities to share common information and knowledge more easily.

While the specific business model and associated benefits will differ across marketplace models, a general set of core benefits can be recognized. The following table outlines some of the key benefits for each of the marketplace participants:

Benefits of a Digital Marketplace		
To Seller	**To Market Host**	**To Buyer**
• Provides new marketing and distribution channel to customers • Provides better customer service through online interaction • Provides more complete product information to buyer • Automates order & fulfillment processes • Lowers overall operational costs	• Protects current role or creates new role within the commerce chain • Establishes high "value-add" in digital economy • Increases service levels to existing customers • Leverages current information and customers • Provides access to more information and suppliers	• Lowers up-front costs and risks • Provides access to more information and suppliers • Provides access to secondary and excess supply auctions • Provides a more comprehensive solution • Eliminates on-going software upgrades & maintenance costs • Utilizes outsourced expertise

New Digital Marketplace Models

Perhaps the easiest way to differentiate between marketplace-based solutions and sell-side/ buy-side solutions is to examine the different marketplace models that are being inserted at all points in the commerce chain. They generally fall into three categories: Procurement Marketplaces, Vertical Marketplaces, and eBusiness Portals. Each of these marketplace models supports different business models and functions along the commerce chain.

Procurement Marketplaces

Procurement marketplaces are buyer-hosted. They streamline corporate or group purchasing while empowering independent divisions, partners or companies to maintain independent buying processes and supplier relationships. Key targets for this market include Global-2000 companies with multiple autonomous divisions, franchises, trade associations and purchasing consortia.
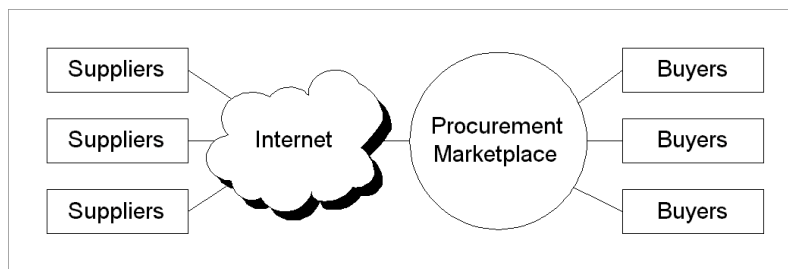

Procurement Marketplace Model

Nippon Telephone & Telegraph (NTT), in Japan, provides an excellent example of a procurement marketplace. They have built an internal marketplace to aggregate their enterprise-wide expenditures for Maintenance, Repair and Operations (MRO) goods and related products. Because NTT is made up of several autonomous business units and subsidiaries, they required a solution that would allow them to easily create a central catalog of approved products, suppliers and contracts. At the same time, they needed to enable individual operating units to establish their independent processes, workflow and user profiles. A homogenous buy-side front-end did not meet these requirements.

A major hotel-chain provides another basic example. This company wanted to aggregate procurement across both their owned and franchised hotel properties. They decided that the best way to do this was to host a centrally managed procurement marketplace, which would provide access to common suppliers, products and, in some cases, aggregated contracts. At the same time, they needed to enable the independently owned hotels to set up their own view of the marketplace, which matched their specific processes and buying relationships.

Vertical Marketplaces

Vertical marketplaces have sprung up in numerous industries and are perhaps the most widely understood example of new digital marketplace models. They generally focus on a single industry that is suffering a critical inefficiency in distribution or sales. They use the marketplace as a strategy to bring buyers and sellers together. Depending on the industry or market, they either automate existing distribution channels or break those channels by creating new exchanges. They thrive in fragmented markets that lack dominant suppliers or buyers. By exploiting a combination of technology and deep expertise in a particular industry, they can eliminate industry-specific problems for both buyers and sellers.
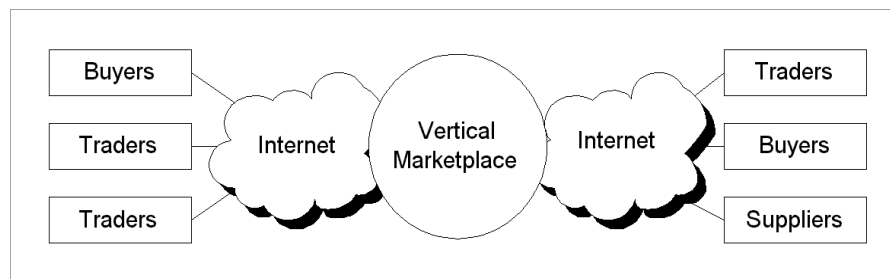
Vertical Marketplace Model

Vertical Marketplaces support industry-specific supply chains by providing new distribution channels for raw materials, secondary inventory, and supplies. Transactions are streamlined, information flows freely, inventory and sales costs are reduced -- and the marketplace host generates revenue. Major distributors, resellers and new market makers typically host these Vertical Marketplaces, and they tend to fall into one of three groups: Virtual Distributors, Exchanges and Enablers.

> ***Virtual Distributors*** attempt to replace and improve some portion of the existing distribution channel. A good example is *Chemdex*, which has managed to eliminate as much as five hours a week from the process of product searching in the pharmaceutical and biotech industry. Rather than leafing through hundreds of vendors' catalogs, research scientists can turn to this marketplace, where the catalog data have been aggregated into a one-stop, online comparison-shopping venue. The online search cuts across all vendor catalogs---making the search easier for the researchers--while simultaneously reducing the vendors' cost to reach those scientists. In short, the virtual distributor cuts the cost to reach all customers, large and small, with product and price information. By integrating a catalog once into a marketplace, rather than separately with each customer, the marketplace enables a host of benefits for all parties involved.

> ***Exchanges*** seize on loose and inefficient broker networks, using the Internet's ability to eliminate barriers of geography. The online solution creates effective transparency of distribution, price and inventory. One example, *MetalSite*, is a steel industry exchange that, for the first time, lets buyers post their demand for products while seeing the entire inventory currently available. The marketplace reduces cost, in time and money, since procurement extends beyond the enterprise to all marketplace buyers. The marketplace also enables small- and medium-sized companies to realize the benefits of reporting on purchases, which were previously available only to large enterprises.

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Enablers facilitate the integration of an enterprise into a central platform. Bringing additional buying power into the marketplace spurs vendor participation, expands sources and selection, and reduces prices by increasing competition. These markets offer a tool that existing distributors or brokers can pass along to their customers. *Collabria*, for example, has created a market in the commercial printing industry among the corporate buyers of printing projects, print brokers and commercial printers. Because print brokers know which local printers have idle presses, as well as which printers have the best prices and the capability to print a particular job, they add value and retain their place in the commerce chain. The online market enables the broker to speed up the matching process, while the sophisticated software offered in this online market--available on the customer's desktop through a web browser – eliminates errors in the pre-press process and sends the job to the printer electronically and instantly.

eBusiness Portals

eBusiness portals, sometimes referred to as "horizontal" marketplaces, are hosted by trusted third parties to provide online buying and selling services to a set of identified clients. Typically, the goal of the portal provider is to extend their brand identity to the Internet, and capitalize on new revenue generating opportunities. They bring powerful assets to the game, by leveraging core competencies in facilitating commerce. There, they can find plentiful business relationships and opportunities for branding or for positioning themselves as financial agents and trusted third parties in these growing online marketplaces.

Trusted third parties that often host eBusiness Portals include large financial institutions, utilities, telecommunications companies, IT service providers, and commerce service providers. They provide the financial and operational benefits of on-line buying and selling to a specific customer base.
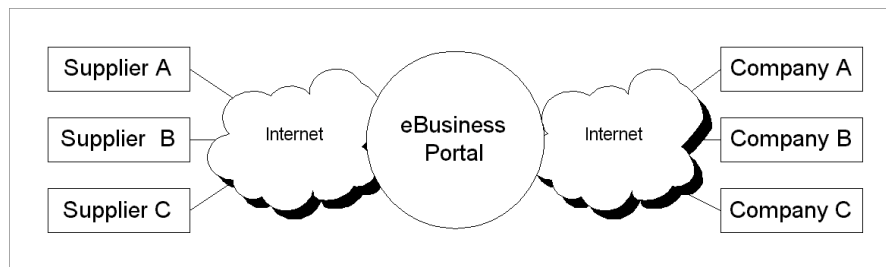
eBusiness Portal Model

The world of online financing illustrates this trend. One major US financial institution has recently initiated the development of a purchase card marketplace where its borrowers and other customers can buy and sell from each other. A credit card company has established a marketplace for its small business card holders. A large utility is using its market clout to establish and bring vendors into an industry-specific procurement marketplace for itself, along with smaller utilities. By pooling their buying power through a co-op, they cut both costs and time from the buying process.

Digital Marketplace Solution Requirements

Handling diverse user types, business processes and trading relationships within a multi-buyer/multi-seller environment requires a significantly higher level of functionality and performance then that offered by first-generation sell-side or second generation buy-side solutions. To date, most new market makers have been forced to build their sites from scratch, using an assortment of technologies and development strategies. In many cases, companies

have built their sites, only to discover that, while they look good, they do not scale, are difficult to maintain, and are nearly impossible to customize.

Today, for the first time, market makers are presented with a "build versus buy" scenario. While there are few, if any, offerings that provide a complete out-of-the-box solution, some software vendors are offering a comprehensive platform for developing and deploying digital marketplaces and exchanges. These platforms offer integrated application functionality and can be customized, configured and branded to meet specific marketplace requirements.

Before making a buy decision, it is important is to separate the wheat from the chaff. Many software providers have attempted to re-package first-generation sell-side and second generation buy-side systems into marketplace solutions. While this approach may work for demonstration, unknowing customers may find themselves with a solution that can not effectively manage their complex marketplace scenarios or be scaled to meet their high-end performance requirements.

When looking at marketplace and exchange solutions, it is important to evaluate four key areas of design and functionality:

1. Performance and scalability
2. Application functionality
3. Flexibility and manageability
4. Customizability and extensibility

While it is outside the scope of this paper to provide a detailed list of requirements for each of these areas, the following sections provide a high-level overview:

Performance and Scalability

Performance and scalability can be evaluated by looking at three key variables. First, can the application be effectively deployed across a limited bandwidth network while requiring only that a browser be installed at the desktop? Second, can the solution be scaled to meet the peak user loads and transaction levels of the marketplace? Third, does the solution provide 24X7 reliability and fault tolerance?

Network Connectivity & Performance
Digital marketplaces must be capable of being deployed to a multitude of remote users over dial-up connections as slow as 28.8 KBPS. In addition, they must be able to work across a public network without sacrificing security or limiting access through tightly controlled corporate firewalls.

To meet these requirements, several key design features should be considered. First, the solution must run a true thin-client application, meaning that no software, other then a standard browser, should reside on the user's desktop. The client should be effectively downloadable at logon, even across low-speed dial-up connections. In general, this means that the client application should not exceed a maximum size of 500K. Solutions that utilize 1+ Meg clients, which may work over a T3 Intranet connection, are not viable in a distributed marketplace environment. (Note: it is not uncommon to find commerce applications with clients as large as 4 – 5 Meg in size. These solutions are essentially client/server applications running over IP networks, and are not considered true distributed network-based applications).

Buyers and suppliers from many different companies, all with varying security and firewall configurations, will need to access the marketplace. To work in these environments, marketplace software must run over or "tunnel-through" standard HTTP ports and not be dependent on accessing specialized ports. A final key factor is the amount of traffic that is passed between the client and the server when executing transactions. For example, in pure HTML-based solutions

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the entire page is refreshed every time an action is taken. This can result in a huge amount of network traffic. In applet or dynamic HTML-based solutions only change data fields are passed to

the server. In this model, the amount of data passed between the client and the server is significantly less, resulting in lower network traffic and faster response times.

Scalability & Reliability

Most client/server applications are designed for professional users within a single company, typically equating to no more than one thousand simultaneous users. With the introduction of browser-based, self-service applications (such as eProcurement front-ends), the concurrent user base can mushroom to several thousand if the enterprise is large. Marketplace software demands an even greater level of scalability. It must be able to support tens of thousands of concurrent users, while providing rapid response times and 24 X 7 reliability.

In general, the only way to effectively ensure this level of scalability and reliability is to design an application that supports load balancing across multiple processors and machines. This is most effectively achieved by utilizing new Internet application servers, such as BEA's WebLogic, Oracle's Application Server, IBM's WebSphere, or one of the other high-end application servers. As transaction volume increases, utilizing an application server will allow the market maker to incrementally add processors and machines without hitting a top-end limit. (It is important to note that, while many applications may advertise their ability to run on these platforms, only a few utilize a true component-based models capable of performing multi-processor/multi-machine load balancing).

Additional benefits of running on an application server include the performance and reliability achieved by running on multiple machines. In a multi-node configuration, the application server will automatically distribute workloads to the most available machine, ensuring that optimal performance is maintained. In addition, if one machine goes down, the application server will automatically shift workloads to another machine – ensuring maximum reliability.

Broad Application Functionality

Unlike one-dimensional buy-side or sell-side systems, marketplace and exchange solutions must support both the buying and selling processes within the end-to-end commerce chain. This includes all commerce processes, from desktop requisitioning, cataloging and purchase order management to acknowledgement, fulfillment and online billing.

All transaction processes should be easy to use and should allow both buyers and sellers to set up standard defaults, such as accounting codes, shipping locations and billing addresses. Transactions should work in a symmetrical and integrated fashion, so that the commerce process can be executed seamlessly between buyers and sellers.

For example, when a buyer generates an order, the system should enable the seller to generate an order acknowledgement. If a supplier sends an advance shipping notice, the buyer should be able to track the location of the item in the shipping process. Finally, the solution should provide open interface points for all core transactions (purchase order, receipt, invoice, etc.), so that they can be easily integrated with back-end systems or passed between trading partners.

While it is unlikely that any of the packaged software applications will explicitly meet each market maker's functional requirements, the application design should provide a strong set of baseline functions that can be easily customized by the market maker. This approach will ensure that the market maker does not have to encode common application functions, such as requisition forms and receiving processes from scratch. While it is impossible to review all areas, other key areas of functionality to be considered include:

Catalog Management & Search

A key component of any marketplace application is the catalog search engine that drives a large percentage of marketplace processing. There are many different search metaphors and catalog tools. When selecting a solution, it is important to consider what types of commodities will be

traded and what type of catalog search is most appropriate. Key factors include ease of catalog use, support for multiple search modes and varied data formats, such as images and drawings.

Because different marketplaces will have different search requirements, and because search engine technology is developing so quickly, it is extremely important to ensure that the platform separates the catalog from other pricing and processing functionality. This allows other third-party search engines to be easily plugged in when catalog requirements or technologies change.

It is equally important to ensure that the application provides tools for aggregating and rationalizing content into a single catalog view. These tools come in several different formats, but their underlying goal is to provide a flexible means of accessing and aggregating multi-supplier content into a consistent catalog structure. Marketplace solutions should support both centralized and distributed catalog management.

Cross-enterprise Communication

In all marketplaces, transactions need to move efficiently between buyers and suppliers. While in some cases, this information may be viewed online through the browser; it will usually need to be passed in one of many data formats. In general, marketplace solutions should be capable of supporting all common integration protocols, including fax, E-mail, EDI, XML and other digital data interchange formats. Solutions that are overly dependent on a single technology or pseudo-standard cannot effectively support diverse trading communities.

Dynamic Trade Functionality

Dynamic marketplaces should be designed with an understanding of the new online processes and interfaces that are possible on the Internet. In evaluating marketplace solutions, decision-makers should look for baseline functionality in areas such as online quote and bid processing, online negotiations and dynamic auctions.

Reporting & Analysis

The marketplace system should provide integrated tools that allow buyers, suppliers and market hosts to check on their outstanding transactions and activity. It should also provide some level of baseline reporting capability for analyzing marketplace expenditure and performance. In some cases, marketplace solutions may include more advanced multi-dimensional decision support systems. All of the query and reporting capabilities should be purely web-based. In most cases, marketplace platforms will utilize best-of-breed reporting tools to meet these requirements.

Flexibility and Manageability

Digital marketplaces traditionally span large, diverse trading communities. Within a given marketplace there will normally be a hierarchy of high-level tenants and associated users. For example, *Company A* may be a buying tenant within the marketplace. Inside Company A, there may be several different divisions, and each division may have several different types of end-users who are authorized to access the marketplace.

Considering the variety of buying tenants, selling tenants and marketplace administrators that make up a given marketplace, managing this hierarchy of tenants and users becomes extremely complex. In many cases, it may not be possible for the market host or administrator to centrally manage every user. It may be more effective to take a decentralized approach, in which the marketplace host registers high-level tenants, and then empowers them to register and mange their own users. Regardless of the approach, It is essential that marketplace and exchange software provide intuitive and flexible tools for managing complex hierarchies.

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Within each trading community, there will be a variety of user types, including customers, suppliers and market administrators. In addition, some users will be experienced, while others may be casual or inexperienced. Normally, a single static interface is insufficient to support this diverse user community. Ideally, the system should present various interfaces that meet the different requirements and profiles of individual user types. For example, a casual requisitioner may see a wizard-type interface that offers limited options and functions. Conversely, a power or administrative user may see more of a windows-based interface that provides extensive systems management and administration features.

Supporting this type of dynamic interface is not possible using standard client/server architectures. Modern component-based applications, however, are capable of dynamically generating custom interfaces, based on individual user profiles. This type of dynamic interface generation is extremely useful when operating complex multi-buyer/multi-seller marketplaces.

User Registration & Administration
In order to facilitate the rapid enrollment of thousands of users, digital marketplace and exchange should provide browser-based self-registration utilities that automate the process. These tools allow users to establish profiles, passwords and other information that can be easily reviewed and approved by the marketplace administration. In addition, the registration process should automatically identify the tenant company that employs the user and set baseline permissions and profiles accordingly. These user registration tools will speed the enrollment process, while keeping administrative costs to a minimum.

Finally, digital marketplace software must provide a high-level of security, limiting access to enrolled users only. In addition to standard security protocols, such as Secure Sockets Layer (SSL), the software should also support digital certificates and other encryption technologies.

Process & Workflow Management
Early sell-side failures proved that buyers, not suppliers or market makers would dictate the rules under which goods and services are procured. Therefore, it is essential that a marketplace solution give tenants the ability to establish their own "view" of the marketplace. Marketplace solutions support this fundamental requirement by allowing buying participants to establish their unique user profiles, permissions and workflows. In essence, each buying tenant should be able to establish his own virtual procurement system within the larger marketplace.

At the marketplace level, market hosts must be able to effectively establish and manage the high level rules that dictate the marketplace structure. These rules must be transparently enforceable across all users.

It is important to examine carefully how user profiles, permissions and workflow rules are established. Many systems rely heavily on third-party tools to handle some or all of these configuration processes. In many cases, these tools are not tightly integrated into the overall solution, making it difficult to change configurations once the marketplace is up and running. Ideally, all configuration activities should be done through the browser from within the core application, without reliance on external scripting languages or separate applications. It is important to remember that the more difficult it is to configure and manage the marketplace, the more expensive it will be to operate.

Relationship Management
It is equally important to manage discrete pricing and contractual relationships between specific buyers and sellers. Business-to-business marketplaces can not operate as open shopping malls, where buyers are free to browse across endless suppliers, shopping for the lowest possible price. Early marketplace failures, such as Industry.Net, demonstrated that suppliers were not willing to put their products into the marketplace unless the market maker could, to some degree, protect their relationship with a buyer. Additionally, they showed that buyers would not transact within a marketplace unless the catalog represents their supply sources and their contracted prices. A

viable marketplace solution must provide advanced features for managing customer-to-supplier relationships. This includes support for mark-ups, discounts and other pricing filters, as well as billing terms and other aspects of the buyer-seller relationship.

Usage Tracking & Billing

A key requirement for managing a digital marketplace is the ability to track usage and set-up filters for capturing billing information. For example, a market maker may decide to charge a one-percent fee to the seller, or he may decide to charge a fixed transaction fee to the buyer. Additionally, this charge may be directly reflected in the price of the product or aggregated and charged on a separate usage bill. In either case, the solution should provide the tools to capture this information and generate online bills for each marketplace participant.

Customizability and Extensibility

It is doubtful that any out-of-the-box solution will meet 100% of the functional requirements for a given marketplace. In addition, what is right today may not be right tomorrow. But perhaps more important than any other requirement in evaluating a marketplace solution is the ease with which it can be customized and maintained. Once again, the use of a new component-based network application architecture (as compared with client/server architecture) will give a marketplace solution the upper hand.

Customizing Core objects

Component-based solutions typically deliver re-usable objects that can be easily changed to meet specific functional requirements. Companies should carefully evaluate the openness of the solution by determining whether it is developed using standard development tools and open development standards. The most common component-based architectures are Microsoft's COM/DCOM and Sun's Enterprise Java Beans. To date, Enterprise Java Beans has provided a more comprehensive and scalable solution.

Marketplace solutions should publish all object libraries and APIs, as well as a customization methodology; enabling users to customize delivered objects or add new ones. When implemented correctly, component-based solutions are easy to upgrade, since custom- developed objects generally remain usable with upgrades to the core-delivered objects. Customers should take special care to evaluate these aspects of any marketplace solution. In the fast-moving world of the Internet, companies can not afford to get caught with proprietary or non-extensible solutions.

Branding & Localization

One of the most important aspects of building a marketplace is creating a unique visual and user experience for participants. Each market maker will want to develop a look and feel that is consistent with the brand identity and the targeted positioning of the marketplace. This is very different from back-office ERP or buy-side eProcurement applications. With these applications, the solution can be implemented almost as it looks when it is installed from the CD. However, a marketplace solution is often re-branded so that it may bear little resemblance to the base application that was loaded from the installation disks. Therefore, it is essential that the marketplace solution can be easily branded to meet different marketplace requirements.

It is almost certain that users from different companies, requiring different languages, will access any given marketplace. Ideally, the solution should not require the customer to completely re-code client or server software to support different languages, currencies or tax structures. The system should, to some degree, be able to dynamically interpret the operating systems of the different users and provide a localized view of the marketplace.

Integrating Best-of-breed Components

Because every marketplace will operate at a different point in the commerce chain, there is a need to provide different end-user functions and services. For example, a vertical marketplace may want to publish large volumes of industry specific news and information, while an eBusiness

Portal may want to provide online news groups or chat capability. A vertical marketplace may require support for more advanced auction functionality, while a procurement marketplace might only utilize basic quote and bid functionality. Regardless of the specific requirements, a viable marketplace solution must provide an open, extensible platform that enables additional best-of-breed modules to be plugged in.

Such plug and play capabilities allow a host to easily customize the marketplace solution by adding custom-developed or stand-alone applications. Key areas typically covered by extended commerce modules include:

Community & Collaboration
An advantage of online marketplaces is their ability to create virtual communities and to facilitate collaboration among their members. Including interactive features, such as discussion forums, E-Mail List servs and chat capabilities provides valuable tools for communication among marketplace peers.

Information & Publishing
Successful marketplaces will provide additional features to entice its users to return on a regular basis, such as access to relevant information, content, resources, industry publications and news. In addition to providing external news sources, web site creation and hosting tools would allow a marketplace to assist its users in the creation and maintenance of their own corporate websites.

Advertising & Sponsorship
An online marketplace offers prime positioning for advertisers and sponsors to generate brand recognition and sales leads for their products and services. To capitalize on this opportunity, market hosts can include internal advertising and sponsorship capabilities. Not only will this give suppliers the ability to advertise, but it can also create a revenue stream for the hosts.

Advanced Dynamic Exchange
Dynamic Exchange technology includes functions and features that allow buyers and suppliers to more easily communicate and collaborate on key sourcing and ordering decisions. Examples of dynamic exchange include Internet-based online negotiations, quote and bid processing, and auctions.

TRADEX Commerce Center: A Uniquely Comprehensive Solution

TRADEX Technologies has been consistently recognized for vision and leadership in developing marketplace and exchange solutions. The initial TRADEX marketplace product was released in 1996, long before digital marketplaces and exchanges became a current topic. While in the past TRADEX has been labeled as being ahead of the market, today, it seems that the commitment to the vision of an Internet-driven economy, made up of many inter-connected digital marketplaces, was prescient.

In the recent past, marketplaces have become one of the most actively discussed models within the business-to-business Internet commerce community. In fact, many buy-side eProcurement providers have created their own marketplaces (examples include Ariba.com and Commerce One's MarketSite). TRADEX remains focused on providing solutions that have been specifically designed to simplify the creation of digital marketplaces. Given a significant technical and functional edge over first-generation solution providers, TRADEX clearly leads the field with the breadth and scope of functionality in its Commerce Center solution.

Performance and scalability

Perhaps one of the most impressive aspects of the TRADEX solution is its underlying network application architecture. It is one of the few available solutions that utilize a true component-based EJB architecture. As discussed in the earlier sections of this paper, this approach gives TRADEX some key advantages over less elegantly designed solutions. Key architectural high-points of the TRADEX Commerce Center include the following:

High-End Scalability and Performance
The TRADEX solution offers excellent high-end scalability. Because it uses servlets on the application layer (rather than static applications), the TRADEX solution can be configured to run over 1 to n processors and 1 – n machines. Market hosts determine the configuration that will best handle their workloads. They can start with a single multi-processor server and add processors and servers incrementally as workloads increase. Additional benefits of the TRADEX network application architecture include:

- Use of EJB standards, and support for new application server technologies, such as BEA's WebLogic and Oracle Application Server.
- A true multi-tier application that can run across 1-n processors and servers
- Advanced load-balancing capabilities that allow assignment of workloads to any processor or server on the utility network.
- Maximum fault-tolerance achieved by allowing workloads to be shifted from over-burdened or down machines to the best available alternative.
- Support for both Unix and NT implementations

Dynamic User Interface
The TRADEX solution delivers all end-user functionality through a true thin client. This design eliminates the installation and maintenance costs associated with client/server applications. The end-user needs only a browser for immediate and complete access to the marketplace.

In addition, TRADEX uses an advanced Java Beans client architecture to deliver a custom-generated user interface to each end user. The interface is dynamically generated, based on a specific user's permission set. For example, if Company A creates a group of users who do not have permission to update user information, then those users will not see the menu items or buttons for updating these areas. The solution offers two distinctly different interfaces – a professional administrative interface (which looks and acts like a windows application) and a casual wizard-based interface that walks users through step-by-step processes. Either interface can be automatically delivered to the end user, based on the established user profile. In addition, this design allows each company to brand the screens with its name, look and feel.

One potential concern with the current TRADEX implementation is its dependence on Java Beans. While the application runs extremely well, some companies are averse to using Java Beans because of perceived performance or browser compatibility issues. TRADEX has announced plans to support an additional dHTML interface in early Q3'99. This client interface, in conjunction with the Java Beans client, will provide customers with an excellent overall solution.

Database Independent
The TRADEX system works with any JDBC-compliant database. It uses no stored procedures or other database-resident logic. This open design enables the TRADEX application to partition data across multiple different databases. Data can be partitioned by customer, by function, by type or by all of the above. This allows a market maker to effectively manage the data of multiple customers, and to optimize data for performance requirements

Minimum Network Bandwidth Requirements
The TRADEX solution runs across the Internet at connection speeds as low as 28.8 KBPS. While its uses an advanced EJB design, it does not require proprietary ports. Using a technique called HTTP tunneling, the TRADEX client communicates across standard HTTP ports, accessible through almost all corporate firewalls.

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Broad application functionality

The TRADEX solution provides comprehensive out-of-the-box functionality for managing both buying and selling processes. All TRADEX application logic is written as independent components, which are separated from the underlying architecture and systems configuration tools. This layered component design makes it easy to customize delivered business objects or add additional objects to the TRADEX platform. By providing a set of well-integrated commerce objects, within an extensible framework, the TRADEX solution will enable customers to rapidly implement and deploy a solution, without having to encode common commerce functionality from scratch. Key areas of the TRADEX application functionality are listed below.

Centralized Catalog Management
The TRADEX product catalog provides effective management and search capability for a large amount of consolidated information. It can effectively handle thousands of goods and services in demand within the marketplace, limiting each customer's view to only those products that he is approved to purchase. Utilizing TRADEX Catalog Utilities, market makers can effectively import and aggregate product information from multiple suppliers in multiple formats. In turn, the TRADEX Catalog Search Engine enables users to easily find and request products and services within the catalog.

Open Supplier Connectivity and Management
The TRADEX system does not prescribe a single method for passing commerce objects between buyers and suppliers. It supports several standards and protocols, including EDI, Fax, E-mail, XML, and other formats. The TRADEX solution also provides Direct-Link Utilities that allow real-time Internet connection to a supplier's ordering system. Most important, the TRADEX system allows a market maker to establish suppliers as users of the system. Suppliers can then connect directly to the marketplace in order to check and acknowledge orders, check payment statuses, update products and prices, and perform other key functions.

Integrated Dynamic Trade Functionality
For more advanced utility functions, TRADEX provides new ways of automating the dialog between buyers and sellers. Key areas of functionality include online quote and bid processing, online negotiations, and basic auction functionality. Customers who require higher-end auction functionality to integrate a best-of-breed auction module with the delivered TRADEX platform.

Web-based Query and Reporting
The TRADEX solution includes a web-based reporting tool that allows all administrators and end-users to easily query on current activities and expenditures. Users can quickly specify parameters and generate a query that is delivered to the browser. This solution does not require installation or licensing of any third party reporting tools. The system provides a simple menu list of query parameters and pre-formatted reports that simplify the query process.

While this is satisfactory functionality for a majority of users, TRADEX expects to increase reporting and analysis capabilities in future product releases. TRADEX has announced plans to partner with a leading reporting and analysis technology provider to extend current capabilities.

Flexibility and Manageability

The TRADEX solution provides a robust set of tools to ease the task of marketplace management.

User Hierarchies and Permissions
While buyers want to leverage a commonly hosted marketplace, they will demand the ability to establish their own processes for interacting with the marketplace. They will also want to control user setup, security and some system administration functions.

TRADEX User and Permissions Management Utilities allow each company to easily establish its own hierarchy of users and permissions to match its specific organizational structure. For example, Company A may allow end-users to buy all computer products up to a $10,000 order limit. Conversely, Company B may not allow end-users to order any computer hardware, may have a lower order limit, or may have different workflow and approval requirements.

The TRADEX User Hierarchy Management facility is the underlying metaphor that drives this distributed user and permission management. It allows a market maker to manage a single hierarchy for the entire marketplace, while allowing each company to view and manage its specific branch of the overall hierarchy. In addition to users and access permissions, the user hierarchy also drives user processing defaults, roles and access security.
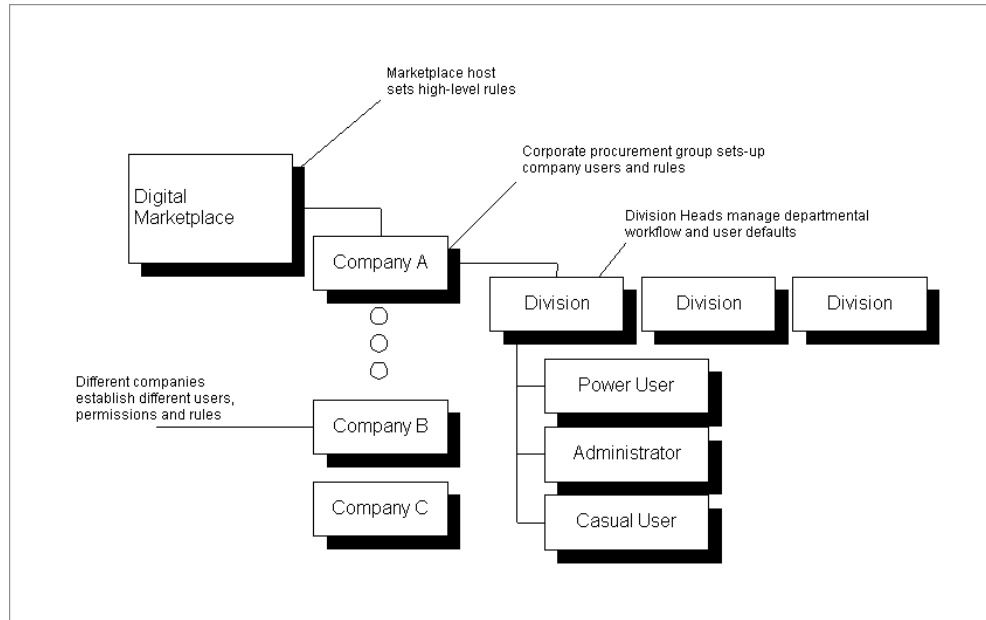

User Hierarchy Management Model

All the TRADEX hierarchies and permissions are easily maintained through an intuitive graphical drag-and-drop interface. The utilities allow each company to effectively manage its own virtual procurement application.

Supplier & Pricing Management
One of the primary requirements of a marketplace is the ability to refer a single product inquiry to several different suppliers and to enable each supplier to establish specific prices and terms for individual buyers.
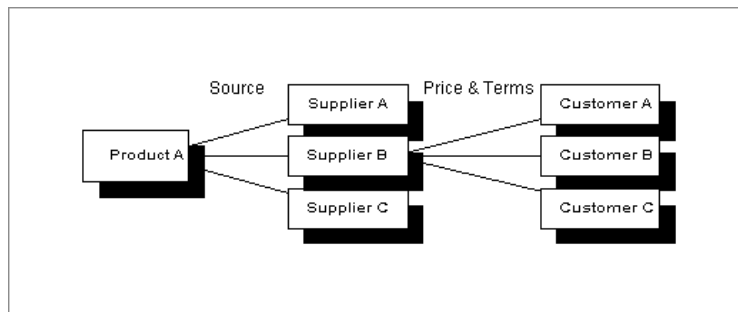
Supplier Contract Management Model

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TRADEX offers robust supplier and contract management features that eliminate the need to replicate product and supplier information for each customer. Using sales and price filters, the TRADEX system offers multiple ways of managing pricing and terms, based on the specific supplier-to-customer contract. The system includes percentage markups and markdowns, customer-specific pricing, quantity price breaks, and pricing by class of customer. These variables can be used in combination to meet the diverse buyer-to-seller relationships incorporated in the utility.

Graphical Workflow Management
As mentioned above, TRADEX allows each customer to manage their own unique rules and permissions on their branch of the marketplace hierarchy. TRADEX also provides very powerful and highly intuitive workflow utilities that allow customers to establish unique workflow processes for the routing and approval of documents. The TRADEX solution does not require complex scripting languages to set up and manipulate workflow processes. All of the processes are built with graphical flowchart diagramming tools. Individual companies can establish different processes, user roles and decision criteria that meet their internal procurement requirements.

Automatic Billing Based on Customer Usage
The TRADEX solution provides built-in utilities for tracking customer usage and recording billing charges. Market makers can establish any rules and events by which they want to track usage. If desired, they can capture per transaction charges based on any event(s) in the system or capture markups for dollars spent. For example, a market maker may set up billing events that take a small percentage of each order amount or may charge a per-transaction amount. All charges are captured on an ongoing basis, and reported at set intervals.

Powerful E-mail Alert Engine
The TRADEX solution provides a flexible E-mail Alert Engine that allows a market maker and each customer to define custom e-mails initiated by system events. For example, a market maker may set up a special e-mail to be sent to a group administrator when a company adds a new product or supplier to the system. Other examples could include an e-mail sent to the buyer when an order is canceled, or e-mail sent to the user, with a package tracking number, when the supplier ships an order. All the alerts can be easily customized. The TRADEX Alert Engine allows market makers and customers to automate the management and exception process within the procurement utility.

Customizability and Extensibility

The TRADEX solution is designed as a component-based Enterprise Java Beans (EJB) application. It is developed to open standards and uses standard development tools, such as J-Builder. The TRADEX object-schema makes it easy for developers to effectively change delivered components. While TRADEX Commerce Center provides a complete commerce application, it can also be thought of as a set of individual components, integrated into a complete solution. This design enables customers to easily replace delivered objects with custom or third-party components. Many customers will find that the TRADEX solution provides an excellent development platform for new object-oriented developers. In addition, they will find that developing on an object-oriented platform will increase developer production by five to ten times over client/server development.

TRADEX offers a unique customization capability called object-proxying, which speeds customization and ongoing migration of custom components. The easiest way to understand object-proxying is through example. Let's assume that a market maker wants to add a special field to the requisition screen. Instead of changing the delivered TRADEX object, developers would create a sub-classed or separate object that would reference the core delivered object and indicate the desired additional field. At run time, the object-proxying function will concatenate the new sub-classed object with the delivered object to create a custom requisition object. The object is then displayed to the user. When migrating to a new version of the TRADEX solution, the customer-developed sub-object will continue to work with the new version of the TRADEX object, speeding migrations and reducing costs.

To address extended marketplace requirements, such as advertising, information publishing and chat capabilities, TRADEX plans to provide packaged integration components to a number of best-of-breed component providers. While it is not reasonable to assume that TRADEX will be able to integrate to all possible solution providers, they provide generic interface APIs to many core functions.

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Conclusion

The Internet is fundamentally changing the world of business-to-business commerce. Traditional channels of communication, negotiation and distribution are being rapidly replaced by the automated, streamlined procedures of the electronic marketplace.

The overriding reality of the Internet economy is that no thoughtful business manager can afford to ignore it! Numbers such as Forrester's $1.3 trillion estimate of Internet commercial activity by 2003 cannot be discounted. Internet commerce is becoming the prerequisite for robust corporate growth rates in the new millennium. Without a broadly competitive Internet presence, stagnation is about the most that any enterprise can hope for.

Without a doubt, the primary engine driving the acceleration of Internet growth will be the relatively new concept of the digital marketplace. Bringing together a widely diverse group of buyers and sellers, digital marketplaces will erase geographic boundaries, bypass today's conventional distribution channels and realign buyer-seller relationships, many of which have been in place for decades. By re-defining the existing commerce chain, digital marketplaces will create new business rules that require enterprises to move faster and think "outside the box". Those who don't risk being relegated to the sidelines in the Internet game, or worse, shut out of it entirely.

Although digital marketplace models are fairly straightforward, implementing them is a matter of careful planning and painstaking execution. An enterprise's successful entry into the Internet economy requires a major commitment of resources to a complex technological infrastructure. Errors committed at the outset will not be easily remedied, and their economic impact could seriously constrict the future growth of the imprudent entrepreneur.

The seriousness of the commitment and the scope of the opportunity demand that market makers seek out the best in expertise and experience when planning and implementing digital marketplaces. As a pioneer in the development of eCommerce solutions, TRADEX Technologies is uniquely positioned to usher your enterprise into this new and promising business arena.

Although there is no ideal out-of-the-box solution, TRADEX's Commerce Center solution provides a robust core platform for integrating multiple commerce processes and functions that characterize a successful digital marketplace. Utilizing a flexible, component-based architecture, TRADEX Commerce Center can be easily scaled to support large numbers of diverse users, enable new forms of eCommerce activity and generate significant new revenue streams for marketplace managers. For forward-thinking business managers, the TRADEX solution provides an excellent system for creating a successful digital marketplace that can expand and grow as your enterprise and technology requirements change.

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