

E-Supply Chain Integration for Inter-Enterprise Business Practices

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Abstract

Traditional business partnerships are changing in response to technology advancements and business innovations. Many companies have already reengineered their internal processes, and now the focus has shifted to their trading partners. With network connectivity, supply chain integration is the core strategic competence that enables many companies to act as one. A supply chain represents the cross-functional integration of activities that cross the borders of individual companies. This feature is very important in many industries, because many firms must collaborate intensively throughout a project lifecycle. The issues involved in selecting e-supply chain partners extend beyond choosing a trading partner or a contractor and must include configuring the business-to-business inter-enterprise processes among partners. In the future, supply chains, rather than enterprises will compete with each other. There will be no isolated islands of automation, and the future of business applications will support inter-enterprise collaborative commerce (C-Commerce). The c-commerce e-supply chain scheme enables a dynamic “virtual team” to fulfill many mission-critical business processes throughout a project lifecycle will undoubtedly be the best business solution for the new millennium.

1. The Emerging Strategic Alliance

Increasing global competitiveness and the advancement of information technology are potent drivers for organizations to alter their business strategies. Companies need to adapt a new type of agile and responsive organizational structure to fit into the global spectrum of business. New market players in today's e-economy gain diverse skills of workers through alliances, and a flat managerial hierarchy enables them to collaborate on a virtual basis that produces flexible products to meet customers' needs. This places the global economy as a whole in a continual restructuring mode, putting pressure on every industry. The situation is intensified by rapid advances in Information Technology (IT), which have drastically shortened the adaptation periods for organizational changes that used to be comparatively long. Hammer (1990) suggested that enterprises use IT to reengineer their existing business processes to achieve strategic outcomes and improve competitiveness [1], and many companies have “reengineered” changes in their organizational structures, business functions, and business processes to achieve more agility, flexibility, and responsiveness in their operations. Reengineering is critical to an organization's

survival during certain periods when there are major economic upheavals that threaten the organization's existence, and many organizations that do not reinvent themselves are doomed to become part of business history. With the maturity of Internet technologies, organizations can readily perform certain business functions which go beyond organizational boundaries. E-commerce practices today have demonstrated the power of this “virtual organization”, which integrates business processes from the front office to the back office through the Internet.

Due to these paradigm shifts, the traditional business partnership scheme has changed, and the focus has now shifted to their business partners. Today, companies can achieve a business advantage by leveraging networking technology and the principles of supply chain integration. With network connectivity, supply chain integration is now the core strategic competence that enables many companies to act as one. This feature is very important for every industry, because many firms need to cooperate/collaborate intensively throughout a project lifecycle. Today, every industry is an information-intensive industry. Information and communication have always played a major role in their competitiveness and growth. In the future, the supply chains, rather than the enterprises (designer, manufacturer, and supplier) themselves, will compete with each other. An increase in horizontal integration synchronizes the output of the entire supply chain. There will be no isolated islands of automation [2], and those who best define and reengineer their business processes in the e-supply chain partnership will likely be the most successful in this industry.

2. The Fusion of E-Business

Although e-business is sometimes confused with e-commerce, it is widely accepted that e-commerce is the buying or selling of products, goods, information, and services over the Internet, whereas e-business is a complex fusion of business processes, enterprise applications, and organizational structure necessary to create a new high performance business model. The topic of e-business often includes business-to-business process automation. Some examples are procurement (bidding, and outsourcing), selling (production and supply chain management), ordering (shipping and logistics), billing, and payment. These processes, by definition, almost always go beyond enterprise boundaries, and there are many other e-business service environments where Internet technologies are being utilized by end users, enterprises, and other parties that wish to do business over the net. Structures changes caused by these shift

impacted the boundaries of the enterprises. Indeed, without transition to an e-business foundation, e-commerce cannot be executed effectively, and no e-business will be truly effective without interacting with all of its supply chain partners in an automated fashion.

2.1 The Customer-Centric Supply Chain Management

While technology is at the heart of the change that is revolutionizing our economic life, successful e-business is concerned with building new kinds of relationships with customers, employees, business partners, and all other participants in business life. These relationships are termed the supply chain. Supply Chain Management (SCM) evolved several decades ago from a set of logistics performance tools to an inter-enterprise, and even channel-wide, operating philosophy. The growing dependence on the supply chain has been emphasized by the following changes to traditional business practices: (a) the growth of information sharing between vendors and customers, (b) the paradigm shift in the marketplace from the mass-production of standardized products to flexible operations providing customized/personalized products that customers are demanding solutions designed to meet their specific needs, (c) the rise of process-oriented team efforts replacing traditional departmental functions, and (d) increased trend on inter-enterprise processing and outsourcing. All of these features are very important to today's industries, because many firms need to collaborate intensively throughout a project life cycle and the project team needs continuous access to business plans as the project proceeds.

2.2 Supply Chain Collaboration and Integration

The supply chain involves procurement, enterprise resource planning (ERP), EAI (Enterprise Application Integration), inter-enterprise processing, schedule sharing, logistics, inventory management, feedbacks, quality management, and so forth. However, to be successful the members of the supply chain need to collaborate to help the organizations reduce cost, utilize resources more effectively, and improve relationships with their clients. The fundamental benefit of SCM is cooperation and collaboration among different stakeholders. The objectives and scope of work must be clearly stated and faithfully executed (Figure 1). Cooperation and collaboration are especially critical in the management of today's supply chain; these depend on the organizations' willingness to link their strategic objectives and fundamental business processes to create unique, seamless, enterprise-wide portal that are ready to serve their customers. These companies are also capable of quickly consolidating critical competencies and physical processes to gain competitive advantages.

Therefore, issues related to e-supply chain integration include the internal and external core business processes,

the development of close linkages between channel partners, and the management of production and information as they move across organizational boundaries. For example, the manufacturing process for materials or the production and distribution of equipment are transparent to all members in the supply chain. A supply chain is integrated in terms of people focused on processes that ultimately respond to customer demand, but its success requires technology that can integrate and support every exchange of information across the entire supply chain. Issues involved in selecting e-supply chain partners extend beyond choosing a trading partner or a contractor and must include configuring the business-to-business inter-enterprise processes among partners. The selection of processes and cooperation with supply chain partners are critical to the success of business.

3. Designing an e-Business Supply Chain Strategic Framework

In today's e-supply chain practices, all business data are transmitted over a variety of communication networks, and the essence of e-business is the communication of business data between organizations under a collaborative scheme in an entire supply chain. Data communication is critical for streamlining the entire supply chain business processes. However, the difficulty is that management has not yet examined these issues from any perspective other than the one dedicated by the paradigm of the field, nor is there much effort to target the issue of transforming e-business practices into an inter-enterprise collaboration supply chain scheme.

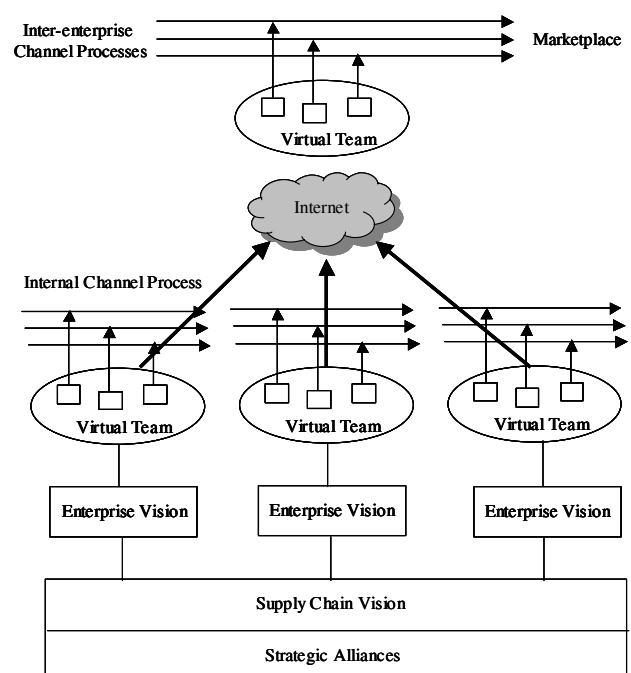


Figure 1. The Virtual Team in a Supply Chain Scheme

A typical project involves the coordination of multi-disciplinary work efforts by different organizations. Although participants may share a common goal of completing a project satisfactorily, their specific objectives are different and their degree of participation depends on their organizational strategies. Thus, the need for integration of trading partners—especially integration of the supply chain and managerial functions—becomes a strategic vision for the future of business practices in the e-business era, and the major parts of the supply chain inter-enterprise processing concepts are presented here.

3.1 The Value Chain

To design a supply chain solution, one must start by examining the basic framework of an enterprise's major business activities, which are considered competitive factors that are derived from Porter's value chain [3]. The value chain divides the organization into a set of generic functional areas, which can be further divided into a series of value activities. In the value chain, there are two distinct types of functional area: primary and support (Figure 2). Primary activities are concerned with the direct flow of production (such as inbound logistics, operations, outbound logistics, marketing, sales, and service), whereas support activities (firm infrastructure, human resource management, technology, and procurement) support the primary activities and each other. Starting with its generic value chain categories, a firm can subdivide into discrete activities, categorizing those activities that contribute best to its competitive advantage. Porter's version of supply chain management

is called a value chain because it focuses on value. The value is measured by the amount customers are willing to pay for an organization's product or service. Primary and support activities are called value activities, and an enterprise will be profitable as long as it creates more value than the cost of performing its value activities [4]. In this way, a value chain is defined and a better organizational structure and business process can be created around those value activities that can most improve an organization's competitive advantage [5].

Porter also recognized linkages outside the enterprise, as they relate to the customer's perception of value. This provides the possibility that one value chain could be linked to another value chain, because one business partner could be the other's customer. This interconnected value chain system can act as a supply chain that encompasses the modern business world, and participating organizations can readily extend their technologies to their partners. The "extended enterprise" aspect enables supply chain integration, more effective outsourcing, and self-service solutions for both internal and external stakeholders [5]. This extended enterprise allows for the sophisticated interweaving of online business processes across trading partners and with other internal and external information sources. The following section will illustrate a typical integrated e-supply chain solution for the inter-enterprise business practices.

3.2 The General Business Service

Based on a value chain analysis, several general base business activities are identified, and a series of

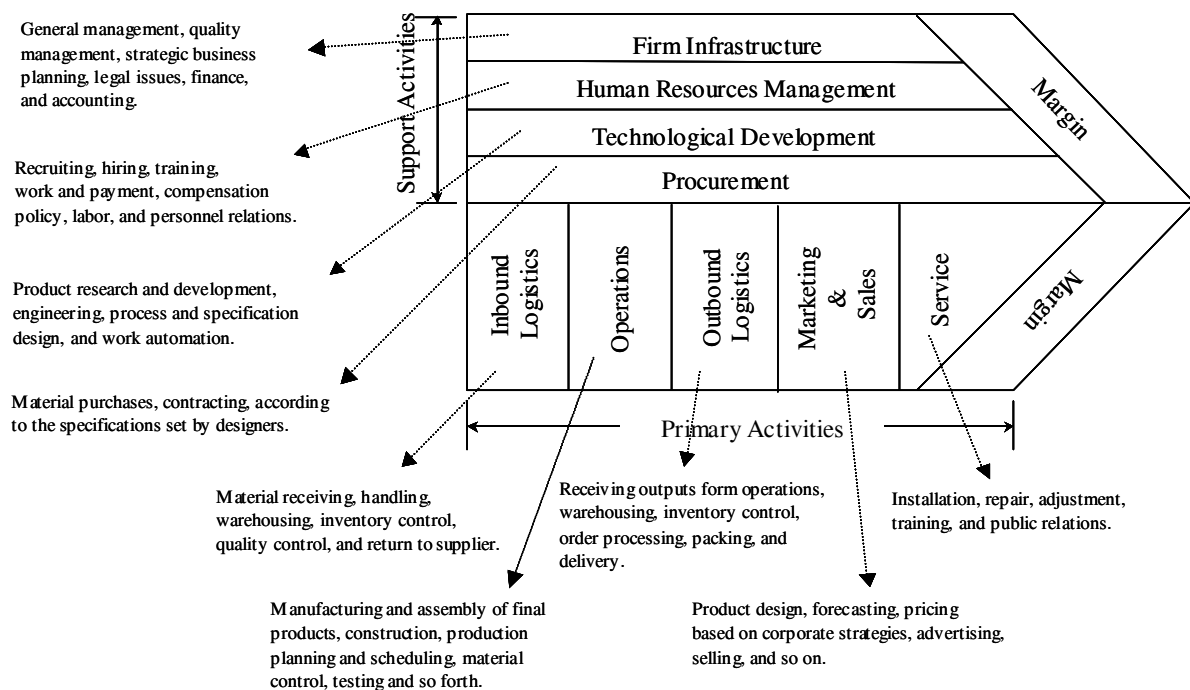


Figure 2 Porter's Value Chain and Value Activities

decomposing efforts will render more detailed sub-processes by using the object-oriented approach. On the other hand, effective management involves many managerial functions, such as scheduling, budgeting, quality control, resource management, and so forth. The ultimate purpose of these management functions is to allocate resources (manpower, equipment, material, etc.) and then monitor, control, and keep all processes on track during every stage of the project cycle. Many business management share many of the same business activities as derived from the value chain, because Porter's value chain activity is the backbone of every type of organization in every type of industry. In here, the Object-Oriented modeling of the transformation process for inter-enterprise processing is summarized in Figure 3.

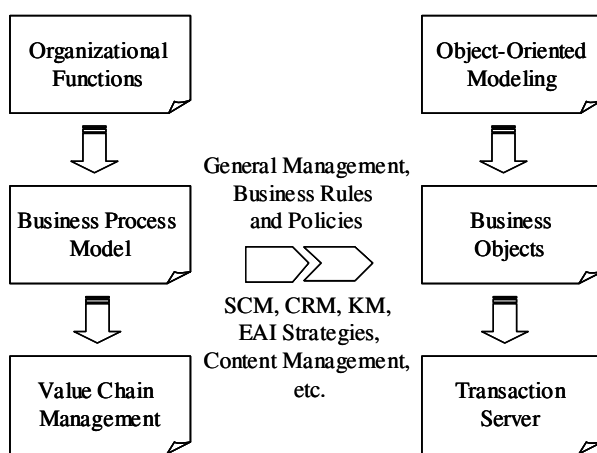


Figure 3 Transformation Process for Inter-enterprise Processing

3.3 The Object Orientation

In this study, an object-oriented approach is used to map the corporate business process with the information system in terms of a series of reusable business objects, which encapsulate complex business rules. Accordingly, (a) the tedious redesign efforts of information systems can be circumvented and the corporate information system can become very adaptive, (b) the applications can run on different platforms through network connectivity, and (c) this schematic business blueprint not only fits a given enterprise, but it can also be viewed as an open architecture that links to trading partners. From a process-oriented point of view, this blueprint allows many organizations to share the same business components (or database) in a network and to participate in the business practices of the strategic alliance supply chain. In contrast to an isolated IT system, this approach allows the organization business process to permeate different organizations, and communication in this system becomes process-to-process oriented.

The Unified Modeling Language (UML) is an object-oriented modeling technique that provides a

comprehensive methodology for designing object-oriented applications in a logical, structured manner, and it is available for the development of three-tier client/server distributed applications. A basic core set of diagrams (use case [6] models, interaction diagrams, class diagrams, and activity diagrams) is used in the development processes to refine the design and ultimately define the business objects, after which the class diagrams are coded and mapped into the organizational information system. By applying the object modeling methodology, these business component relationships can be transformed into object-based interactions.

3.4 Wielding the Solution

These tools and theories can now be combined to provide an inter-enterprise processing scheme for e-supply chain practices. The first step is to transform a functional organizational structure into a process-based structure based on the value chain model and business process reengineering. The second step is to use the UML to build an object view (Class Diagrams) of business operations that follows the organizational business rules, policies, and business process scenario (Figure 4). The third step is to translate the object-oriented blueprint of the enterprise processes model into machine recognizable codes that can be compiled into a series of reusable business objects.

Several programming languages (such as C++, Java, and Visual Basic) can be used in this transformation. The fourth step is to migrate these business objects into a transaction-processing system that has Internet/Intranet capability (for example, Microsoft Transaction server or the SAP R/3 Enterprise Resource Planning Transaction Server). The business objects can reside on the project team's information system and "talk" to each other using the Common Object Request Broker Architecture (CORBA) scheme to perform over the Internet certain business functions which go beyond organizational boundaries. Regardless of location, users can participate in team coordination/collaboration and share their "collective intelligence" within a virtual corporation. Figure 5 is a schematic diagram of a three-tier information system that stores business objects to perform certain tasks for the organization. This global information networking and inter-enterprise process offers enormous benefits to the many industries.

The business objects presented thus far depict business services, in that each represents an artifact that is encountered or produced in the daily business routine. Each module in the user services part of the model actually relates to a single use case statement, which, in code terms, would actually have to be divided into a number of distinct routines. These routines deal with the methods and properties of the business objects in the business services tier, and the user interface uses these objects to display needed information and feed user input into the system. The business objects, in turn, use objects in the data services layer to get their data. In this

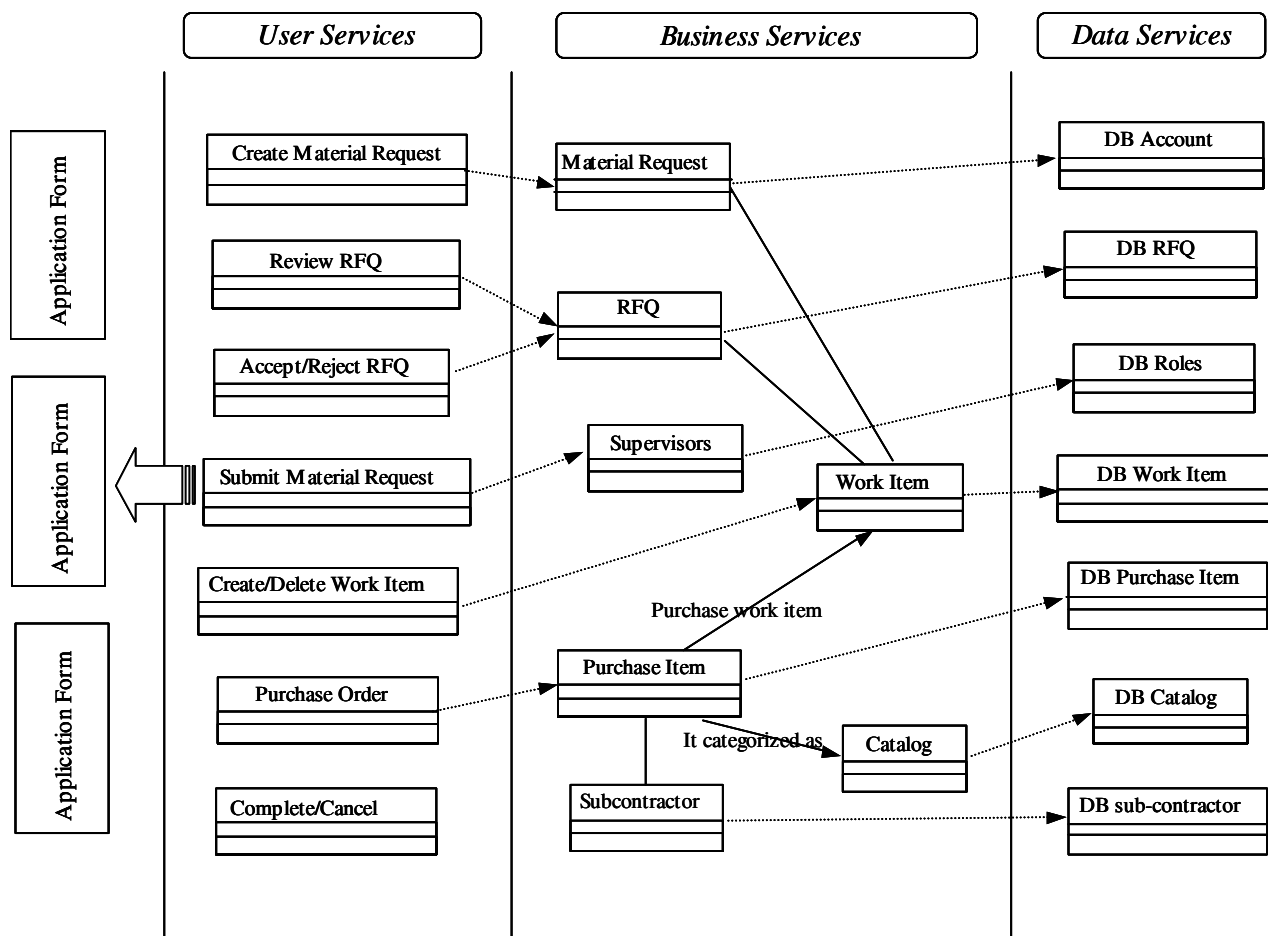


Figure 4 Object-Oriented of Typical Progress Payment in Three-Tier Service Approach

way the user interface could change without impacting the underlying way in which the application dealt with the business, and the database could be replaced with a new database without affecting the rest of the system. As long as the interface to the data service objects remains intact, the rest of the code will compile and run properly.

3.5 The E-Supply Chain Inter-Enterprise Application Integration

As mentioned previously, most business plans are unique, complex, extensive, expensive, and subject to tight schedules and budgets. The teams for any given project includes some combination of engineers, contractors, subcontractors, materials suppliers, equipment providers, and even inspectors, and thus the team will normally be different for each project. All of the complexities inherent to different project situations are an inherent part of business practices. As a consequence, managing a business project may require extensive interdisciplinary professional skills to achieve optimum performance. From the supply chain point of view, project members must collaborate to synchronize the output of the entire supply chain to fulfill a particular job. The project partnership in the supply chain becomes

a strategic alliance wherein contractors must align their business processes and information systems to support inter-enterprise processes and decision-making. Configuring business-to-business operations among trading partners is very important, because the supply chain represents the cross-functional integration of all activities that cross the borders of the participating organizations. The issues involved in selecting e-supply chain partners extend beyond choosing a trading partner or a contractor and must include the technological capability to configure the business-to-business collaboration among the partners. Using the value chain concept to identify an organization's competitive advantages and then reengineering its core business processes accordingly is the best way to make a company more process-aware, and that is the beginning of inter-enterprise processes.

E-business solutions should be built on an Internet computing architecture that leverages standard Internet communication protocols and company intranets, extranets, and the global Internet to provide low-cost and universal access to all members of the e-business supply chain. With new web technologies, such as XML, Internet-based systems can offer functionality and information to users through a standard Web browser,

thereby eliminating requirements for traditional Electronic Data Interchange (EDI) or client-based software and reducing IT implementation and maintenance costs, cycles, and burdens. The winners in the Internet economy will be those companies that can respond most rapidly and efficiently to the customer's demands. As a result, an e-business supply chain solution must provide support for the capture and communication of customer demand, as well as enable this demand to automatically trigger business events and initiate process workflow (such as launching manufacturing runs, starting business tasks, and issuing purchase requests within the enterprise and across the supply chain). This supply chain also needs a common data model, because to be effective an e-business supply chain solution will need to deliver an accurate and common view of customer demand data -- as well as any subsequent events, plans, or other business data. This new "e-supply chain" offers virtually unlimited business opportunities in the alignment of processes and technologies. A well-designed and well-integrated supply chain will improve upon existing cost-responsive processes and have organizational agility in the event of change.

4. Conclusion

The challenges of the global marketplace are increasingly forcing today's process-centered organizations to utilize more fully the skills, knowledge, competencies, and resources found in their integrated supply chain networks. Parallel, rather than serial optimization is the key to supply chain management, and companies must acknowledge that adaptivity is increasing becoming a measure upon which its productivity will be evaluated. This adaptivity requires enhancing communication among all team members and aligning their actions toward a common project goal, and IT will be a key "enabler" for this transformation effort.

The explosion of strategic alliances and partnerships on a global scale has brought about the formation of inter-enterprise virtual organizations capable of leveraging the skills, physical resources, and innovative knowledge that reside at different locations in a supply chain network (Figure 6). This paper provides a broad discussion on the possible development of EAI scheme for inter-enterprise processes that embraces all aspect of business practices, and creates multi-channel and multi-technology solutions such as CRM, PRM in a fast-moving and technologically indefinite environment. In today's customer relation management, or selling chain management practices, the customer is in control, and a business must realign its value chain around the customer to eliminate

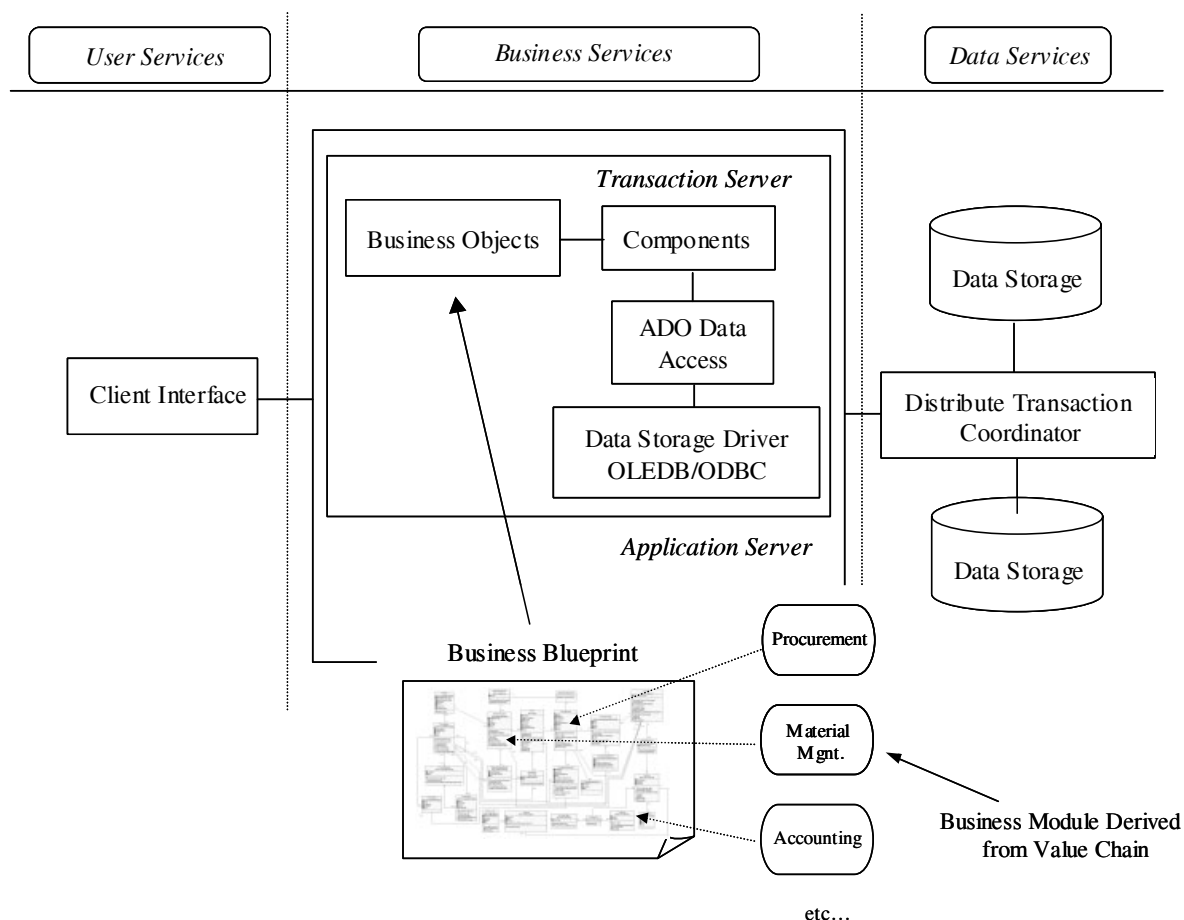


Figure 5 The Adaptive Business Information System

inefficiencies, and custom information, products, and services. Communication in the supply chain must be process-to-process oriented, and collaboration is the best way that trading partners can interact. Process integration across the supply chain becomes a new challenge for today's industries. Enterprises will need to learn that content communication is as important as technological infrastructure to the enterprise software application architecture. For example, the future mobile business will rely more heavily on content management than software application. Opportunity opens doors, but success requires walking through them. With a new focus on process and supply chain management, traditional business partnerships will have to redesign their business strategies. The Collaborative Commerce (CC) e-supply chain scheme that enables a dynamic "virtual team" to fulfill many mission-critical business processes throughout a project lifecycle will undoubtedly be the best business solution for the new millennium.

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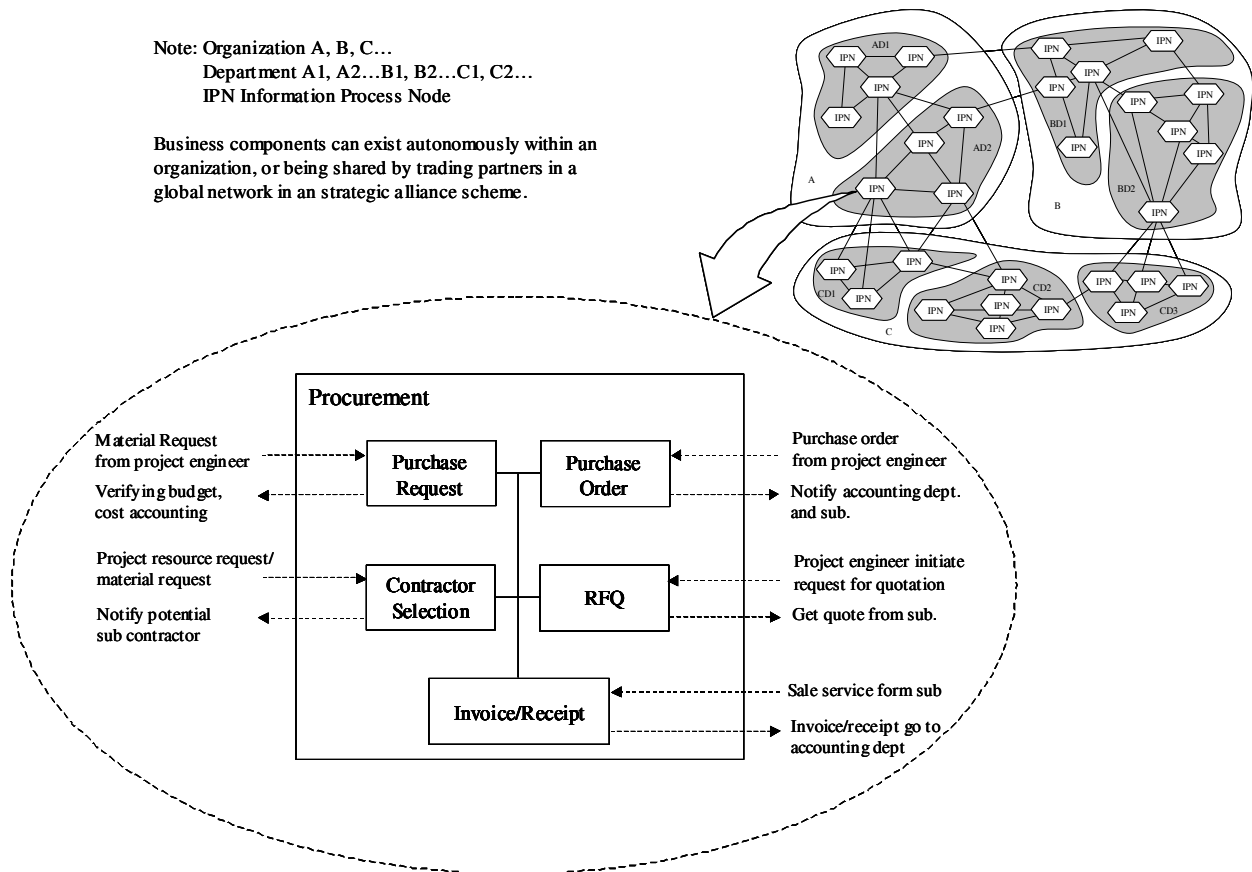


Figure 6 Share Component Inter-enterprise Processing