ASSESSING TECHNOLOGY INTEGRATION FOR E-BUSINESS

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ABSTRACT

In today's increasingly network-driven world, one of the biggest challenges that are facing organizations is integration of technology with enterprise applications to coordinate and manage the activities of customers, partners, employees, suppliers and internal systems. An enterprise without effective integrated systems will find it difficult to think and act as quickly as the competition. This paper assesses different levels of technology integration within a set of 300 enterprises including 100 Fortune 500 companies.

Key Words: Technology integration, e-business, assessment framework

Introduction

Executives and managers engaged in transforming their operations to e-business are confronted with many challenges, including new technologies, infrastructure, security, availability, growth, standards, affordability and integration (Howlett, 1999). The biggest challenge for most companies is the integration of new technology with existing core enterprise systems for e-business adoption. Transforming to an e-business requires transformation of the entire value chain. Effective e-business strategies involve different departments within the organization, customers, suppliers, and other outside partners
E-business adoption requires integrations at multiple levels. Enterprise Application Integration (EAI) requires a common framework for integrating incompatible and distributed systems - making it faster and easier to tie together applications into business processes. Collaborative efforts in shared databases, open tracking systems and inter-enterprise transparency result in streamlined business processes and cost saving. Streamlining of business processes is only possible if there is an effective enterprise wide integration of technology and applications. Optimising business opportunities by developing an effective streamlined and integrated supply chain sounds straightforward, however creating an extended supply chain to enable collaborative commerce requires integration with partners, wholesalers and suppliers (Barua, Kriebel, and Mukhopadhyay 1995). Application-to-application technologies, such as supply chain software and ERP systems provide information about the present and past. Using this information in seamless e-CRM (Customer Relationship Management) to personalize communication to individual customers and suppliers is a key in a successful e-CRM strategy (Whiting 2000). To maximize e-business efforts, synchronization of end-to-end business processes across the entire value chain is required. This paper assesses e-business readiness by examining the three levels of technology integration throughout the value chain: 1) Data Integration; 2) Application to Application Integration; and 3) Interface Integration.

Methods

This study is based on both primary and secondary sources of information. The data for the study were collected through phone, e-mails, and a web-based survey of firms in the manufacturing, retail, distribution, and wholesale sectors. The structured questionnaire was generated based on existing academic and practitioner-oriented literature on e-business integration. A seven-point Likert scale was used to measure most responses. The framework for e-business integration was created to test the integration of technology, processes and business applications related to the enterprise, customers, and suppliers. Only those firms that had a corporate website and also used traditional channels of business (i.e., accept orders through sales force, phone, fax and mail) were included in the study. Pure “dot coms” were excluded since the focus of the study was to assess the value of electronic business transformation and integration. Over 300 enterprises including 100 Fortune 500 companies were contacted via telephone, e-mail and postal questionnaires. An independent and extensive cross-validation of responses was conducted on more than 300 websites, assessing the accuracy of stated informational and transactional capabilities. The items and constructs were tested for reliability and validity. The study examined recent literature and news reports that were published on e-business integration in different regions of the world during 2001 and 2002. The sample composition is shown in table 1.
The Assessment Framework

An enterprise should design an e-business integration framework in order to leverage technologies that facilitate e-business integration. This framework defines how disparate integration technologies enable application, business process, business-to-business (B2B), and legacy integration initiatives. The conceptual framework depicted in this research study (as shown in figure 1) is derived from e-business architecture integration first suggested by Ulrick (Ulrick 2001). The framework described in this paper should be helpful for assessing e-business integration at different levels of enterprises.
Figure 1: A Conceptual Framework for Assessing E-business Integration
Findings

Businesses strive to integrate, automate, and streamline core internal and external business processes to improve their performance in today's dynamic e-business environment. Business processes drive a company's e-commerce interactions with customers, partners, distributors, and suppliers and streamline the company's internal business. To support these processes, integration must support workflow processing, messaging and routing, enterprise application integration, customer relationship systems and supply chain systems. Extending Ulrick framework (Ulrick 2001) a conceptual framework was developed to guide the assessment of business process integration in participating companies. The results are shown below in table 2 and figure 2. The first step of the integration assessment begins at the data integration level as illustrated below.

Data Integration

Data integration occurs at the database and data source level within an organization. The integration is achieved by migrating data from one data source to another. A problem with data integration, however, is that business logic usually exists only within the primary system, limiting real-time transactional capabilities. Our study shows that 77 percent of the firms have not integrated data from different sources. Only 23 percent of the firms have integrated their databases, yet even in these firms, integration of databases with their front end web sites is still far from complete. Data is maintained in different formats in many proprietary software packages. One consequence of such a situation is that the organization can never respond quickly to market shifts.

Legacy Systems

Examining the existing business logic of the legacy systems or packaged applications such as ERP, CRM and SCM is the next step in the assessment process. As the need to meet increasing customer and business partner expectations for real-time information continues to rise, companies are forced to link their disparate systems in the form of ERP systems to improve productivity, efficiency, and, ultimately, customer satisfaction.

Enterprise Resource Planning (ERP) Systems

Enterprise Resource Planning systems integrate data, processes and plans to help organizations develop not only "best practices" but methods that work to outperform normal business methods. The managers should understand the value that ERP systems can bring to the company and make sure that the concepts are strategically integrated at every level of the company. The management must be willing to set and adopt standards. To realize the results possible through ERP systems, data integration is required. This is easiest to accomplish if the data is being integrated through applications commonly in use throughout the company rather than trying to bring data from a number of unrelated sources with unrelated and sometimes proprietary data structures. Data from a repository or legacy data must be accessible and transparent to middleware technology and web-enables application as indicated in the following illustration. Our study shows that big companies (77%) have integrated their legacy applications with their ERP systems, however, smaller organizations (23%) have still disparate systems for their data. Many of
these companies do not have branded ERP software but these companies have developed their own in-house systems which are kind of ERP systems to integrate their data across all legacy applications.

**Application to Application (A2A) Integration**

Application-to-application (A2A) integration involves the integration of cross-platform applications over a network. It can range from custom code (COBOL, C++, Java), to application programming interfaces (APIs), to remote procedure calls (RPCs), to distributed middleware such as TP monitors, distributed objects, common object request broker architecture (CORBA), Java remote method invocation (RMI), message oriented middleware (MOM), and Web Services. The A2A application infrastructure allows applications throughout an enterprise to seamlessly communicate with one another in a real-time manner (Ulrich, 2001). E-Business solutions should follow open standard-based infrastructure for enterprise application integration (A2A), B2B collaboration and web services integration in a single integrated product and provide a complete enterprise application integration (A2A) solution including messaging, data transformation, validation and adapters for connectivity to 3rd party package applications and legacy systems. Our study shows that most of the companies (86%) are far away from A2A integration. Companies still have their legacy applications and many of these applications are not integrated to seamlessly communicate with one another.

**Integration of Customer Related Processes**

CRM technologies should be designed to provide clients' brands and reinforce customer retention and loyalty, as well as provide our client's customers with options and information to make their client experience more positive (Aberdeen Group 2000). These technologies should offer clients key intelligence about customer preferences and the customer life cycle. Our study shows that there are no investments made in CRM technologies in interacting with customers. For example, 86 percent of the firms do not have any capabilities to personalize content (e.g., order history, order status). In addition, 84 percent do not exploit the benefits of online forums and virtual communities to enhance stickiness and information exchange, while 76 percent of the firms do not even provide an FAQ related to products/services information. In order to assess integration at the customer level, we examined how customers were able to communicate their needs online effectively through a single contact point so that customer feedback be quickly disseminated into organizational processes (e.g., design, manufacturing, quality assurance) for immediate action (Rathnam, Mahajan, and Whinston 1995). Our study shows that a majority of the firms (70 percent) have not made significant efforts in streamlining customer processes to provide one-stop contact point to resolve customer complaints.

**Supply Chain Integration**

The success of e-business critically depends on the successful implementation of electronic linkages with supply chain partners. Supplier oriented systems must be capable
of sharing information regarding quality (e.g., customer feedback, product failures and defects, process quality, and changes in orders and product design), resource planning (inventory, production schedules, capacity, and demand), and relationship management (e.g., online communities for suppliers/vendors, online FAQ, and supplier evaluation reports) (Lee, and Billington 1992). These applications should support automatic ordering from a firm's existing material requirement planning or ERP system, online invoicing, procurement order status tracking and electronic payments. While firms in our sample have made some progress in developing online customer relationships, there is an untapped potential to gain efficiencies with supplier relationships and the entire value chain. Approximately 70% to 89% of the firms do not have any form of online transactional and informational sharing capabilities with their suppliers. The study showed that a majority of firms do not procure a sizable portion of their MRO or production goods online. Over 73% of the firms procure less than 20% of their MRO or production goods online.

Electronic business requires businesses to substitute inventory with information and to develop mutually beneficial relationships with suppliers to reduce approval steps, paperwork, and exception handling for all purchasing decisions (Lee, Padmanabhan, and Whang 1997). However, such strategies require a reengineering of the entire span of procurement activities to build efficiencies. Successful e-businesses have reduced the number of suppliers for each item; have improved value proposition, product characteristics, and conflict of interest (e.g., agency-related issues). This study suggests that a majority of the firms have not integrated their processes with suppliers and thus have not been able to reduce their procurement costs. For instance, only 13% of the firms in our sample share demand and product roadmap information with suppliers, and 18% have information exchange policies with suppliers. A majority of the firms still lack processes to aid in monitoring quality at the supply source.

Internal Integration of Applications and Processes

Internal processes integration in the form of intranet systems is a critical element of an organization's e-business initiatives. The impacts of the intranet on internal communication, project management and internal process improvements have been impressive, including a 50 percent reduction in time spent on obtaining access to project information from other business units. The intranet has been described as being an important step toward the envisioned boundary-less organization. Our study shows that a majority of firms (79%) have a good intranet system in place and have very effective communication within the organization.

User Interface Integration

User process integration is the process of replacing the terminal screens of legacy systems and the graphical interfaces of PCs with one standardized interface, typically browser-based. Generally, the functionality of terminal screens applications can be mapped on a one-to-one basis with a browser-based graphical user interface. The firms
in our study did well on this aspect and a majority (67%) of the firms has established a standard interface.

**Business Process (Internal/External Systems) Integration**

A high level of systems integration across different channels of operation enables an organization to transmit, combine and process data from customers and suppliers. Its external and internal systems are able to monitor order status at various stages in the shipment) and automatically reflect order changes in downstream processes or systems (e.g., inventory and manufacturing systems) (Libert, Samek, and Boulton 2000). Further, integration makes it easy to share data among various internal systems (e.g., forecasting, production, shipment, accounting, etc.) and to retrieve information from various databases for decision support (e.g., cost information, reporting tools). However, integration across internal and external systems is a significant challenge for most organizations. A research study found that 76% of retailers cannot track their customers across multiple channels. Our analysis found that larger organizations score lower on the level of systems integration than smaller ones. Smaller firms do not face the same integration challenges owing to the relative simplicity of their IT applications. Larger firms can benefit more from combining systems to interact with customers and business partners across all channels.

**Summary and Conclusions**

Integration and collaboration efforts in shared databases, open tracking systems and inter-enterprise transparency means enormous benefits in streamlined business processes and cost saving. Difficulties lie in integration, instilling trust among trading partners and cultural changes. Optimising business opportunities by developing an effective streamlined and integrated supply chain sounds straightforward, however creating an extended supply chain to enable collaborative commerce requires integration with partners, wholesalers and suppliers which is a challenging task. Our study suggests that a majority of the firms are lagging in integrating their processes across the value chain and thus have not been able to reduce their costs or improve efficiencies.

One of the most challenging issues facing businesses worldwide is the integration of technology as a strategic resource for making effective business decisions. As companies expand their business universe to become part of the digital economy, they need to share information and work collaboratively with an increasingly larger community of companies including customers, suppliers, partners, and others. Adoption of e-business necessitates a fundamental transformation of traditional organizations and processes. The true benefits of e-business can only be realized if all processes and activities of firms are integrated at various levels. The study shows that e-business integration is still far from its potential and there are untapped opportunities for all firms, especially in the areas of online procurement, supplier relationships, customer service and customization of products and content. The framework provided in this study details various levels of integration that must be assessed to capture full benefits. A complete framework for assessment, combining previous illustrations of each of the three levels, is shown below.
References


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Table 2: Type of EC Adoption

<table>
<thead>
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<th>Type of EC Adoption</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
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<td>.756</td>
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<tr>
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Figure 2: Integration Results