2004

Data limitations can be overcome to move toward effective business system integration

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Data Limitations Can Be Overcome To Move Toward Effective Business System Integration

By

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Thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Information Technology

Rochester Institute of Technology

B. Thomas Golisano College
Of
Computing and Information Sciences

December 15, 2004

Rochester Institute of Technology

B. Thomas Golisano College
Of
Computing and Information Sciences

Master of Science in Information Technology

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Abstract

Investigation indicates that data quality and consistency issues will continue to be overwhelming impediments to the complete integration of all information systems in the current Information Technology (IT) environment. However, there is evidence that businesses can still move toward an effective "Digital Business Design" (DBD) by focusing on a relatively small number of critical success factors. The possible approaches to integration available in the current IT environment were reviewed to gain insight into candidate design bases available. The DBD implementations of sample firms were examined to explore what aspects of integration they considered in their implementations and whether or not they achieved significant levels of integration from a customer perspective. Based on these examinations, several key points that should be kept in focus when contemplating a DBD integration project were identified.

Introduction

According to the RIT IT website in 2003,

> "...The rapidly accelerating acceptance of both Inter- and intra-net solutions has addressed many cross-platform issues, but as the possibilities of this radically new computing world become apparent to more and more users, the demands on IT professionals to make the Web truly 'seamless' accelerate rapidly. To put it mildly, it's an *exciting* time to be in this field!" (IT "Info" Page, emphasis added)

The excitement of this challenge is strongly tempered by a welter of confusing claims and counter-claims made by proponents of competing approaches to achieving multi-platform flexibility when integrating a wide variety of new and legacy systems. The Total Cost of Ownership (TCO) for maintaining connections between disparate platforms and technologies is also generally recognized as being potentially very high, making a favorable Return-On-Investment (ROI) difficult to achieve. In the midst of confusing and conflicting considerations, IT and business managers must jointly make choices that make the most effective use of available resources.

Today, the RIT IT Web site notes that "[i]n a rapidly changing technological world, we need experts that make it ***simple*** for individuals, businesses and companies to get the job done without having to wonder *how* it is done." ("What is IT" Page, emphasis added) This truly non-simple goal must

increasingly be achieved in "multi-platform, distributed computing environments". (Ibid)

The analysis undertaken in this study is focused on understanding the role that a business' approach to integration plays in creating an effectively "seamless", apparently simple business environment that incorporates the Web. This includes identifying the spectrum of approaches available, assessing which of those approaches are practical and effective in light of data issues that affect integration efforts, and reporting key findings that should be considered as managers make choices to pursue a DBD.

The Role of Integration in *e*Process/Digital Business Design

"Integration" is a concept that is woven throughout the emerging e-business framework literature despite the fact that it is not clearly articulated as a goal *per se*. The 10th Edition *Merriam-Webster Collegiate Dictionary* defines "integrating" (among other mathematical and social aspects) as actions "to form, coordinate, or blend into a functioning or unified whole." (608) With the exception of Ranadivé's *The Power of Now*, the term "integration" is not listed in the contents or indexes in the e-commerce texts included as references. However, information technologies and the beneficial results of " designing, sourcing, coordinating the.. process portfolio in the best way" are clearly seen as central to the concept of *e*Process/Digital Business Design. (Keen & McDonald 86)

For example, Slywotzky and Morrison's review of DBD at General Electric (GE) is described by observing that they ".. began by applying *digital technology* to improve .. internal processes.." (205, emphasis added) A specific example cited was GE's:

> ".. Trading Partner Network (TPN) which extensively digitized the procurement process. It allows customers, including GE's own business divisions, to request price quotes for products and services on the Web; it then manages the bids from potential

> suppliers digitally, and yields drastic cuts in the time and energy required to make purchases." (Ibid)

This increased ability to access and distribute information quickly and accurately is supported at GE and other digital businesses through technologies that link systems – integration technologies. Integration tools are clearly needed to achieve the Digital Business goal of ".. *[m]anaging bits*[- the] manipulation of information: gathering, analyzing, modeling, sorting, sharing, and replicating data." (Ibid 29)

The concept of using integration technologies to support business processes is also alluded to but not specifically articulated in *The eProcess Edge*:

> Perhaps the first rule of *e*Process is that any company should look for opportunities to substitute software for workflows. .. eCommerce processes are very dynamic. Some of them can be automated. Indeed, more and more standard processes can be largely or even entirely automated as *technology* makes it practical to gather and apply the needed information to reach a decision. (81, emphasis added)

Without specifically using the term, the implication is that the technology that most effectively supports this objective is "integration".

Even Linithcum's *Enterprise Application Integration* fails to specifically identify integration as a subject in the text despite its title. The text does, however, extensively discuss Application Programming Interfaces (APIs), including an elusive one termed the "Enterprise API" – defined as ".. a single, well-defined API that is able to access every piece of information and every

process that exists within an enterprise." (55) The Enterprise API is noted as the ".. notion behind the Gartner Group's Zero Latency Enterprise .." (now dubbed by Gartner as the "Real Time Enterprise"). (Ibid) The ability to share all information everywhere is also reported by Linithcum as being more ".. of a religious state [than] a technical possibility". (Ibid) He also reports the practical concerns attendant on such a technological feat, saying that " .. such an API would be so complex as to be unusable". (Ibid) He also notes that it ".. would be a proprietary, two-year, enterprise-only API, meaning that it would have to be maintained and enhanced for it to function." (Ibid)

Only Ranadivé is somewhat optimistic about the practical potential for effective enterprise integration, not completely surprising since his firm is in the business of supplying integration technology. According to the Tibco corporate site, Ranadivé, now chairman and CEO, founded the company in 1985. (Tibco Corporate Information) Tibco had more than $260M in revenues in 2003 and a varied customer base in industry sectors such as financial services, communications/media, energy/utilities, and transportation/logistics. (Tibco Annual Report) Ranadivé's vision of the role of integration is clearly and specifically articulated:

> "The event-driven approach to integration ... uses middleware to provide a common publish/subscribe exchange mechanism for information and to 'normalize' the

> various types of content.. . The components of the architecture transform and translate information from one form to another to allow content sharing across application technologies. The infrastructure creates a continuously active flow between business processes." (91)

Although implicitly in most cases, integration is generally endorsed as the lynchpin for accomplishing the benefits of effective e-commerce. Keen & Macdonald, in the summary portion of *The eProcess Edge* comes close to saying as much, acknowledging that "[a]n *e*Process company competes on its ability to blend technology and business to create new forms of commerce and relationships." (238). They later elaborate, saying that "eCommerce demands a business-oriented and *technology-integrated applications suite* between the Web components and legacy systems, as well as an IT platform specifically designed to provide lines across today's value network and enable its continuing extension." (Ibid, emphasis added) In light of this lack of clear and specific consensus on the definition or desirability of "integration" in the IT/business world, the first task to be undertaken in understanding the challenges is analyzing the potential spectrum of integration approaches.

Integration Approaches - The "Integration Spectrum"

The concept of "integration" in the real IT world is dizzyingly broad and crushingly vague. A search for Internet items related to "integration" using the *Google*™ search engine resulted in over 11,000,000 English language entries, including many non-IT articles and organizations. (Google 1) Limiting the search to "application integration" still produced more than 1,000,000 results. (Google 2) Similar numbers of results can be produced by searching for the related subjects of "business process management" (597,000), "real time enterprise" (101,000) and "knowledge management" (3,110,000) (Google 3, Google 4, Google 5) Combining these subjects into a single search significantly decreases the number of results but the number of directly relevant items found is still quite large. For example, a search for the specific combination of "application integration" and "business process management" produces over 57,000 results. (Google 6) Other terms that are (or have been) used to allude to the idea that information should flow freely within a business are "Zero Latency Enterprises", "Straight Through Processing", "Real-Time Enterprises", and "Enterprise Nervous System". (Thompson) This overwhelming array of conceptual terms is compounded by an ambiguous and somewhat contradictory collection of names given to tools allegedly capable of producing the desired result of instantaneous, synchronized, and organized information that is able to

provide the knowledge needed to anticipate and respond to customer needs. Examples include Oracle's 8i server, IBM's suite of web-related products collectively referred to as "Websphere", and Microsoft's competing set of products collectively referred to as ".Net" components.

The lack of accurately defined terms for any of the potential approaches to effective integration to support DBD makes it very difficult to discuss the subject in a rigorous manner. A review of the MS's .Net offerings by ComputerWorlds' Jon Udell stated the problem somewhat wryly in a February 2004 article:

> Determining exactly what .Net ***is*** may be the hardest part of measuring its success. The confusion goes way back to June 2000, when Bill Gates framed the .Net initiative in consumerish terms as an Internet 'platform' to support all sorts of devices. As it turned out, .Net mainly manifested itself as a collection of technologies for developers, and that's how we have chosen to evaluate it. (Udell 1)

A similar state of confusion exists in relation to the oft-bandied-about term "Web Services". Barry establishes one relatively clear definition in the early part of his book to separate Web Services from a Service Oriented Architecture:

> The term *Web Services* can be confusing. It is, unfortunately, often used in many different ways. Compounding this confusion is the term *services*, which has a different meaning than the term *Web Services*. In [his] book, the term *Web Services* refers to the technologies [SOAP, UDDI, etc] that allow for making connections. *Services* are what you connect together using *Web Services*. A *service* is the endpoint of a connection. ... The combination of *services* – internal and external to an organization – make up a *service-oriented architecture*. (5)

In order to clarify the vast array of integration offerings being promoted by vendors and consultants as a basis for investigating successful real-world implementations, a structured assessment was performed to place historical, current, and "vaporware" theories related to integration within a context. A combination of IT industry publications, consulting firm reports, academic literature and vendor marketing materials was used to develop a graphic representation of the range of conceptually possible approaches that are (or could be) used to help businesses anticipate and respond to customer needs. The result of this effort is shown as an "*Integration Spectrum*" diagram in Figure 1.

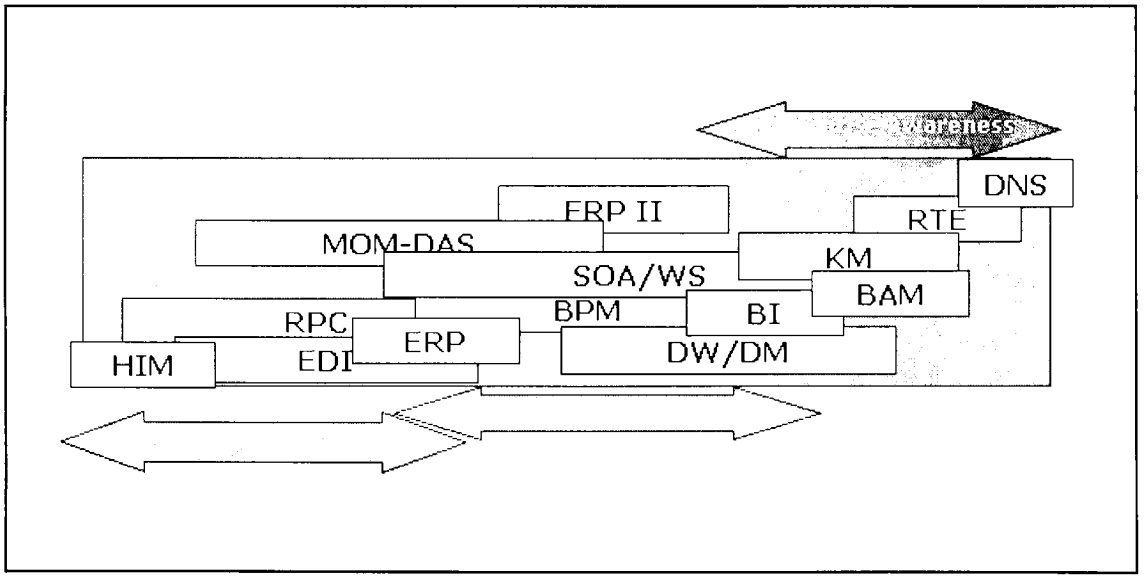

Figure 1 - The "Integration Spectrum"

In this Integration Spectrum graphic, individual integration approaches are represented by boxes containing the acronym typically used in IT literature and periodicals to identify them. At the "lowest" (left-most) end of the spectrum is

the "Hardcoded Inter-application Messaging" (HIM) technology that was initially used by programmers to permit exchange of specific pieces of data between isolated applications, often within a single computer. At the "highest" (right-most) end of the spectrum is the "holy grail" of a "Digital Nervous System" that permits all knowledge within an enterprise to be gathered, processed, and distributed as needed to develop the insights required to immediately and correctly anticipate and respond to customer needs and desires without conscious interaction with technology. Between those two extremes lie a number of approaches that have been promoted for integrating information and enabling firms to increase their capability to anticipate and respond to customer inputs and interests.

This spectrum can be divided into three major sub-categories. The first is "Functional Efficiency". The second is "Process Effectiveness". The third is "Enterprise Awareness".

Approaches to increase Functional Efficiency lie at the low end of the spectrum. The focus of these approaches is to reduce the effort required to accurately perform a specific task or function within a business. The integration approaches in this category typically involve production of a consolidated (often printed) report from multiple sources of data or limited hand-offs of specific

operational data from one organization (typically a "department") to another involved in a task that spans the two organizations.

Approaches involved in increasing Process Effectiveness lie in the middle of the spectrum. The focus of these approaches is to create a data communication "mesh" that fosters multi-use and re-use of data to more easily and accurately perform a variety of related tasks (sometimes specifically identified as "processes") or *ad hoc* activities within a business. The integration approaches in this category often involve use of a single database to serve multiple applications in a hub-and-spoke topology or separation of business logic (rules) and data to permit immediate data translation and use among varying computer applications.

The area of Enterprise Awareness level of integration lies at the highest end of the Integration Spectrum. At this level of integration, the role of application and information is reversed: information is no longer used by applications; information is used to create mechanisms (applications or other tools) that respond to customers. Information, knowledge, and insight (sometimes referred to as "wisdom") become independent entities that drive action. The tools involved in this level of integration are relatively exotic. They can be thought of as information "distillation" systems, very high-speed autonomic systems that are self modifying, or elaborate neural networks that "learn" through experience.

As is true of many natural phenomena, individual integration tools do not necessarily occupy a single slot in the Integration Spectrum. Depending on how it is deployed, any single technology could be viewed as occupying more than one integration category. For example, Message-Oriented Middleware (MOM) can be deployed in a way that is simply a standardized way of doing application-to-application communication similar to HIM, making it a Functional Efficiency focused tool. On the other hand, MOM can also be tightly integrated into an overall application architecture using a "data bus" available to existing or new applications, making it more of a Process Effectiveness approach. The same is also true of the Services Oriented Architecture (SOA) approach, perhaps to an even greater extent. This phenomenon is portrayed in the graphic by varying the width of the individual technology boxes.

The specific definitions of the technologies assessed and the attributes used to classify the approaches on the Integration Spectrum are presented in Appendix 1.

Current Integration Approach Activities

Although there is a great deal of discussion (and an even greater deal of advertising) in the IT press related to approaches at the Enterprise Awareness end of the Integration Spectrum, finding true examples of advanced tool deployment and highly-integrated system implementation is not easy. In addition to legitimate concerns about disclosing competitive advantages to others, there is also a masking effect that arises from the confused and inconsistent use of terms in reporting. For example, a very recent article was headlined "Calpine Generates Revenue With *Real-Time* Market Interface" [emphasis added] despite the fact that it talked about a very limited application of "a Cellular Digital Packet Data backbone .. that allows it to view customer [electric]load data and dynamically schedule .. [with] the agency that manages a major portion of the [Texas] electric power grid." (Hoffman) While the ROI on this modest implementation was quite substantial ("Calpine was able to reduce its implementation costs per interface [from $12,000 per customer site]to $2,500 and slash deployment time [from 60-90 days] to one or two days" (Ibid)), it looks more like a small MOM or BAM example instead of an RTE demonstration. In order to obtain some insight into integration approaches being pursued by IT practitioners, a parametric analysis was performed by exploring the current levels

of indicative activities or relevant publications associated with the various approaches.

Review of Current Integration Approach-Related Activities

The basic technique used to assess current activities was to search for Internet sites or documents in English that refer to the integration approaches by name and which have been updated within the last year (March 2003 to March 2004). The *Google*™ search engine was used to develop an initial set of results. The *CIO Magazine* web site was also used to do some follow-up analysis.

Three categories of web document searches were performed for each integration approach. The first category was documents relating to "Meetings, Symposia, or Conferences" related to each approach. This category was selected to represent commercial interest in the approach because such activities are relatively costly to conduct and can best be supported by revenues of sales related to an integration approach.

The second category was documents relating to "Whitepapers, Textbooks, or Books" related to each approach. This category was chosen to represent academic, research, and intellectual interest in the approach. It could be seen as a precursor to commercial development since the activities involved are largely documentation to communicate possible benefits to potential users.

The third category was documents relating to "Newsgroups, Bulletinboards or Usergroups" related to each approach. This category was selected to identify approaches with a broad base of participant activities. It could also be seen as a "postcursor" of commercial interest in an approach since it involves relatively low costs on the part of individuals who have adopted the approach as a result of commercial promotion.

The overall initial result of this assessment is shown in Figure 2. The assessment details are presented in Appendix 2. By an overwhelming margin, the "Services Oriented Architecture/Web Services" approach to integration shows the highest

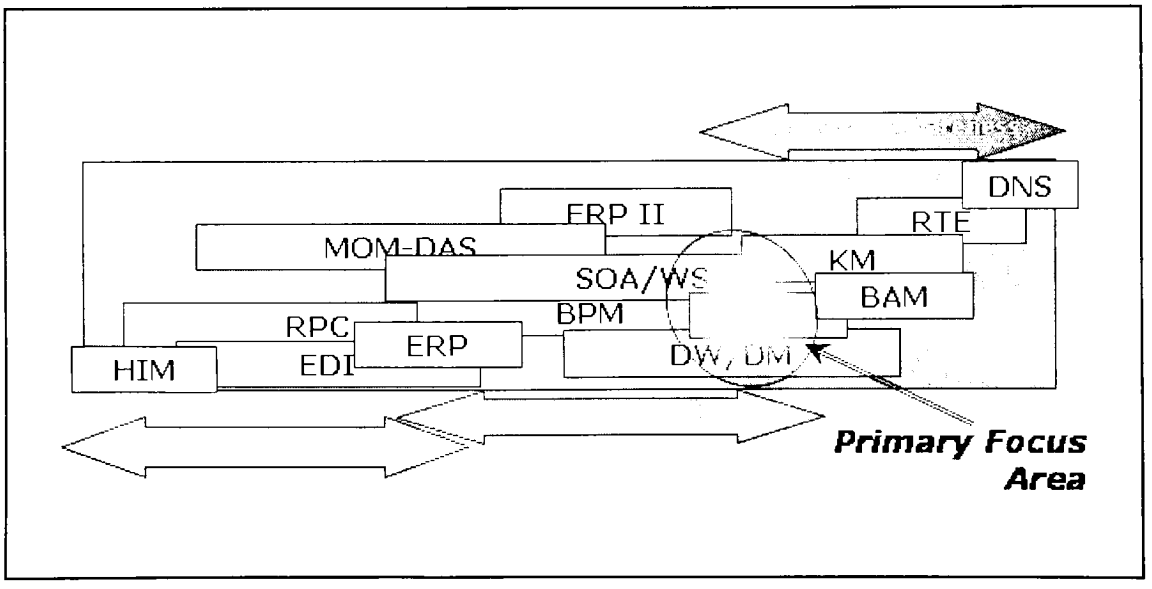

Figure 2 – Integration Spectrum & Primary Focus Area

level of activity and interest. All three search categories for SOA/WS produced more responses than any other by a margin of more than two-to-one. It is of

some interest to note that the highest response rate for the SOA/WS approach was in the "Whitepaper, Textbook, and Book" category, perhaps lending support to the view that such written materials precede commercial activities for an initial period.

The SOA/WS approach response frequency was followed in descending order by "Knowledge Management", "Business Intelligence", and "Data Warehousing/Data Mart" approaches. Only KM achieved a response rate of nearly 50% of SOA/WS. In light of these results, each of these dominant approaches is discussed further in the following sections. However, it is also interesting to note that there was a second "mode" of response in the search results data.

By excluding the approaches that produced the overwhelming levels of response, a secondary area of interest and activity can be seen. The results of this second analysis are shown in Figure 3. It appears that the more traditional and longer-established approaches of "Electronic Data Interchange", "Remote Procedure Call", "Enterprise Resource Planning", and "Business Process Management" form another area of ongoing interest and activity. While not as "chic" as the approaches at the Enterprise Awareness end of the spectrum, they appear to offer some benefits that are tangible if not huge. EDI in particular appears to be experiencing a resurgence as Internet connections supplant costly

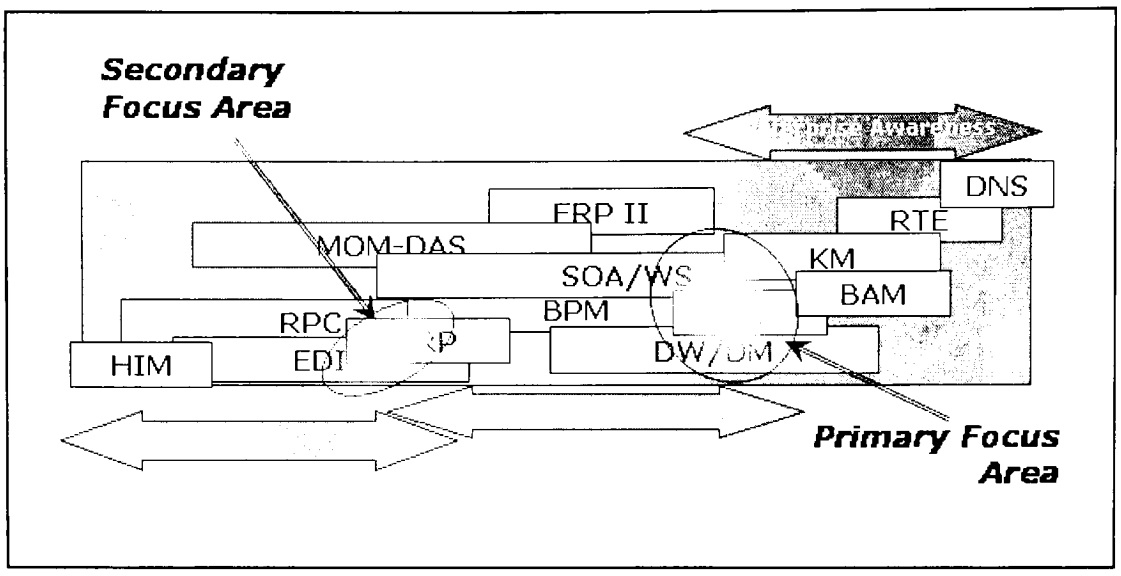

Figure 3 – Integration Spectrum w/ Secondary Activity Focus Area

Value-Added Networks as a mode of communication. In this vein, *Line56.com*'s Ericson notes that:

> ".. newer standards, tools and the Internet channel have made EDI cheap and available to the smallest trading partners of EDI users, even those with no back office systems to speak of. It's this last category of small users, and a recent emphasis on supply chain execution (SCE), where the technology has been resuscitated and grows to this day. (Ericson – EDI)

Services Oriented Architecture in the Integration Spectrum

SOA exhibits an interesting characteristic in the level of activity in the Integration Spectrum. If only the term SOA is used to conduct a *Google*™ search, there is virtually no response (4,000 total in all three categories). If the term Web Services is used, the results skyrocket (6,000,000+ total). This result occurs despite the arguable point that the real reason Web Services are of interest

is to support SOA. It appears that the extremely intense interest in Web Services is not coupled with a clear understanding of what they are or how they are to be incorporated into an integration strategy. The Gartner "hype-cycle" concept looks applicable to this situation – wild speculation is occurring in the initial phase of WS adoption but it will be some time before it enters the "Trough of Despair" let alone the "Plateau of Productivity".

Knowledge Management & Business Intelligence in the Integration Spectrum

Knowledge Management, the second most active area in the Integration Spectrum, also suffers from a lack of clear understanding. *CIO Magazine* Web site's "KM Research Center" makes a very important observation that can be related to the entire Enterprise Awareness end of the Integration Spectrum: "Unfortunately, there's no universal definition of KM, just as there's no agreement as to what constitutes knowledge in the first place." (Santosus) They go on to observe that:

> Succinctly put, KM is the process through which organizations generate value from their intellectual and knowledge-based assets. Most often, generating value from such assets involves *sharing* them among employees, departments and even with other companies in an effort to devise best practices. It's important to note that the definition says nothing about technology; while KM is often facilitated by IT, technology by itself is not KM. (Ibid, emphasis added)

The same observations can be made of the very closely related approach of Business Intelligence, the third most active area in the Integration Spectrum. BI is somewhat more limited in scope, focusing on a subset of "knowledge" more clearly targeted on achieving specific business results. However, the same challenges appear to have stalled BI initiative also. According to a 2002 research report produced by Gartner, some technologies had changed (web-based versus client/server), the "[o]verall penetration of BI capabilities remains [as] low" as it was in a 1997 study. (Dresner 2)

Data Marts & Warehouses in the Integration Spectrum

Although it is not generally recognized or discussed as an integration approach, Data Warehousing does exhibit characteristics that make it an important bellwether in the drive toward the higher levels of Enterprise Awareness. According to *searchDatabase.com*, a data warehouse is "a central repository for all or significant parts of the data that an enterprise's various business systems collect." (DW Definition) The data in the warehouse is "gathered" from online transaction processing applications and other sources. It is then "selectively extracted" and "organized ... for use by analytical applications and user queries." (Ibid) This process of extraction and organization clearly involves a form of data integration from diverse sources.

A related concept – the "data mart" – also provides evidence that the Data Warehousing technology is playing a key transition role in achieving the Enterprise Awareness end of the Integration Spectrum. Data Marts are defined by *searchDatabase.com* as "... a repository of data gathered from operational data and other sources that is designed to serve a particular community of knowledge workers." (DM Definition) While a Data Mart's contents are typically derived from a larger, more comprehensive Data Warehouse within the same enterprise, ".. [t]he emphasis of a data mart is on meeting the specific demands of a particular group of knowledge users in terms of analysis, content, presentation, and ease-of-use. Users of a data mart can expect to have data presented in terms that are familiar." (Ibid) The link between the Data Warehouse and the Data Mart represents a manifestation of the significant translation in the Integration Spectrum from the state when data serves applications to the situation where data/information drives the creation of applications. This translation is most clearly identified in the discussion of the relationship of Data Marts and Data Warehouses from *searchDatabase.com*:

> In practice, the terms "*data mart*" and "*data warehouse*" each tend to imply the presence of the other in some form. However, most writers using the term seem to agree that the design of a *data mart tends to start from an analysis of user* [application] *needs* and that a *data warehouse tends to start from an analysis of what data already exists and how it can be collected in such a way that the data can later be used.* (Ibid, Emphasis & expansion added)

The differing starting points for DW and DM place it clearly at the boundary between Process Effectiveness and Enterprise Awareness in the Integration Spectrum. The perception of a somewhat schizophrenic nature in the development of DW and DM also illustrates an apparent "barrier" that few organizations seem to be able to cross in their pursuit of Enterprise Awareness. The leap to making expenditures of scarce resources to "analy[ze] .. what data already exists and how it can be collected in such a way that the data can later be used" without a clear benefit that can be identified by users is a large one.

One new approach to making the leap is the use of a form of Internet infrastructure known as "Enterprise Search Engines" (ESEs) . ESEs have the same core elements as Internet search engines: they "spider" enterprise content (locating documents by following hypertext links), index the resulting material, and present it in response to user queries. After the initial spidering and indexing, search engines use various techniques to determine a document's relevance. (Robb) However, the basic issues of data quality and relevance remain even when using only hyperlinked documents:

> "The main problem we were running into was the relevance of search results," says Brad Hochhalter, director of the Permanente Knowledge Connection, the clinical library site of Kaiser Permanente Health Plan Inc. in Oakland, Calif. "With medical knowledge, there is a lot of ambiguity for what terms mean and a lot of synonyms, so it is difficult to quickly bring up relevant material for the clinicians." (Ibid)

Despite such Web-related advancements in technology, DW and DM projects are still seldom successful to any reportable extent. A 2003 Gartner "Letter From the Editor" regarding BI and DW issues noted that:

> We continue to see mixed results from BI and data warehouse projects. Some projects have delivered on the promise of benefits, while others have failed due to underfunding, understaffing, or a tactical approach not aligned with strategic business objectives. Lack of planning and poor design also contribute to these inflexible, 'stovepipe' projects that quickly become legacy baggage in the face of an ever-changing business environment. It is not a pretty picture. (Strange)

Evidence of Data Quality and Availability Limitations

Issues associated with data quality are inherent in any of the integration approaches examined here and they have been a significant feature of the IT world for decades. Indeed, a *Google*™ search for documents related to "data quality" produced an order of magnitude higher level of results than any individual integration approach with almost 13,000,000 English items identified. (Google 7)

The first item identified in the *Google*™ search is the *www.dataquality.com* website. (Ibid) That site is related to the *Data Quality Journal*, an academic publication focused on Data Quality issues that was published from 1995 to 2002. (DQ Website) The staff at *www.dataquality.com* provided a "clipping" service to report on data quality issues as reported "the media". (DQ News) In a poignant example of the problems associated with data quality, the service was discontinued in 2001, with the note that:

> We found that, in terms of data and information quality, the American media are unreliable. We worried about the quality of information we were abstracting from media reports. We have at least a thousand abstracts related to data and information quality in our files that we haven't put on-line. We don't have the resources to investigate more than one media report each week. We don't know what deals publishers, editors, and reporters have made with the people and organizations they are writing about. It would cost us too much to try to find out. (Ibid)

In a much more serious vein, according to Searchdatabase's Cushman, "[t]he Data Warehousing Institute, (TDWI), in a recent report, estimates that data

quality problems currently cost U.S. businesses a whopping $600 billion each year." (Cushman) The report ".. traced that price tag to things such as unnecessary mailings, postage, printing, and staff overhead. Lost customers, unsatisfactory client relationships and problems that multiply whenever corrupted files duplicate are all results of poor DQ." (Ibid)

Another recent development was reported by both the Data Quality website and the *Google*™ through links to Office of Management and Budget's recently promulgated guidelines to implement section 515 of the *Treasury and General Government Appropriations Act for Fiscal Year 2001* (Public Law 106-554; H.R. 5658). Section 515 directs the OMB "to issue government-wide guidelines that 'provide policy and procedural guidance to Federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information (including statistical information) disseminated by Federal agencies.'" (DQ Law)

> It is crucial that information Federal agencies disseminate meets these guidelines. In this respect, the fact that the Internet enables agencies to communicate information quickly and easily to a wide audience not only offers great benefits to society, but also increases the potential harm that can result from the dissemination of information that does not meet basic information quality guidelines. (Ibid)

In the opinion of the "Center for Regulatory Effectiveness",

> the Data Quality Act applies to [the Internet Corporation for Assigned Names and Numbers] ICANN since the organization performs its functions under specific agreements with the Department of Commerce's National Telecommunications and

> Information Administration (NTIA). NTIA's Data Quality guidelines define 'sponsored' dissemination of information as 'situations where the Agency has directed a third party to distribute or release information, or where the Agency has the authority to review and approve the information before release.' (REG Week)

It has become clearer that negative impacts of poor data quality are not limited to common, day-to-day commercial activities.

Vendor Offerings

Another significant indicator of the struggle with data quality and consistency issues are the many and varied offerings of vendors that attempt to deal with the problems. SeeBeyond's product suite, as reported on their Web site, is typical of a wide variety of vendors. One critical component of their integration services is a product called *eView™ Studio 5.0* which is designed to provide "Data Quality Management for Single Views of Information" (SeeBeyond Product Information) SeeBeyond's Web site product description provides a high-level overview:

> In today's business world, vital information is distributed throughout the enterprise in disparate systems such as CRM, ERP, Billing, eCommerce and Customer Support systems. These systems typically use their own unique record identifiers, making it difficult to create a single, reliable view of this information across the enterprise. eView Studio uniquely identifies common records across disparate systems using data cleansing and matching technology to automatically build a cross-index of the many different local identifiers used to represent the same entity.

> eView Studio is an enterprise module that provides application wizards that allow business analysts to rapidly design and generate these "single view" applications, a very unique offering among enterprise integration vendors. (Ibid)

Microsoft's BI Resource Guide takes the interesting position that all data issues can be resolved easily by existing staff. According to Microsoft, their "Business Intelligence platform, based on SQL Server 2000 and Office XP, provides organizations of all sizes and employees at every level with the ability to transform data into knowledge and knowledge into success." (MS BI Guide) However, the painful details of this process are only briefly hinted at in a six-page whitepaper discussing the process. (Kennedy) Among other very detailed and complex technical considerations, the introduction to the whitepaper notes that " .. simplifying the execution of many complex tasks, [with] wizards and other tools make[s] using Analysis Services easier.." but " .. the user is isolated from direct access to the more complex features of Analysis Services". (Ibid) Among the resulting limitations is the problem that ".. individual aggregations cannot be directly modified using the administrative tools supplied..". (Ibid)

Other vendors take a more realistic position regarding the challenges of DW/BI/KM data management and creation but they are still highly optimistic in light of previous experiences. A software tool called i/Lytics from innovativesystems.Inc promises to do "Customer Data Integration in Weeks, Not

Years" in their promotional whitepaper. (Healy) The whitepaper provides a good overall description of the data creation process but the alternative proposed is also extremely sophisticated and dependent on very skilled statistical sampling and inference techniques that could very well take more than "weeks" to perform. (Ibid)

Perhaps the most complete and informative overview of the data development process is provided by DQS Software Inc. on their Web site. (DQS Homepage) The overall process is illustrated in Figure 4. The DQS software products are intended to support the three major components of Customer Data Integration (CDI) – [Application] Code Analysis, Data Profiling, and

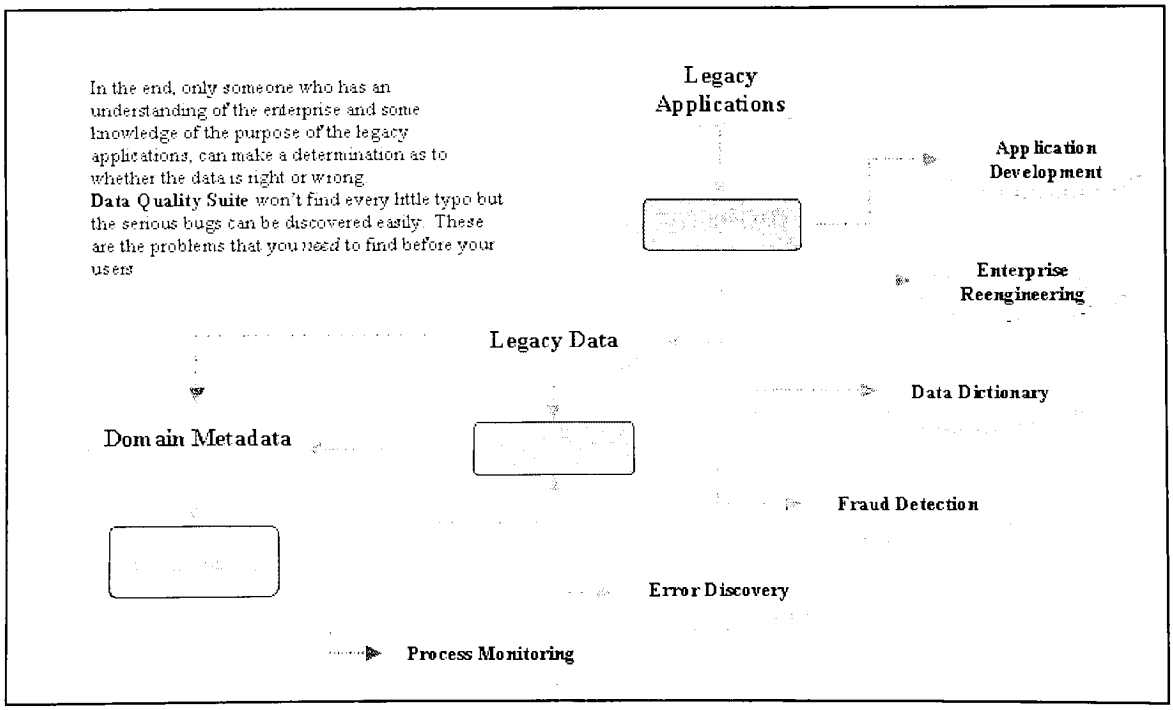

Figure 4 – The DQS Customer Data Integration Process

Change Analysis. The DQS site also provides a summary of competitors in the CDI area. The summary is shown in Figure 5

This is how we stack up against the competition. Competing products are expensive, difficult to use, and above all, they don't really solve the problem.

Class of Tool	What they do	Vendors include...
Data Integrity	Despite the generic-sounding name these tools only handle addresses.	SSI, First Logic, Group 1
Data Cleansing	These tools represent an attempt to extend the address cleansing methodologies to other types of data - with limited success.	Vality, Trillium
Data Validation	Verify each item of information by comparing it to a manually entered domain profile. This requires a manually intensive process that is itself error-prone.	Unitech Systems
ETL	Some data quality issues are addressed by these tools but the treatment is limited.	Informatica, Ascential
Analytical Tools	Statistical packages can support data quality needs but you have to program your own solution.	SAS Institute
Data Integration	These tools can generate a profile from the data but require manual intervention. They are designed primarily for data integration.	Evoke (Axio), Avellino
Data Quality Suite	Generates a data profile from the data itself. Presents the user with a structured analysis showing where the most significant errors are likely to be found.	DQS Software

Figure 5– DQS' Summary of CDI Tools & Suppliers

Perhaps the most succinct statements of the CDI "problem" also come from the DQS site. The first is a quote from Jeff Zeanah of Z Solutions LLC (a provider of neural networks used to solve a variety of problems including data mining/knowledge discovery), who notes that:

> The first impediment, obviously, is data quality. We can't get around that. It's obviously the blue-collar part of the job. It's not fun. No one likes to talk about data quality – not the billing personnel who enter the data, such as sales staff; not the IT professionals; not the users. It's just drudgery. (DQS Presentation)

The other telling observation is made by DQS in relation to the "Error Discovery" part of the CDI process: "In the end, *only someone who has an understanding of the enterprise* and some knowledge of the purpose of the legacy applications, can make a determination as to whether the data is right or wrong." (DQS Homepage, emphasis added) Finding a single human being (or even a manageable group of people) who have "an understanding of the enterprise" in its entirety is a very tall order in the real world.

Impacts on ENTERPRISE AWARENESS Projects

The integration approaches on the Enterprise Awareness end of the Integration Spectrum (DW/DM, BI, KM and others) all exhibit the "chicken and egg" problem of deciding to start an effort based on information that is needed by existing users and applications or to start with data analysis to identify needed applications. The cumulative effect of data quality and organizational challenges, when combined with the dual/schizophrenic nature of Enterprise Awareness efforts, has historically had the impact of introducing the equivalent of an "infinite do-loop" into the process: movement continues with no progress. The challenge to business and IT managers in today's climate is to achieve "effective" integration of their systems without becoming mired in the long-running debates about "information", "knowledge", or "wisdom".

Business Integration Case Studies

A practical alternative to massive and complete integration of business processes in the pursuit of DBD is identification of relatively "small" alterations in customer/business interactions that can result in "large" changes in customer behaviors and market advantages. This kind of apparently "non-linear" response has been examined by Gladwell in "*The Tipping Point – How Little Things Can Make a Big Difference*". A "Tipping Point" is characterized as a situation where ".. big changes follow from small events, and .. sometimes these changes can happen very quickly." (11) Example of this kind of critical shifting point can be found in the spread of fax machines and cell phones:

> Sharp introduced the first low-priced fax machine in 1984, and sold about 80,000 of those machines in the United States. For the next three years, businesses slowly and steadily bought more and more faxes, until, in 1987, enough people had faxes that it made sense for everyone to get a fax. Nineteen eighty-seven was the fax machine Tipping Point. A million machines were sold that year, and by 1989 two million machines had gone into operation. Cellular phones have followed the same trajectory. Through the 1990's, they got smaller and cheaper, and service got better until 1998, when the technology hit a Tipping Point and suddenly everyone had a cell phone. (12)

Finding ways to emulate the improvements in cell phone technology from a customer perspective and achieve order-of-magnitude increases in market share or profits can be an attractive alternative to the gargantuan task of total business integration.

The businesses chosen for examination are those whose web presence and customer interactions indicate that they have achieved at least a degree of success in their efforts to find small ways to move toward an integrated DBD (with significant changes in customer behavior patterns) or substantially failed in some critical way in their efforts. These businesses have existing, legacy systems and business components that have been integrated into a more digital model despite data limitations. To the extent possible, structured interviews of participants in these efforts were conducted to solicit information on key decision criteria used to select their integration implementations and validate the assessments done in this research.

The Flower Club

The Flower Club was created as a front-end aggregator for florist-delivered flowers and plants in 1993. They claim to have the most extensive network of quality florists in the business, providing prompt delivery virtually anywhere in the U.S. and in many areas throughout the world. Arrangements and plants are delivered by local florists with a total satisfaction guarantee. (FC History) The Flower Club has also created "strategic marketing alliances and partnerships with Fortune 500 companies including major airlines, oil companies, nationally recognized department stores and banking institutions." According to the Flower

Club website, strong loyalty relationships with customers and business partners have been created through those partnerships. (Ibid)

The Flower Club was chosen for examination because their Internet site demonstrates a singular lack of integration from a customer perspective. The starting point for this examination is shown in Figure 6. Despite the fact that purchases had been made from their organization through one of their vaunted

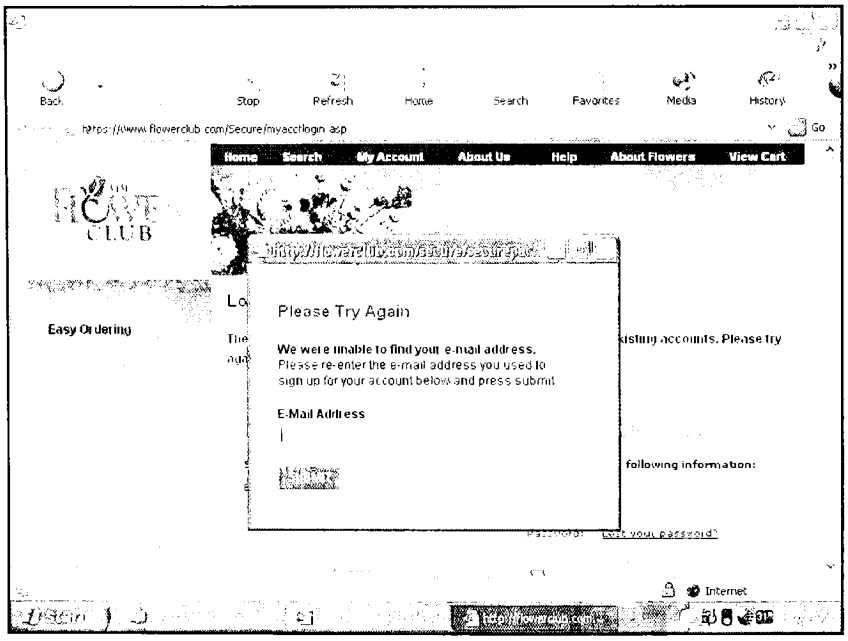

Figure 6 – The FlowerClub Fails to Recognize Their Customer

partnerships (with USAir), they were unable to recognize that customer when they used a different channel to access their account. The specifics of this situation are presented in Appendix 3.

The FlowerClub failed to respond to e-mails shown in Appendix 4 requesting a discussion of the source or causes of the authentication failure and

possible corrections. This lack of response is curiously consistent with their apparent lack of sensitivity to customer service.

Tops Friendly Markets

According to their Web site, Tops is "[n]ow among the leading grocery retailers in the United States" but they ".. can trace [their] roots to a simple family store in Niagara Falls, NY in the 1920s." (Tops History) In a historical review of their firm, the Web site explains that:

> What started as a small association of franchised stores grew into a regional leader, and would eventually become part of one of the world's leading retailers, while remaining an integral part of the fabric of the community in which it all began. Today, with 159 Tops Friendly Markets, 205 convenience stores under the Wilson Farms, Sugarcreek and Tops Xpress banners, and 9 B-Kwik Food Markets, altogether employing more than 22,000 associates in New York, Pennsylvania and Ohio, Tops is proud to maintain the same close-knit customer association and family feeling that characterized that small Niagara Falls store so many years ago. (Ibid)

Tops was chosen for examination because they demonstrate an unusual ability to instantly connect and update customer information and purchases to interact directly with customers. The best example of this unusual ability is illustrated in Figures 7 and 8. Figure 7 shows a sample sales receipt from a Tops market. In addition to the normal information presented in such a document, several additional items have been added. The first, a year-to-date tabulation of discounts received on the basis of a customer-affiliation (frequent buyer)

program. The second is a listing of the people who were participants in the customer interaction by name, ranging from the store manager to the checkout clerk. The third and most interesting piece of information is an up-to-the-minute report on the customer's progress in participating in a short-term promotion being conducted by the Tops organization. By spending a pre-determined number

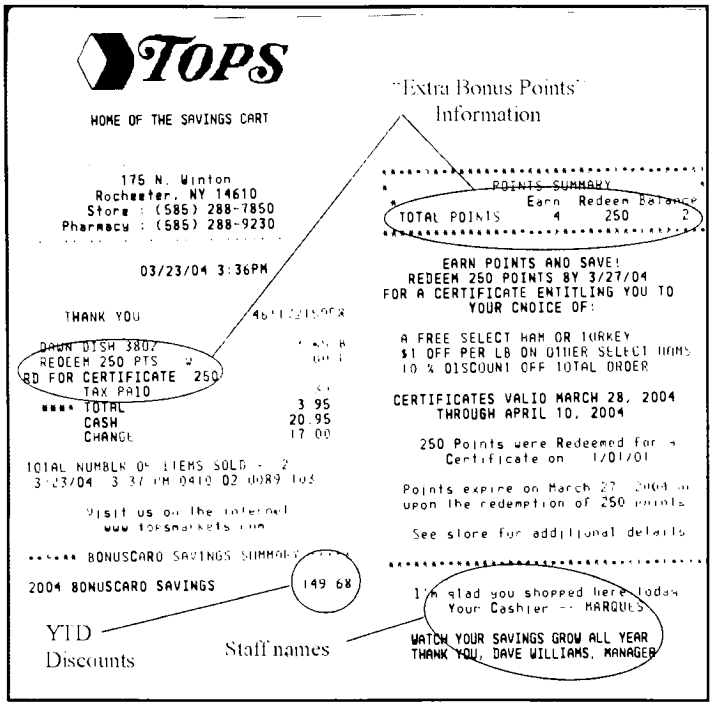

Figure 7 – Special Information on a Tops Receipt

of dollars in any Tops store, a customer receives a certificate for free or discounted merchandise. The certificate (shown in Figure 8) is *automatically produced and delivered to the customer in real-time* – the customer's eligibility to receive the certificate is determined at each purchasing event and a certificate is printed and presented to the customer on the spot as soon as they qualify.

Figure 8 – A Special Promotion Certificate Delivered in Real Time

This level of interaction with a customer requires integration several ways. First, the running tally of discounts must be delivered from the Tops information system but this is not a process unique to Tops. The second level of integration occurs between the POS logon by each check-out staff person, the current HR records for each store, and the printing system to increase the customers' sense of personal interaction with the Tops staff. The final level of integration occurs between real-time POS and accounting systems for qualifying purchases and the store/POS printing systems to provide authentication, validation, and proper issuance of a negotiable paper instrument.

The promotional certificate campaign is a variation of an Internet-based program conducted by Tops in conjunction with "ValuPage" – "a collection of manufacturer-sponsored offers good on leading brands, distributed throughout the World Wide Web." (WebBucks) The program "provides a convenient and easy coupon solution for busy families and is honored in over 15,000 supermarkets nationwide. ValuPage is owned and operated by Catalina

Marketing Corporation (POS on the NYSE)." (Ibid) The design of the system – known as "Catalina Coupons" in the Tops organization – is based on a Web "shopping list". The first part of the process is illustrated in Figure 9. A customer identifies a store participating in the program and prepares a "shopping list" selected from a collection of products shown on the ValuPage site (shown in Figure 10).

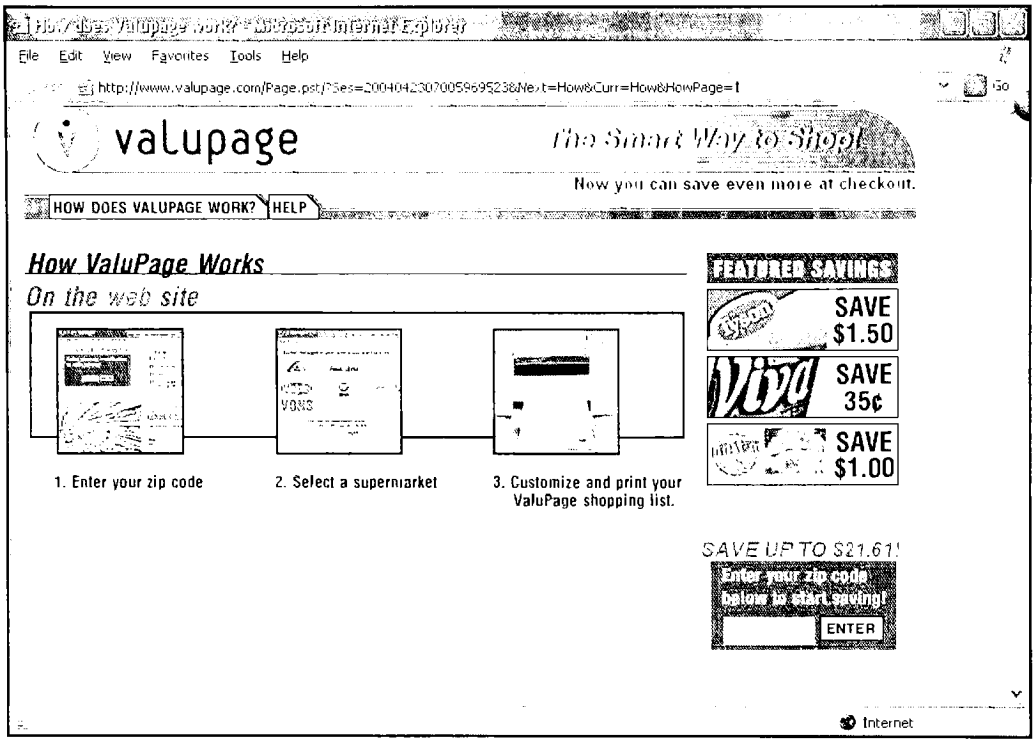

Figure 9 – "Catalina Coupon" Customer Process – Part 1

After the customer selections are made, the shopping list is printed by the customer as shown in Figure 11. The second phase of the process is illustrated in Figure 12. The customer presents the shopping list to the store checkout cashier and the customer's purchases are scanned to ensure that the required number and

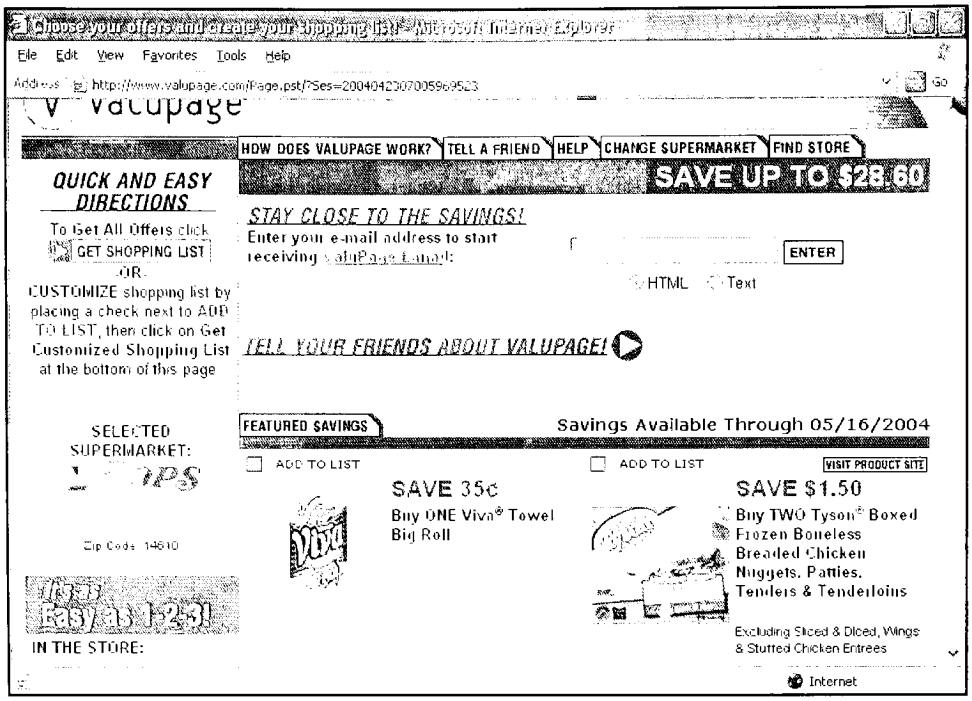

Figure 10 – Building a Customer/Store Specific Shopping List

types of products were included in the order. Based on the number and types of products actually purchased, the Catalina system immediately prints a coupon for discounts that can be used on *any* (legal) purchase *the next time the customer visits the same store.*

Tops' implementation of the Catalina system has supplemented the Web-developed shopping list by adding a link to their customer loyalty-card application. By monitoring the level of customer purchase activity reported by the loyalty-card and establishing a pre-determined minimum, a Catalina Coupon can be produced and presented to a customer.

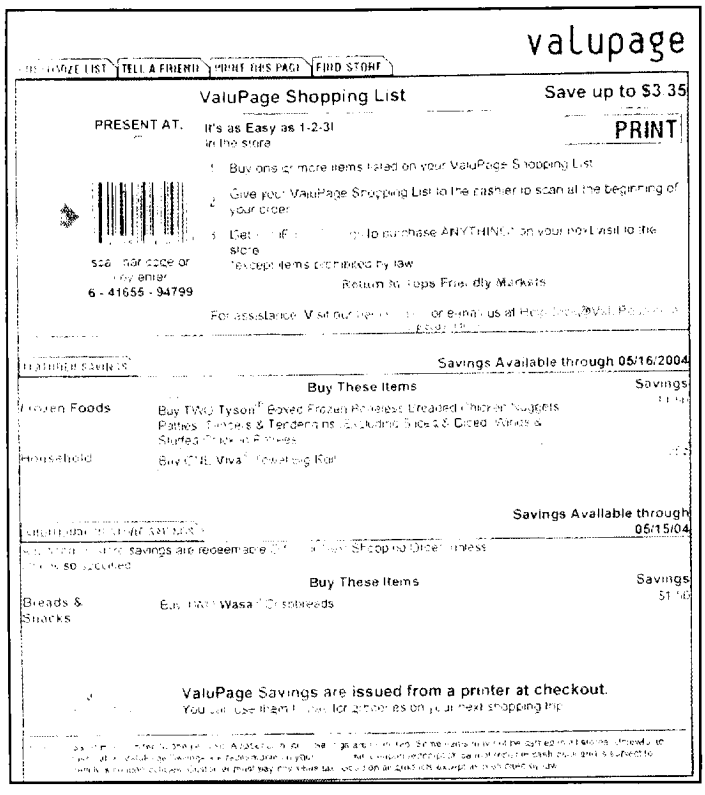

Figure 11 – Printed Customer/Store Specific Shopping List

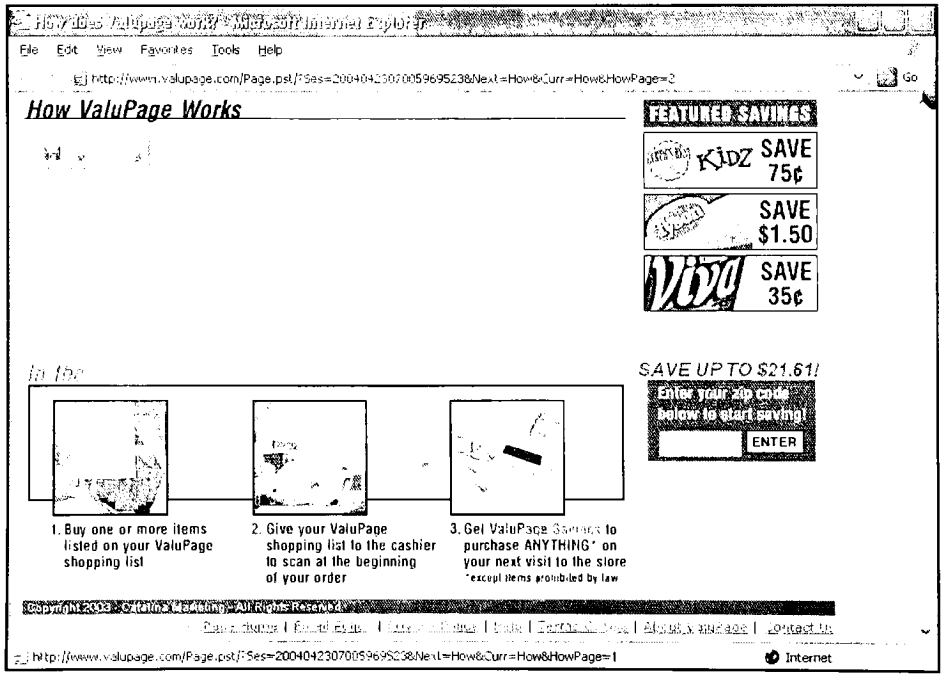

Figure 12 – In Store Catalina Coupon Process

Figure 13 illustrates another level of integration evident in Tops' business design. At each purchasing event, the items purchased are matched against marketing promotional opportunities to again produce paper discount certificates for items related to those purchased by the customer. Purchase of a low-carbohydrate product produces a coupon for a related product. In addition, the receipt printing system in each store provides discount coupons for neighboring business, even those who could be considered to be in competition with Tops' prepared foods offerings. This "neighborhood" integration gives customers a higher level of assurance that Tops is concerned about their welfare regardless of competitive issues.

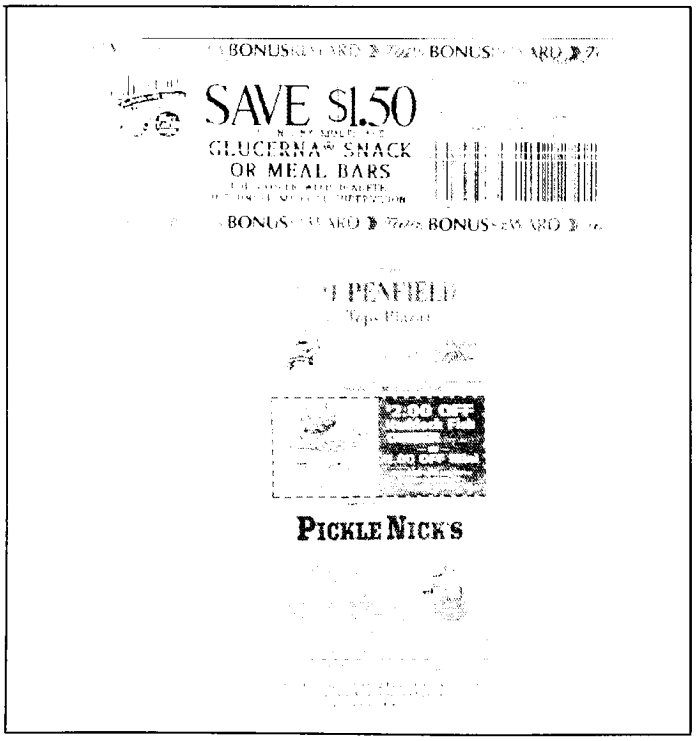

Figure 13 – Cross-Promotion and Neighborhood Integration

Mr.David Smyers, Tops' Manager of Customer Relations Marketing was interviewed regarding their experience with the Catalina Coupon program. The notes from that interview are included in Appendix 4. In essence, the Tops approach to integration is leveraging component software in a manner that can be characterized as an RPC/ERP within the Integration Spectrum. Applications such as POS and Loyalty Card databases are networked among Tops stores. (Tops Homepage) However, Tops management has taken a very pragmatic approach to their Internet involvement and they have found that the print promotion/coupon delivery program is easy and effective for the vast majority of their customers.

West Marine

West Marine has more than 260 stores in the United States and two in Canada. In early 2003, West Marine acquired the retail and catalog divisions of long-time competitor BoatUS. As a result of that acquisition, West Marine now also operates 62 BoatUS Marine Centers. They carry more than 50,000 products, ranging from rope to the latest in marine electronics. In addition to its retail stores and Port Supply wholesale divisions, the company serves boaters in more than 150 countries through their mail order and Internet divisions. (WM History)

West Marine was chosen for examination because their combined brick-and-mortar stores, mail-order business, and Internet site demonstrate a material level of integration from a customer perspective. Customer transaction data and account information is available and consistent in any of the three potential customer contact channels. Figure 14 shows the Website page that reports the current "West Advantage Points" balance for a registered customer. The balances are updated daily after purchases are made at a local store in a batch process that occurs overnight.

West Marine also has begun to integrate inventory functions between the Web site and local stores. As shown in Figure 15, the inventory for a potential purchase at the closest store is reported. This screen is created in several steps, including locating the three closest stores for a pickup site selection with a Zip Code search. As noted in the Inventory screen, the system is not truly real-time and customers are advised to contact the selected store directly if a purchase is really time-critical.

Mr. David Schenker, West Marine's CIO, was interviewed regarding their experience with integration in general and their experience with channel consolidation specifically. The interview was conducted on June 2, 2003.

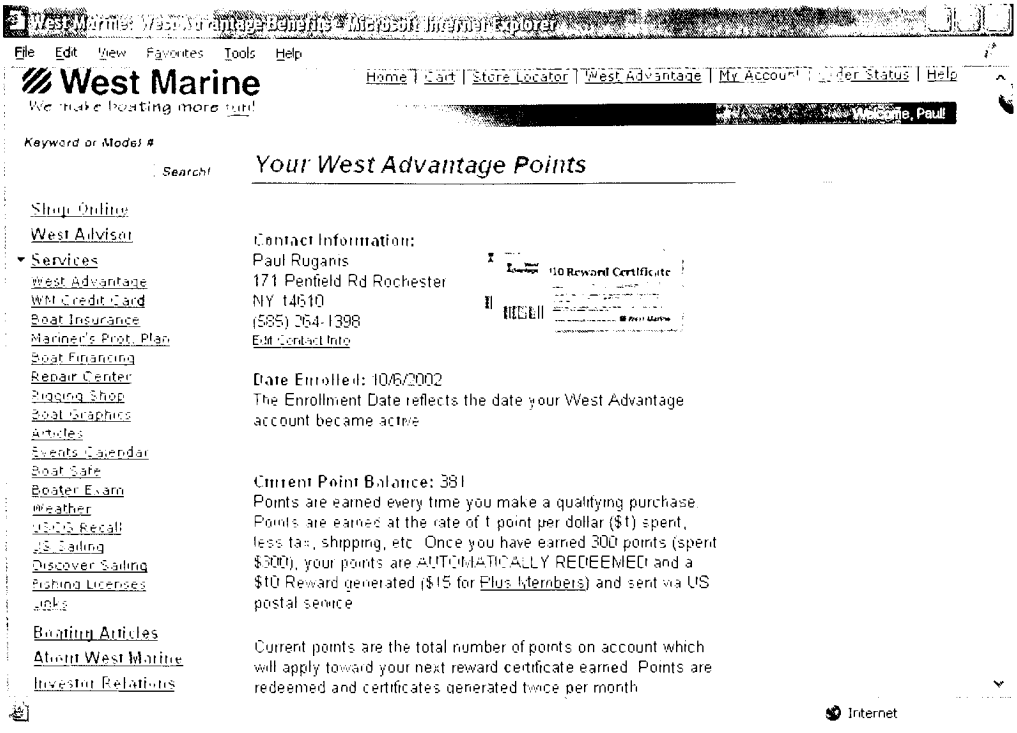

Figure 14 – Up-to-the-Purchase Data from Stores or Web Available

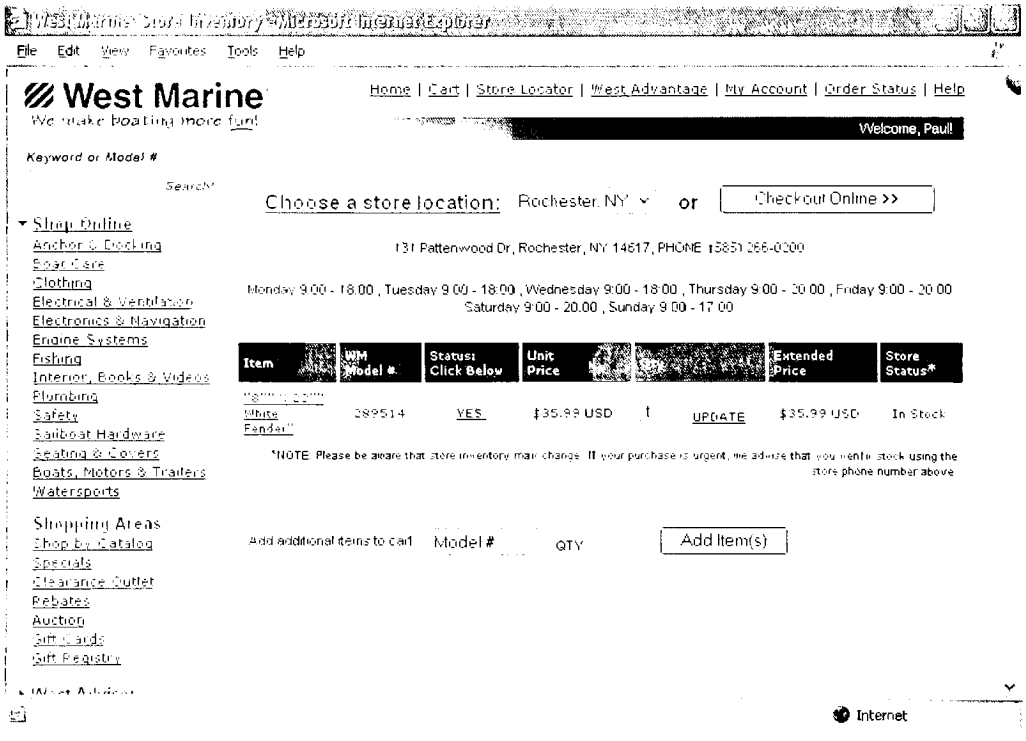

Figure 15 – West Marine's Store Inventory Choice Screen

West Marine's approach to integration and e-commerce can be characterized as conservative and ROI focused. West Marine sees e-commerce as "represent[ing] a growing channel as catalog sales decline." They are still very willing to use HIM, RPC, or EDI style integration approaches to control initial investments. West Marine seeks to achieve early returns on "pay-as-you-go" small investments. This approach is consistent with identifying relatively small projects implemented with the support of outside service providers. They do acknowledge continuing data quality concerns and have used "slug-it-out", labor-intensive means to cope with data consolidation. Although Mr. Schenker indicated that West Marine has pursued Knowledge Management as an integration approach, his use of the term referred to a "knowledge–base" application within the Help Desk environment. West Marine's experience with MOM and DW/DM integration approaches have been limited and "expensive" according to Mr. Schenker. The notes from that interview are included in Appendix 4.

It is of some interest to note that Mr. Schenker is not solely responsible for e-commerce activities at West Marine. According to ChannelAdvisors web site in 2003, Anthony Gasparich held the title of "VP of Internet Services". His overall area of responsibility is not clear but he did work with Channel Advisor to

dispose of excess inventory on *eBay*. (CA/WM PDF) Other staff and management at West Marine were also identified as being "involved" with e-commerce in the process of obtaining an interview included another Vice President and an Internet Production Manager. Mr. Schenker did indicate that West Marine "has established an 'Efficiency Taskforce' to review process efficiency and effectiveness" and that "an Internet orientation is being fostered in all aspects of WM's organization and processes".

Circuit City

Circuit City operates more than 600 "Superstores" and 15 mall-based "Express stores" throughout the United States from its headquarters in Richmond, Virginia. (CC History) According to their web site, "[t]he technologies and solutions we provide can make your life easier and more enjoyable. And it's our goal to ensure just that. So, whether you're browsing through one of our stores or surfing our website, we're with you." (About CC)

Circuit City was chosen for examination because they are unique in their ability to instantly connect and update customer requests and purchases to locally available brick-and-mortar stores' information systems. As Circuit City's television 2003 advertising campaign said: "Now you can enjoy the convenience

of shopping on-line without having to wait for the product to arrive or pay shipping charges!"

Figure 16 shows the "Welcome Page" for the Circuit City site. In addition to identifying the returning customer by name, the number of current "Express Pickup Locations" previously selected by the customer is reported. Those Express Pickup Locations were designated by the customer in a process explained in the screen shown in Figure 17.

Figure 16 – Welcome Page w/ Pickup Locations Noted

After product selections are made and placed into the customer's Shopping Cart, the screen shown in Figure 18 is presented. The single screen provides

consolidated information about the inventory available for delivery for a Web site purchase OR pickup at all of the three previously designated Express Pickup

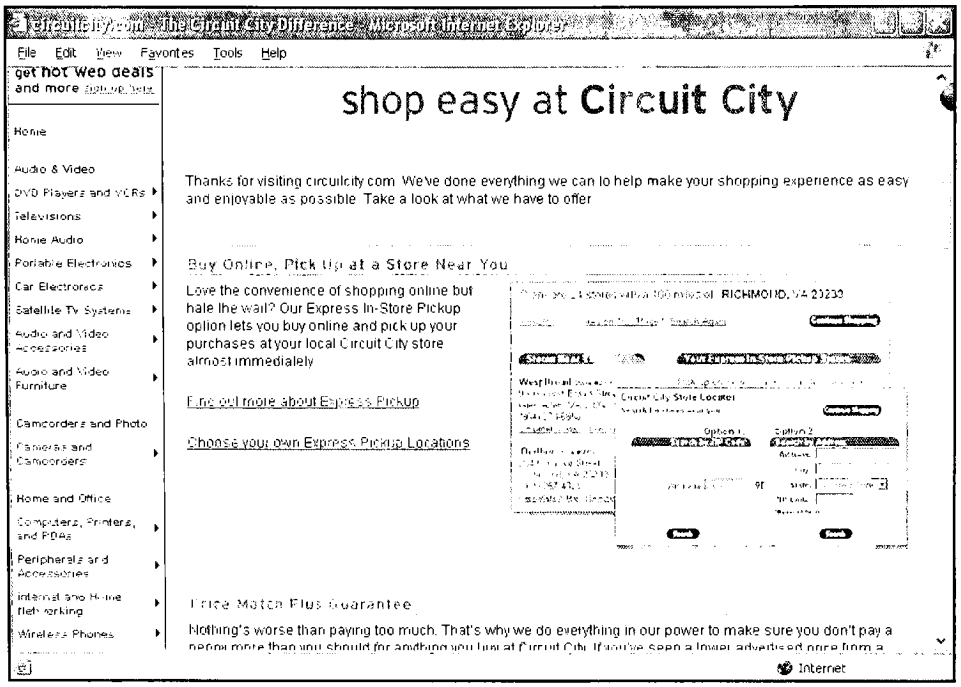

Figure 17 – Pickup Locations Choice Page

Locations. The information is provided in a user-friendly format that is easily understood on a graphic basis.

All of this produces very favorable customer ratings for Circuit City as shown in Figure 19. Circuit City's overall positive rating of 90% Positive substantially exceeds competitor BestBuy's score of 78%. (BizRate 1 & 2) Circuit City's "Would Shop Here Again" rating is 8.8 (of a possible 10) in contrast to BestBuy's score of 8.0. (BizRate 1 & 2)

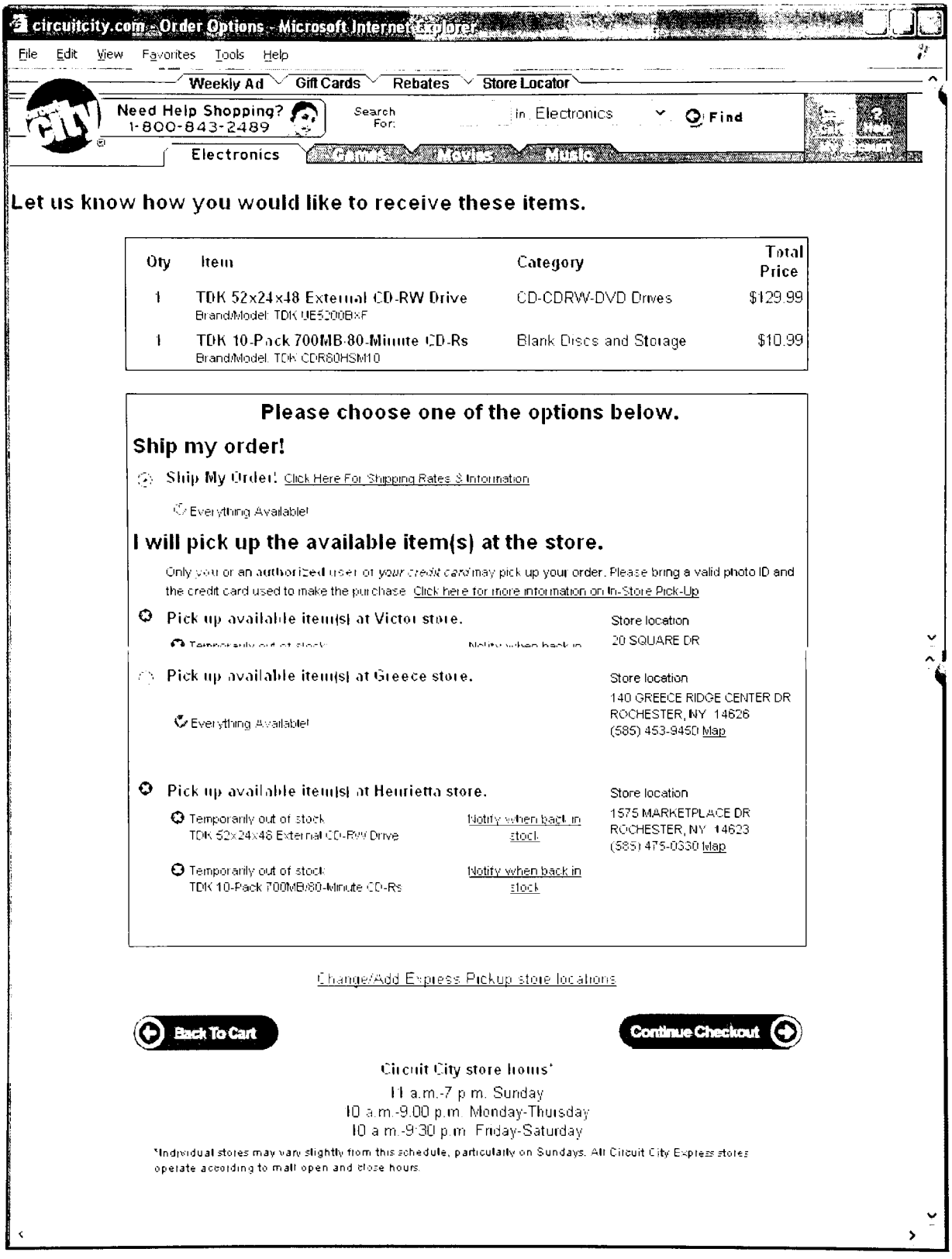

Figure 18 – Delivery Choice w/Inventory @ Pickup Locations Noted

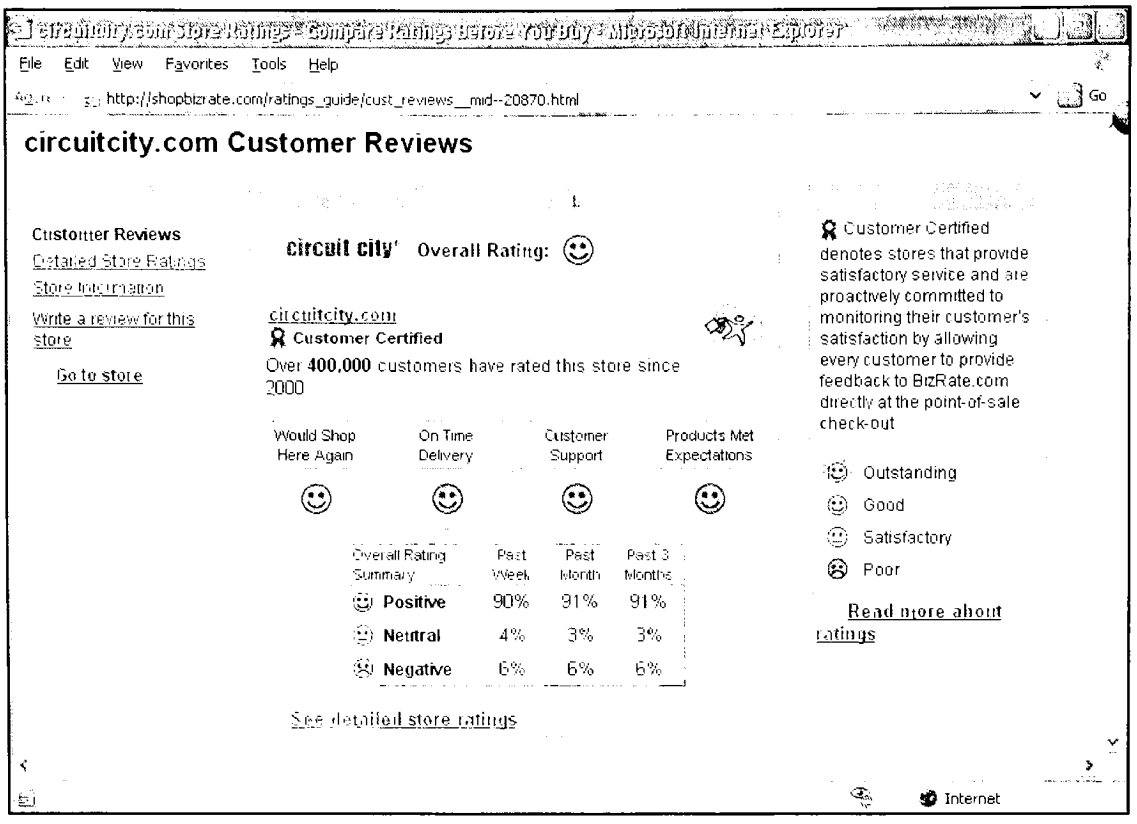

Figure 19 – Circuit City's BizRate Survey Results

Mr. Scott McCorry, a CSA Lead at a local Circuit City store indicated that the source of their tightly integrated Website and brick-and-mortar stores is a leveraged interconnection of systems installed in a sequenced approach with outside vendors. (See Appendix 4) This development has been reported in the press for some time. Early in 2003, RealMarket.com reported that:

> Circuit City will expand its Astea Alliance configuration to manage maintenance of Point-of-Sale systems and other in-store equipment at more than 600 Circuit City stores. [In] September [of 2002], the company selected Astea Alliance to manage scheduling for in-home installations of products such as home theater systems. '[The] Astea Alliance will provide Circuit City with a single solution for two previously discrete business processes--customer-facing installation services and internal store

equipment support,' said Joe Cipolla, vice president management information systems for Circuit City. (RealMarket)

Mr. Cipolla also noted that "Expanding our existing Astea Alliance solution saves implementation time and costs on the store services system compared with implementing a separate software." (Ibid)

As reported in Computer Weekly's "IT Management" newsletter, another building block used by Circuit City is "Microsoft's Smarter Retailing Initiative, a framework for developing standards-based tools to ease the retail experience for consumers, salespeople and store managers." (CW IT Management) The Microsoft initiative "is backed by 20 partners, including Accenture, which has developed several complementary tools, such as a system allowing shoppers to scan and pay for items as they are selected instead of queuing at the checkout. .. The system is used in more than 300,000 point-of-sale terminals worldwide .. including Circuit City Stores" (Ibid)

Key Findings

Integration is a much discussed subject in the IT and business management worlds but there appears to be little in the way of consistent understanding or reporting about the subject. There are so many competing views, definitions, and incentives that achieving any level of consensus is a challenge. However, based on the performance of the selected case study firms, discussions with people in the case study businesses, and review of the many sources of information available, four key findings emerge.

Key Finding One – Firms Should be Organized to Meet Integration's Multi-Dimensional Business Challenges

The most common thread that runs through all of the various integration discussions and efforts is the complexity and multi-dimensionality that emerges when integration efforts encounter human psychology and business politics. Rather than being a technology challenge, there is consistent evidence that integration must be recognized as a business process that must coexist with and lever other processes. This has lead some observers to argue that organizational structures and strategies must be fashioned to endorse and support effective integration.

Marco Iansiti, the David Sarnoff Professor of Business Administration at Harvard Business School has been investigating "integration" for more than ten

years according a to a recent CIO Magazine article. (CIO Q&A) In his 1998 book *Technology Integration*, he focused on the product development aspects of combining emerging and stable technologies within various organizations. What he ultimately concluded was that:

> [t]he mastery of technology integration is important because it creates the capability to manage technological change. It enables an organization to navigate between technological trajectories, fighting inertia and adapting to and influencing an uncertain market context. ... [R]eacting to uncertainties in technology and market streams has become the quintessential skill for life in the increasingly chaotic world of the science-based enterprise. (215)

Iansiti's latest book, *Keystone: Operating and Technology Strategies in Business Ecosystems* continues his exploration of integration. It was tentatively scheduled to be published in January, 2004 but it has been delayed until August, 2004. (Amazon) The first chapter of his new book is tentatively titled "Why Wal-Mart and Microsoft Are Similar", based the fact that, while many companies outsourced their integration initiatives, both Microsoft and Wal-Mart created in-house teams that focused on integration, not on one product or one process. "That structure allows Microsoft and Wal-Mart to be masters of their own fate and", Iansiti argues, "gives them a distinct advantage over their competitors." (Ibid)

Barry is more direct and clear in his statement of this situation. Noting that "Web services are rapidly removing many of the technical restraining forces

related to adopting a service-oriented architecture". (118) However, in developing a "force diagram" that illustrates incentives and impediments to SOA adoption, he notes that ".. [a]s technical issues diminish, the remaining restraining forces are business issues, design issues, and change issues" (95) Barry devotes an entire chapter of his book to dealing with change issues in particular. (Ch.8)

Attempts to interface with the four case study organizations showed that the organizational structures to support integration as a process are not in place or even actively contemplated. Without exception, inquiries regarding the integration designs or business drivers resulted in a "ping-pong" match among departments within the enterprises. It appears that the successes that are evident were not the result of conscious design.

Key Finding Two – Authentication is the New Data Cleansing Frontier

Historically, "data cleansing" has focused on reducing redundancy and inconsistency within business' data bases to reduce costs and, to a lesser extent, avoid multiple contacts with the same customer. In today's more interactive world, the lack of consistency can create a situation in which a potential customer cannot contact a business – a situation likely to result in mistrust and frustration for that potential customer.

In light of current security and privacy concerns, it is very important to ensure that customers' data and history is protected against unauthorized use with rigor. However, the systems and techniques used to authenticate users must not become a barrier to access. The FlowerClub case study clearly illustrates the undesirable result if insufficient attention is paid to this basic concern. West Marine and Circuit City illustrate the alternative – a welcoming, personal entry into the site with more rigorous authentication occurring in relation to actual financial transactions and opportunity to correct erroneous identification. Amazon.com takes this approach further with extensive personalizations that occur in the Welcome screen. In contrast, Circuit City's competitor BestBuy.com and Amazon's competitor Barnes & Noble do not evidence any recognition of a customer as they sign on. This is a major lost opportunity according to a 2003 report by The Yankee Group entitled "Enterprise Content Personalization Boosts Employee Productivity and Customer Service". (Yankee Group) That report stresses the "benefits of providing customers and employees with a personalized view of relevant content and applications [and] details personalization technologies and traits ...explor[ing] how personalization is rapidly becoming a core component of many categories of enterprise software including knowledge management, Web content management, and enterprise portals. (Ibid) According to the Yankee Group report:

> Personalization enables businesses to understand how customers, partners, and employees individually create, manage, and present content. Businesses that analyze the user's role within the organization and specific behaviors are able to predict user activity and respond by delivering personalized content more effectively. (Ibid)

One interesting approach to this issue is demonstrated by Fleet Bank's Web site – they use a customer's existing ATM card PIN as an authentication element. This avoids the need for an additional password and simplifies a customer's access to their site. This area of *e*Process activity should be a more productive focus than massive data consolidation efforts.

Key Finding Three – Firms Should Focus on Content Control vs.Data Integration

Data integration is, and will continue to be, a major and costly undertaking for the foreseeable future. One aspect of the need for organizational support in integrated systems is in the area sometimes referred to as "Content Management". Integrated systems typically involve an IT component that is often mistaken as driving integrated business systems. A classic example of this is illustrated in an anecdote from CW's collection of "Dumb User" stories from IT staff:

> Office manager gets peeved when the weather forecast on the company's intranet is wrong. 'She complained to me that the CIO needed to make sure the weather was reported correctly', says the local IT support [staff]. 'When I said we get the forecast from Weather.com' – it does say this on the Web site -- she responded that it was still

> the CIO's fault since it was on our Web site. But I didn't bother forwarding the complaint -- knowing the CIO would take it poorly.' (Sharktank)

Many organizations, including those examined for this analysis, do not have clear organizational structures to address the responsibility of business managers to control and authorize the content that is put into integrated systems. Too often, integrated systems are seen as the IT organization's "problem". Ensuring content security and making conscious choices about what is to be displayed and communicated to customers *is* challenging but it is more practical than ensuring that there is only one data set that contains no errors. As Barry notes, well intended attempts to "over-Standardize" data ".. will either cause a lack of needed application development or will effectively cause a rebellion resulting in 'stovepipe' ... which is effectively *no* integration". (Barry, p.83 emphasis added)

Key Finding Four – Firms Should Focus on Relatively Simple Technology to Provide Easy & Timely Information Delivery

If information is packaged in easily acquired, logical bundles and delivered to users of integrated systems in an easy to understand format, the usability and attraction of those systems increases. Circuit City's unified, graphic display of inventory in multiple locations is a very good example of success in this dimension. Other retailers force customers to sort through multiple screens, doing input and sorting work that is better done by IT systems. Combining ease-

of-use with information that users can depend on to be up-to-date is a powerful demonstration of integrated, competent business management. This demonstration clearly creates a sense of trust in an enterprise's ability to take care of customers.

The ease-of-use aspect of Internet sites is the single largest component of the Customer Respect Group's Customer Respect Index (CRI). According to the Customer Respect Group's website, the CRI was created in 2002 and updated in 2004 "to measure those attributes that, combined, reflect a customer's online experience." (CRG) Since 2002 they "have researched more than 1000 websites of the world's largest companies and conducted multiple interviews and surveys with a broad representative segment of the adult online population." (Ibid)

As reported on the CRG Website, the CRI "is an aggregation of 6 sub-indices, which together combine to provide a measure of the online experience. They are: Simplicity, Privacy, Attitude, Transparency, Responsiveness and Principles and together they measure 90 attributes of the online experience." (Ibid) The overall components of the CRI are shown in Figure 20.

The "Simplicity" component is described as addressing basic ease-of-use issues:

> How easy is it to find information on your website? Is the site easy to navigate? Was it developed with the user's needs in mind at all times or was there a message that you wanted to get across? A huge total of 54% of users cited a lack of simplicity as the

main reason that they abandoned websites, with over 70% admitting that they would go to a competitor if a website was difficult to use. (Ibid)

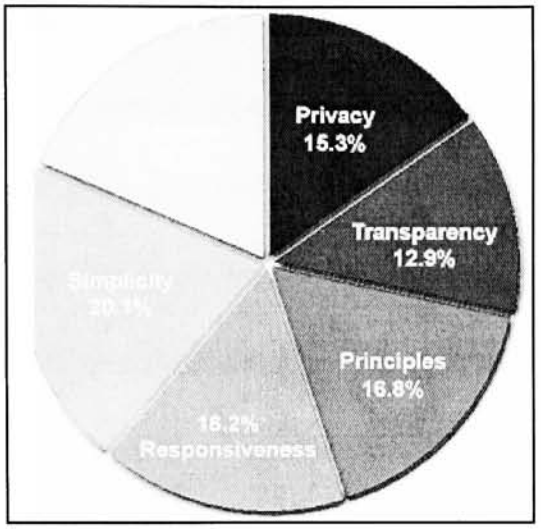

Figure 20 – Customer Respect Index Components

Clearly, sites like Circuit City's are paying good attention to this component of their customers' experience. This clearly can be accomplished without becoming mired in the long-running debates about "information", "knowledge", or "wisdom" inherent in Integration Approaches at the Enterprise Awareness end of the Integration Spectrum

Summary & Conclusions

In an IT industry that thrives on acronym-fueled paroxysms of "Fear, Uncertainty and Doubt", Integration stands out as a subject area that has achieved unparalleled levels of confusion and ambiguity. Integration can range from very modest attempts to link two computer programs to exchange data all the way to exotic, self-aware automata that can independently direct the operations of a global enterprise without human intervention.

Much of the apparent interest and activity in the integration arena is focused on the exotic end of the Integration Spectrum. Knowledge Management and Business Intelligence seem to be particularly active. This is true despite a track-record of frustration and lack of demonstrable success. IT and business practitioners seem to be lulled by vendors' promises to solve all business problems if only an IT system is big enough and tied to everything everywhere. This phenomenon also appears to be driven by vendors' pursuit of high value software sales with wide margins combined with business managers' very human desire to have all problems solved for them by "the system". This phenomenon is characterized in Figure 21 as the home of "Buzz" and intense marketing activities.

A typical example of this is provided by IDC, a "premier global market intelligence and advisory firm in the information technology and telecommunications industries .. [with o]ver 700 IDC analysts in 50

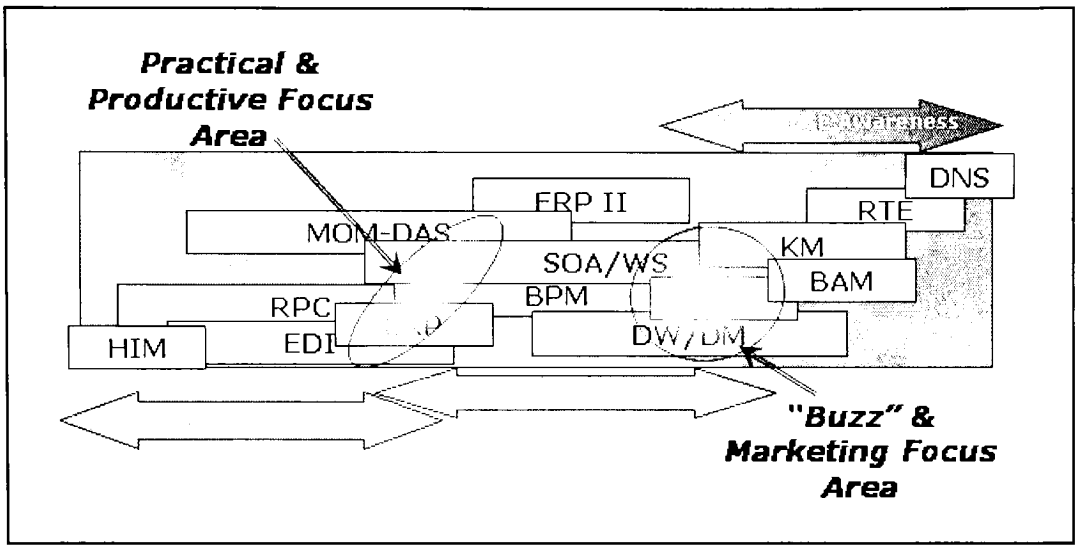

Figure 21 – Current Results Focus Areas

countries". (About IDC) According to IDC, the worldwide interactive data visualization (IDV) tools market is expected to reach just over $6.7 billion in revenues by 2007, compared to $5.1 billion achieved in 2002. The largest annual growth of 7.5% will occur at the end of the forecast period, when IDC believes this market will gain momentum. (IDC DV)

> 'Because visualizing information is critical to so many industries and applications, the opportunity for tools vendors to make all kinds of data and content easier to visually understand and work with is significant', said Joshua Duhl, research director for IDC's Content Management and Retrieval Software service. 'Companies are eager to find and purchase tools and solutions that will ease the pain of tedious manual efforts, duplication of systems, and pressures for them to meet quality and accuracy

> requirements caused by the vast amount of complex, diverse information they have to process and manage on a daily basis.' (Ibid)

Despite the "eagerness" of firms looking for such "deus ex machina" solutions, IDC also admits that "[v]endors do, however, face four key challenges in the interactive data visualization tools market – the need for interoperability, the need for products that fill specific industry or company requirements, the need for more user-friendly tools and application interfaces, and the need for tools to analyze data more effectively." (Ibid) It is extremely interesting that $5.1 billion was spent in 2002 without having met these challenges.

There appears to be little realism evident in vendors even in the face of previous experience. For example, Hyperion's CEO Jeffery Rodak acknowledges "... frustration over ERP installations, which around Y2k companies spent so much on and will admit they wasted so much money on there. When they put these ERP systems in, they had no insight into their business." (Johnson) However, instead of proposing that businesses rectify the basic problems, he advances the interestingly political theory that his firm's product ..."Essbase or a[nother] large {financial} consolidation system—are often IT's way into the business. So IT is part of the evaluation, part of the solution and ends up partnering with the CFOs." (Ibid)

On a daily basis, vendors promote products that offer hope to beleaguered IT and business managers. Typical of this phenomenon is IBM's May 5, 2004 announcement of "another piece of its integration strategy in place for SMBs (small and midsize businesses), unveiling a new WebSphere-based server that helps users better integrate both business processes and people." (Scannell) There are far fewer announcements of products that will help identify and improve the processes to be integrated with people.

In contrast to the lack of progress at the exotic end of the Integration Spectrum, firms that are selectively using more modest approaches, such as West Marine and Tops Markets, are addressing the fundamental issues of process identification and management with BPM and RPC. Firms like Circuit City are achieving leveraged, targeted integration approaches by building on ERP-like modules, ICE, and the Internet. In this vein, the issue of ROI has been making some recent press. The 2004 SAP Sapphire users' conference, for example, "is hoping to woo its installed base next week by demonstrating to users how the latest enhancements to its software can help them cut operational IT costs and plow that money back into business innovations that can help a company grow. .. [and] touting its integration, infrastructure and middleware technology." (Songini) Even in the area of general Data Quality, ROI must be a continuing concern. According to Excellence in Data, Inc's DQ consultant Chuck Kelley,

"most companies do have moderately unclean data. Still, total data cleansing is something that sounds better on paper than in practice, he says. Most companies could get by with 70-80% clean data, and must carefully measure their ROI before installing a DQ system." (Cushman)

According to InformationWeek's Pope, in 2004 the focus of software development will be toward "software to support new initiatives involving supply chains, security, data storage, and the way they interact with customers over the Internet." (Pope) He reports that industry analyst Forrester "expects overall information technology spending to grow 4 percent, but such 'strategic' spending to rise 9 percent. The growth will be concentrated in such industries as retail and insurance, Forrester found, where technology goes to the heart of how businesses interact with customers." (Ibid) These initiatives can make use of basic integration approaches like RPC, ERP, and MOM and they are much more focused than KM, BI or DW approaches.

A Yankee Group survey reported by Internet Week's Hulme indicates that "[t]he top three spending areas in 2004 will be antivirus, intrusion-detection systems, and firewalls. Fighting for scraps will be Web-application security, access control, storage security, anti-spam, authentication technology, and wireless security". (Hulme) Within the area of security, the "spending focus [in

2004] will be on hackers and viruses. A lesser priority will be managing employee access via virtual private networks and identity-management apps." (Ibid) The approaches at the exotic end of the Integration Spectrum do not warrant mention despite the high level of "buzz".

It is clear from the data and information available that many businesses are not yet clearly prepared to deal with basic process definition or management issues. Although the exotic end of the Integration Spectrum holds many fascinating visions for Enterprise Awareness, the reality is that today's organizational and technological challenges still lie in the boundary between Functional Efficiency and Process Effectiveness. The relatively well-defined ERP, EDI, and RPC integration approaches can deliver substantial results. SOA is still in formative stages but that approach can form a solid springboard for achieving Process Effectiveness.

If businesses focus on using sound, basic technologies to deliver consistent information in easily-used forms, they can impress customers with differentiation among competing business. Firms should organize to deal with the institutional challenges of business integration and consciously manage content to be accurate and timely. By focusing on basic interaction functions in all contact channels firms can achieve small changes that result in noticeably better customer experiences – the ultimate goal of DBD.

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Note – Additional resources are listed in Appendix 1.

Appendix 1 – Integration Approach Definitions & Characteristics Assessment

Approach Definitions

In order to develop a better understanding of the various approaches available for integration in the marketplace and corporate experience, it is useful to establish a cohesive and comprehensive set of definitions for those approaches. It is also important to link the definitions to contemporary and accepted uses of the terms to the extent possible. The following definitions used for this assessment were assembled from a variety of resources generally available to IT and business managers.

Digital Nervous System (DNS)

In addition to noting that DNS refers to Domain Name Service, the *Webopedia* site somewhat laconically identifies DNS as "short for ***d**igital **n**ervous **s**ystem,* a term coined by Bill Gates to describe a network of personal computers that make it easier to obtain and understand information." (Webopedia DNS) Gates provides a more elaborate description that is very long on vision but quite short on details in his 1999 book "*Business @ The Speed of Thought: Using a Digital Nervous System*":

> To function in the digital age, we have developed a new digital infrastructure. It's like the human nervous system. Companies need to have that same kind of nervous system--

> the ability to run smoothly and efficiently, to respond quickly to emergencies and opportunities, to quickly get valuable information to the people in the company who need it, the ability to quickly make decisions and interact with customers. (Time 1)
>
> You know you have built an excellent digital nervous system when information flows through your organization as quickly and naturally as thought in a human being and when you can use technology to marshal and coordinate teams of people as quickly as you can focus an individual on an issue. It's business at the speed of thought. (Ibid 4)

Of course Microsoft in general, and Mr. Gates in particular, have the ability to inspire opprobrium and his DNS proposal is no exception. One anonymous observer was prompted to ask:

> … 'What the *HELL* kind of crack were they smoking when they came up with that term, and *where can I get some*?' I mean, if I had a Microsoft Operating System running my network, I'd be nervous too. But please. Did they think that Scott McNealy about had the term 'network' wrapped up, and, not feeling strong enough to try to appropriate the term for their own malevolent use, [tried to] change the playing field by defining a new phrase? (Rants)

Another commenter noted that

> "..[t]reatments for obsessive compulsive disorder include the use of tranquillisers to calm the central nervous system and reduce the level of anxiety. A somewhat mischievous thought: should we be tranquillising our **digital nervous system**, and would that then remove some of the stress that senior managers suffer?" (Lambe)

Suffice it to say that the DNS concept is extremely broad and all encompassing in the world of integration.

Real-Time Enterprise (RTE)

According to the e-business journal *Line56.com*'s Ericson, Gartner Inc. coined the term ZLE (Zero Latency Enterprise) in 1998. It referred "to the need to eliminate the latency, (or the time from input to system response), in order to gain access to real-time decision making data. Further, a requirement for ZLE was access to data throughout an organization regardless of where it resided." (Ericson) In 2002, the Gartner Group acronym factory morphed ZLE into RTE, defined as "an enterprise that competes by using up-to-date information to progressively remove delays to the management and execution of its critical business processes." (Dobrik et al) According to CRMGuru's Jill Dyché , "… the goal of the real-time enterprise is to act on events as they happen. It's the established practices of event-driven marketing, process automation, just-in-time provisioning, and business intelligence all rolled into one. It's about getting information out quickly, making decisions nimbly, and monitoring the pulse of business as it occurs." (Dyché)

One approach to RTE is ".. through a combination of two established e-business solutions: enterprise application integration (EAI) software and an operational data store, or ODS." (Ericson - Outfitting)

> An ODS is a database that gathers and rapidly updates information usually kept in operational systems and one that can answer queries in close to real time. In some cases, the ODS acts as an interim or staging area between applications and a data warehouse; in others it is a single database of record. In verticals where the data really flies, like telecom or financial services, an ODS that can scale to grab high volumes of time-sensitive information can head off fraud or identify potential network failures. It can also serve as a separate point of access for data mining or business activity monitoring (BAM) and drive a more proactive business strategy.
>
> 'With this data available, you can take two pieces of information from different parts of the enterprise, put them together, and there's an 'Aha!" says Dave Wilson, director of product marketing for NonStop Enterprise (servers) for HP. 'I can now do something I could not do before. It's the use of information that makes a difference in business, but you have to have the plumbing or it's just a technology exercise.' (Ibid)

Business Activity Monitoring (BAM)

According to the ComputerWorld's Gary Anthes, BAM is another term coined by the ubiquitous Gartner Inc. for automated monitoring of business-related activity affecting an enterprise. "Although BAM applications are seldom truly real-time, they generally look at and report on activity in the current operational cycle—the current hour, day or week, for example—and are designed to spot problems early enough to head them off." (Anthes) He also notes that:

> There is no precise definition of BAM products. They incorporate concepts from—and sometimes are built on—ERP, business intelligence (BI), business process management and enterprise application integration (EAI) software. Most vendors of those types of products claim to have BAM offerings.

> And BAM isn't a new concept; credit card companies have had real-time fraud monitors for years, and manufacturing facilities have real-time error-detection software built into their assembly lines.
>
> Most companies monitor their business activity, but it's often after the fact—too late to head off a problem such as a missed bid deadline or the loss of a major customer. 'The conventional wisdom has been to just take transactional data and move it to the data warehouse and then to the BI system,' says Mike Smith, a senior vice president at Ventana Research in Belmont, Calif. 'But those systems aren't responsive.' (Ibid, 2)

It is interesting to note that, according to Anthes, "... BAM applications generally don't take data from a data warehouse; they pluck it in real time from the applications where it originates—order entry, accounts receivable, customer relationship management and so on." (Ibid) The delays inherent in storing data in a warehouse render it useless for correcting problems as they occur.

Knowledge Management (KM)

Knowledge Management is an approach that calls for an entire enterprise to specifically and consciously gather, organize, share, and analyze all of its "knowledge" in terms of resources, documents, and people skills. According to *Whatis.com*, "Knowledge management [typically] involves 'data mining' activities and some method of operation to 'push' information to users. Some vendors are offering products to help an enterprise inventory and access knowledge resources." (Whatis KM)

One example of the more global approaches to KM is provided by TheBrain Technologies Inc.'s BrainEKP product. According to their Home Page it is "the first-ever Enterprise Knowledge Platform". (Brain) It is said to be " .. an easy-to-use system for organizing and sharing information [that] connects your people, processes, and information in a single interface so you can see and share your thinking." (Ibid) The products' claimed reach and functionality are shown in Figure 1.

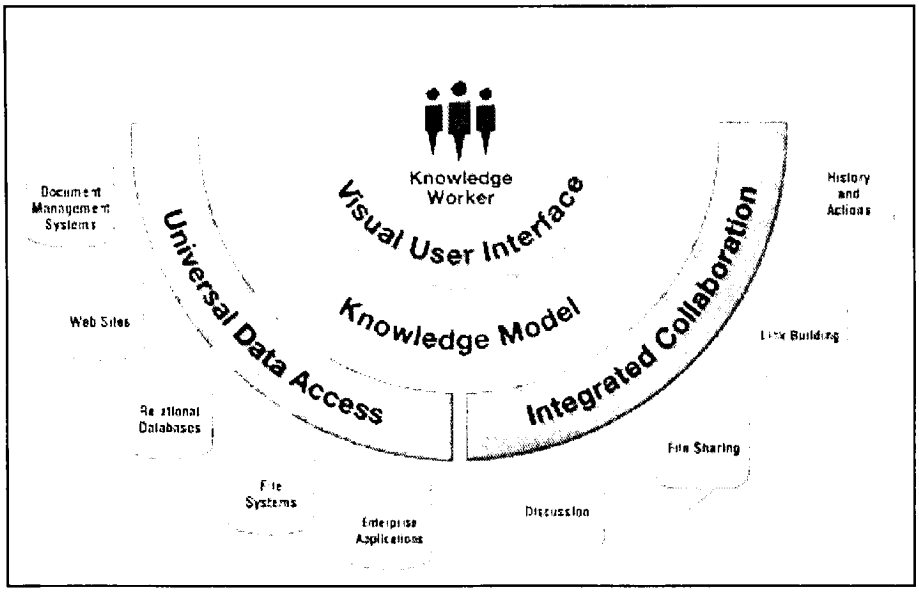

Figure 1 – The BrainEKP's Global Reach Process

Business Intelligence (BI)

The "Business Intelligence" integration approach covers a broad category of applications and technologies for gathering, storing, analyzing, and providing

access to data to help enterprise users make better business decisions. BI applications include the activities of decision support systems, query and reporting, online analytical processing (OLAP), statistical analysis, forecasting, and data mining. (Whatis BI) This term was used as early as September, 1996, when a Gartner Group report said:

> By 2000, Information Democracy will emerge in forward-thinking enterprises, with Business Intelligence information and applications available broadly to employees, consultants, customers, suppliers, and the public. The key to thriving in a competitive marketplace is staying ahead of the competition. Making sound business decisions based on accurate and current information takes more than intuition. Data analysis, reporting, and query tools can help business users wade through a sea of data to synthesize valuable information from it - today these tools collectively fall into a category called 'Business Intelligence.' (Whatis.com)

Today, according to Hyperion' s CEO Jeffrey Rodek, "there's a recognition that BI as a category is expected to play well with others, and that's been [Hyperion's] forte for a long time." (Johnson) However, the integration challenges of BI are substantial:

> Think of the average company, and where's your HR data? In Peoplesoft. Where's your general ledger? In the U.S., it's in Oracle; in Europe, it's in SAP. Where's your supply chain information? Manugistics. Where's your customer data? Siebel. Though in Asia, it's in Salesforce.com. You start mapping that out -- all these sources for this information -- and you see that to do what [Hyperion does], you have to be interoperable with all these systems. (Ibid)

Next generation Enterprise Resource Planning (ERP II)

According to *Line56.com*'s Ericson, "next Generation ERP" (or "ERP II") was another of many linguistic products of the Gartner consulting organization:

> [In 2000] Gartner decided to put a new face on ERP. The result? ERP II, 'an application and deployment strategy to integrate all things enterprise centric,' according to Brian Zrimsek, research director at Gartner. A Gartner research paper says ERP II would take the ERP foundation and extend it outward, to position the enterprise in the supply and value chain. Deployment of ERP II could take place through a single vendor or a variety of best-of-breed application providers.
>
> 'The two things it emphasizes are an open architecture and a vertical-specific functionality', says Zrimsek. 'Given that there will likely be no single vendor who provides everything you need as an enterprise, it's going to be up to you to assemble what you need.'
>
> But when Gartner laid down the rules for identifying ERP II *vendors*, attributes had to include those old ERP functionalities. 'When we said you have to have accounting, purchasing and order entry costing, it eliminated Siebel and i2 from being ERP II vendors, but they could still be used by an enterprise to achieve ERP II capability,' says Zrimsek.
>
> The new appellation came at the same time the old ERP vendors were running away from the term, and toward best-of-breed applications. Just try to find the letters 'ERP' on the SAP or PeopleSoft websites. SAP's U.S. director of public relations, Bill Wohl, says SAP purposely dumped its old guard image. 'It was important for us to have the world understand that while we have ERP expertise, we can also talk about real world challenges: consumer relationship management (CRM), supply chain management (SCM), product lifecycle management (PLM)'. (Ericson – What the Heck)

Data Warehouse/Data Mart (DW/DM)

According to the *Whatis.com* site, the term "Data Warehouse" was coined by W. H. Inmon. *Whatis.com* defines a data warehouse as "a central repository for all or significant parts of the data that an enterprise's various business systems collect."

> Typically, a data warehouse is housed on an enterprise mainframe server. Data from various online transaction processing (OLTP) applications and other sources is selectively extracted and organized on the data warehouse database for use by analytical applications and user queries. Data warehousing emphasizes the capture of data from diverse sources for useful analysis and access, but does not generally start from the point-of-view of the end user or knowledge worker who may need access to specialized, sometimes local databases. The latter idea is known as the 'data mart'. ...
>
> Data mining, Web mining, and decision support systems (DSS) are three kinds of applications that can make use of a data warehouse. (Whatis.com)

Services-Oriented Architecture (SOA)

An enterprise IT architecture that is structured to take advantage of "services" provided by both internal and external suppliers is often described as a Services-Oriented Architecture. According to *Developer.com*'s Michael Stevens,

> A service[s]-oriented architecture has services that developers create in a service layer. The services that they develop have published interfaces. These interfaces support a distinct business domain. Organizations that focus their development effort around the creation of services, will realize many benefits.

> The most common scenario for development organizations is to have some experience with component-based development. The use of application servers such as J2EE or .NET for hosting applications is becoming more common. If [an] organization is using component-based development practices and application servers for business logic, then [they] are already service-oriented. By following the service-oriented mind set with even more rigor, combined with the component-based approach to software development, [that] organization will realize many benefits. (Stevens)

SOA is seen as providing increased Return on Investment through code mobility; more focused developer roles, code reuse and security; better testing, maintainability, scalability, parallelism in development and support for multiple client types; fewer defects; and higher availability. (Ibid)

Business Process Management (BPM)

Marcel Dekker, Inc. is a privately-held, international publishing firm specializing in scientific, technical, and medical (STM) fields. The discussion of Business Process Management on their Web site reports that:

> Business processes are defined as a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer. Alternatively business processes can also be defined as, 'a set of logically related tasks performed to achieve a defined business outcome.' Processes can be understood as 'beginning and end points, interfaces, and organization units involved, particularly the customer unit.' Examples of such processes include processing an insurance claim, sales and delivery, management of supply chains, and so on.
>
> The concept of Business Process Reengineering (BPR) became a highly touted management philosophy in the early 1990s. While it remained a major issue in the 1990s the end of decade review seemed to indicate that it had achieved mixed results.

There was an abundance of articles, books, and presentations on the subject of business process reengineering in the 1990s. Most of these articles were based on reported cases within companies that had attempted reengineering. While most such cases involved consultants, several organizations undertook this effort by themselves. (Basu)

Line56's Ericson recently noted that BPM is experiencing something of a resurgence:

> Though it sounds simple enough, business process management is one of those topics that rests on the fringe of the esoteric. The engineering of the way people work together has been around in its modern sense for 25 years or more, but a lot of the thinking has been reserved to offices of top executives.
>
> A sign that the mainstreaming of BPM is now under way was this week's IDS Scheer ProcessWorld conference in Florida. It's just the second annual event for IDS, but given a strong turnout and emergent end-user stories, it's a safe bet that more of these conferences will follow. (Ericson Process)

Enterprise Resource Planning (ERP)

According to the *TechWeb.com*'s Encyclopedia, **E**nterprise **R**esource **P**lanning refers to "[a]n integrated information system that serves all departments within an enterprise." (TechWeb ERP) The definition goes on to note that ERP

> Evolv[ed] out of the manufacturing industry [and it] ERP implies the use of packaged software rather than proprietary software written by or for one customer. ERP modules may be able to interface with an organization's own software with varying degrees of effort, and, depending on the software, ERP modules may be alterable via the vendor's proprietary tools as well as proprietary or standard programming languages.
>
> An ERP system can include software for manufacturing, order entry, accounts receivable and payable, general ledger, purchasing, warehousing, transportation and

human resources. The major ERP vendors are SAP, PeopleSoft, Oracle, Baan and J.D. Edwards. Lawson Software specializes in back-end processing that integrates with another vendor's manufacturing system. (Ibid)

The level of integration achieved by ERP products was achieved largely through incorporation of various functions within a single, monolithic code and data structure typically implemented in a 3-tier architecture.

Message-Oriented Middleware/Distributed Active Systems (MOM/DAS)

According to the *TechWeb.com* Encyclopedia, Message-Oriented Middleware is "[s]oftware that provides an interface between applications, allowing them to send data back and forth to each other asynchronously. Data sent by one program can be stored in a queue and then forwarded to the receiving program when it becomes available to process it." (TechWeb MOM) The definition goes on to say that:

> Without using a common message transport and queueing system such as this, each application must be responsible for ensuring that the data sent is received properly. Maintaining communications between different types of applications as they are revised and eventually replaced with newer architectures creates an enormous programming burden in the large enterprise.
>
> A message broker is either a complete messaging system or software that works with existing messaging transports in order to add routing intelligence and data conversion capabilities. A rules engine analyzes the messages and determines which application should receive them, and a formatting engine converts the data into the structure required by the receiving application. Examples are MQSeries Integrator which extends

MQSeries, e-Biz Integrator (successor to MQSeries Integrator) and Rendezvous.

Messaging middleware and e-mail messaging systems provide similar transport functionality. The primary difference is that messaging middleware deals with transactions between programs, whereas e-mail messaging deals with memos between people. (Ibid)

The MOM architecture is illustrated in Figure 2.

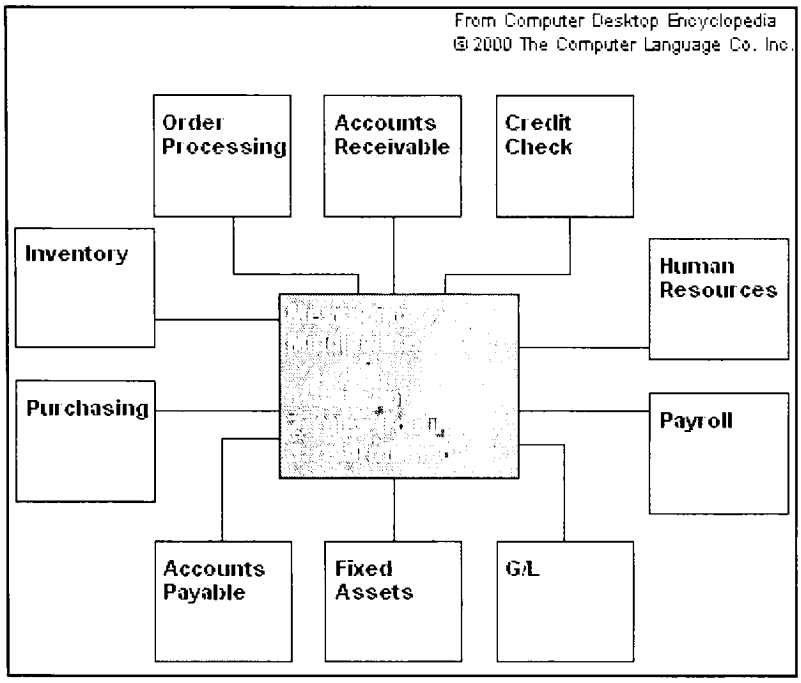

Figure 2 – A MOM Architecture Example

According to IEEE researcher Buchmann, the general category of messaging middleware also includes what he calls Distributed Active Systems (DAS). (Buchmann) DAS "support[s] building applications that must monitor and react to changes in the environment, information of interest or process status.

The publish/subscribe interaction paradigm is at the heart of DAS. Notification services provided may range from simple messaging to content based filtering and event composition and encompass integration with transaction mechanisms and support transactional coupling." (Ibid)

Remote Procedure Calls (RPC)

According to the *Whatis.com* site, "Remote Procedure Call is a protocol that one program can use to request a service from a program located in another computer in a network without having to understand network details." (Whatis RPC) The definition goes on to say that:

> RPC uses the client/server model. The requesting program is a client and the service-providing program is the server. Like a regular or local procedure call, an RPC is a synchronous operation requiring the requesting program to be suspended until the results of the remote procedure are returned. However, the use of *lightweight processes* or threads that share the same address space allows multiple RPCs to be performed concurrently.
>
> When program statements that use RPC are compiled into an executable program, a stub is included in the compiled code that acts as the representative of the remote procedure code. When the program is run and the procedure call is issued, the stub receives the request and forwards it to a client runtime program in the local computer. The client runtime program has the knowledge of how to address the remote computer and server application and sends the message across the network that requests the remote procedure. Similarly, the server includes a runtime program and stub that interface with the remote procedure itself. Results are returned the same way.

There are several RPC models and implementations. A popular model and implementation is the Open Software Foundation's Distributed Computing Environment (DCE). (Ibid)

Electronic Data Interchange (EDI)

According to the *Whatis.com* site, EDI is a standard format for exchanging business data:

> The standard is ANSI X12 and it was developed by the Data Interchange Standards Association. ANSI X12 is either closely coordinated with or is being merged with an international standard, EDIFACT.
>
> An EDI message contains a string of *data elements*, each of which represents a singular fact, such as a price, product model number, and so forth, separated by delimiter. The entire string is called a *data segment*. One or more data segments framed by a header and trailer form a *transaction set*, which is the EDI unit of transmission (equivalent to a *message*). A transaction set often consists of what would usually be contained in a typical business document or form. The parties who exchange EDI transmissions are referred to as *trading partners*. (Whatis EDI)

Hard-coded Inter-Application Messaging (HIM)

A useful historical summary of HIM is provided by Moldoff, President of Applied Business Technologies until its acquisition by SCT in 2002. The origins of HIM can be summarized as follows:

> In Legacy systems, most application modules are linked by shared data structures. Sharing data structures is not necessarily complex. Complexity derives from the number of applications, the number of data files and the interface functions needed to perform workflow procedures.

Inherited data structures create obstacles to enhancements and new applications that require data that are not accommodated in the existing structure. Two options are in order: (1) add new files, or (2) modify the existing files, with ripples throughout application designs. Both options add redundancy and increase the cost of operations as application components are implemented from different software developers.

A typical Legacy system may have hundreds of data files, which accommodate the need for many interfaces. Complexity is added when a shared data file is altered, impacting other application modules sharing access to the changed data file. The cost to accommodate changes in this model is high due to hard coded dependencies. (Moldoff)

An illustration of the HIM architecture is provided in Figure 3.

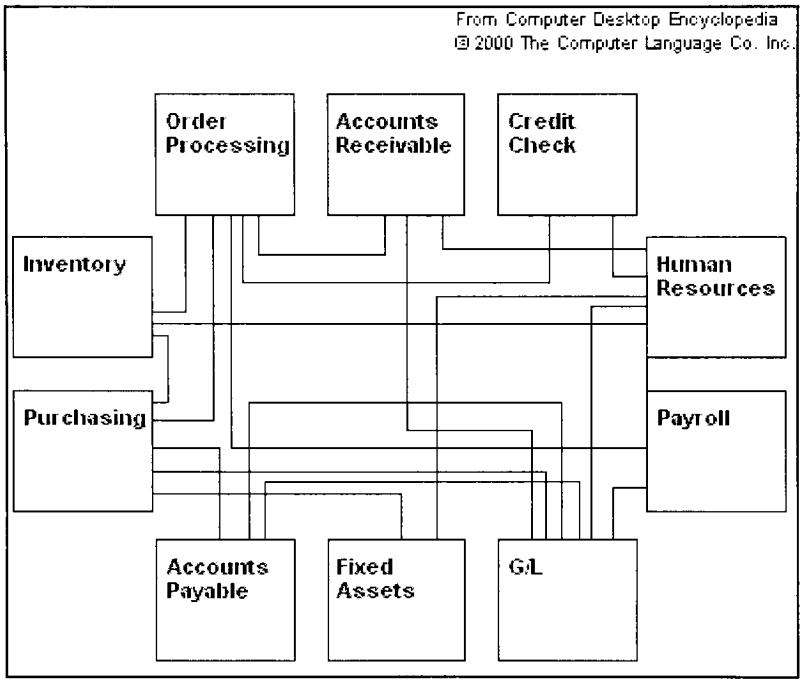

Figure 3 – An HIM Architecture Example

Integration Approach Attributes

There is a wide variety of characteristics that the fourteen Integration Approaches exhibit. In order to place each of the approaches on the Integration Spectrum, seven relatively broad but useful "attribute categories" were identified. The designated attributes range from those that are limited in scope and complexity to ones that are highly sophisticated and exotic. Each of the approaches was then characterized as "Completely or Dominantly", "Partially or Occasionally" exhibiting the specific attribute, or as "Not" exhibiting the specific attribute.

Fixed Communication Focused

The most elementary attribute of any integration approach is that of communication, either inter-process or inter-organization. In order to integrate the information or activities of separate entities, they must exchange information. The "Fixed Communication Focused" attribute describes systems, technologies, or functions that communicate between two or more specific and unchanging end points. The end points can be internal to one computer or multiple computers, one company or multiple companies. The overriding characteristic of this attribute is the fixed, hard-coded or hard-wired nature of the systems with this attribute.

Flexible Communication Capable

The second most elementary attribute of an integration approach is that of flexibility in communication, inter-process, inter-organization, or with other entities whose nature and description may change with the passage of time or altered enterprise requirements. The "Flexible Communication Capable" attribute describes systems, technologies, or functions that communicate between two or more specific end points that can flex as differing communication needs are identified. An advanced form of this attribute would involve technology-based, internal abilities to sense the need for change and execute it without external action.

Process Aligned

A more sophisticated attribute of an integration approach is that of process alignment – the ability to internalize workflow and business logic formulations within the structure of the integration approach. The "Process Aligned" attribute describes systems, technologies, or functions that structure communications and reporting along the lines of defined business processes or other business logic structure. A Process Aligned approach permits robust visualization of the needed integration points and information flows that can be related to business results.

Exception Based

Another expansion of integration capability can be generalized as exception handling ability – the ability of systems, technologies, or functions to recognize and respond to unanticipated events. Such events may include out-of-specification performance in a well-defined process or the creation of a new question or unexpected performance requirement regarding an existing or undefined process. The basic form of this attribute would be simple alarm generation or redirection of communication on the basis of activities outside a pre-approved set of specifications.

Internal Heuristics

The penultimate level of attribute sophistication is internalized heuristic capability – the ability to sense opportunities for performance improvement or creation of new processes to respond to previously unrecognized opportunities. In a manner similar to the function of a neural network, the systems, technologies, or functions that exhibit this attribute would "learn" from prior operations and modify their performance in response.

Autonomous Operation

The final level of sophistication in an integration approach can be visualized as operational autonomy – the ability to perform all of the

requirements and exhibit all of the less-sophisticated attributes of systems, technologies, or functions without external intervention.

Integration Approach Assessment Table

Table Legend

■ = "Completely or Dominantly" exhibits the attribute
◘ = "Partially or Occasionally" exhibits the attribute
□ = "Not" an attribute

Integration Approach	Fixed Communication Focused	Flex. Communication Capable	Process Aligned	Exception Based	Internal Heuristics	Autonomous Operation	Notes
Digital Nervous System	□	◘	◘	■	■	■	
Real-Time Enterprise	□	◘	◘	■	■	◘	
Business Activity Monitoring	□	■	■	■	◘	◘	

Integration Approach	Fixed Communication Focused	Flex. Communication Capable	Process Aligned	Exception Based	Internal Heuristics	Autonomous Operation	Notes
Knowledge Management	□	◘	◘	■	■	◘	
Business Intelligence	□	◘	◘	◘	■	□	
ERP II	□	◘	■	■	◘	□	
Services Oriented Architecture	◘	■	◘	◘	◘	□	1
Data Warehouse/ Data Mart	□	□	◘	◘	◘	□	

Integration Approach	Fixed Communication Focused	Flex. Communication Capable	Process Aligned	Exception Based	Internal Heuristics	Autonomous Operation	Notes
Business Process Management	□	◘	■	◘	□	□	
Enterprise Resource Planning	◘	■	◘	◘	□	□	
Message-Oriented Middleware	◘	■	◘	◘	□	□	2
Electronic Data Interchange	■	◘	□	□	□	□	

Integration Approach	Fixed Communication Focused	Flex. Communication Capable	Process Aligned	Exception Based	Internal Heuristics	Autonomous Operation	Notes
Remote Procedure Calls	■	◘	□	□	□	□	3
Hard-coded Inter-Application Messaging	■	□	□	□	□	□	

Table Notes

Note 1 – Includes Web Services (SOAP, UDDI, etc.)

Note 2 – Includes proprietary systems such as IBM's MQ Series and SAP's IDoc & BAPI; also includes Distributed Active Systems (publish and subscribe) technology implementations

Note 3 – Includes APIs. According to the Java Community Process Website, "There is considerable interest in using XML for "Remote Procedure Calls", where a procedure call (or method call) on one computer is transmitted over a network as XML and is then delivered as procedure call (or method call) on another computer. In particular,

there is now a W3C Protocol Working Group developing a standard XML protocol, "XP", which supports XML based RPC." (JSR-101)

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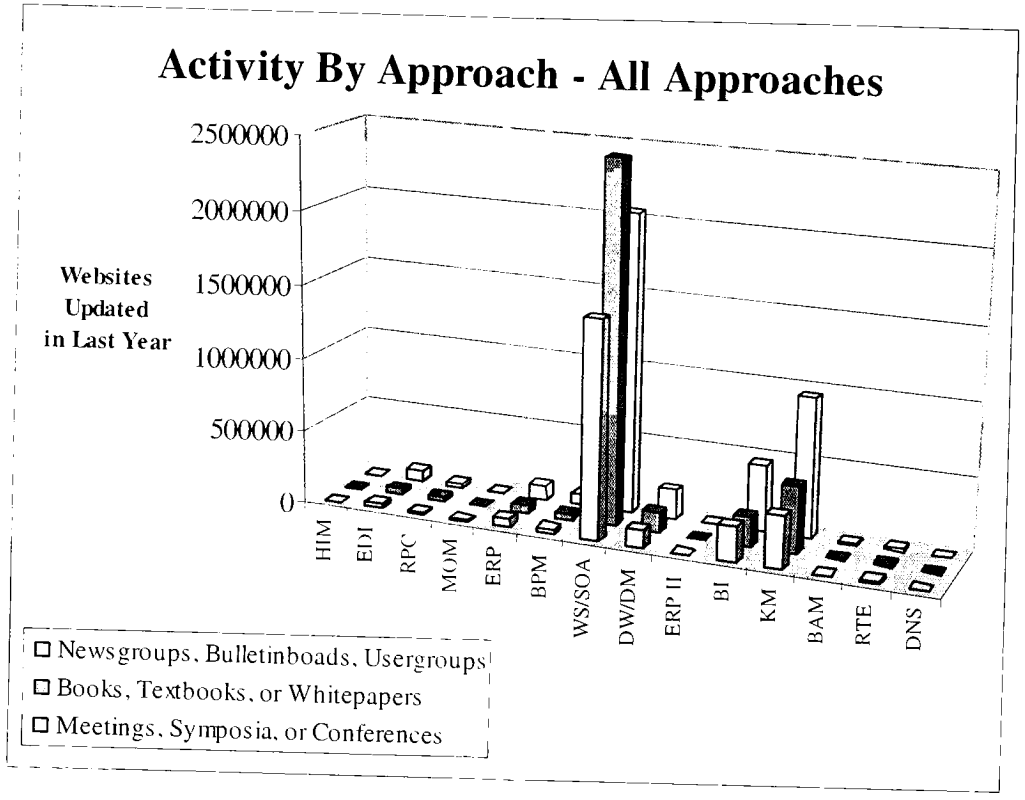
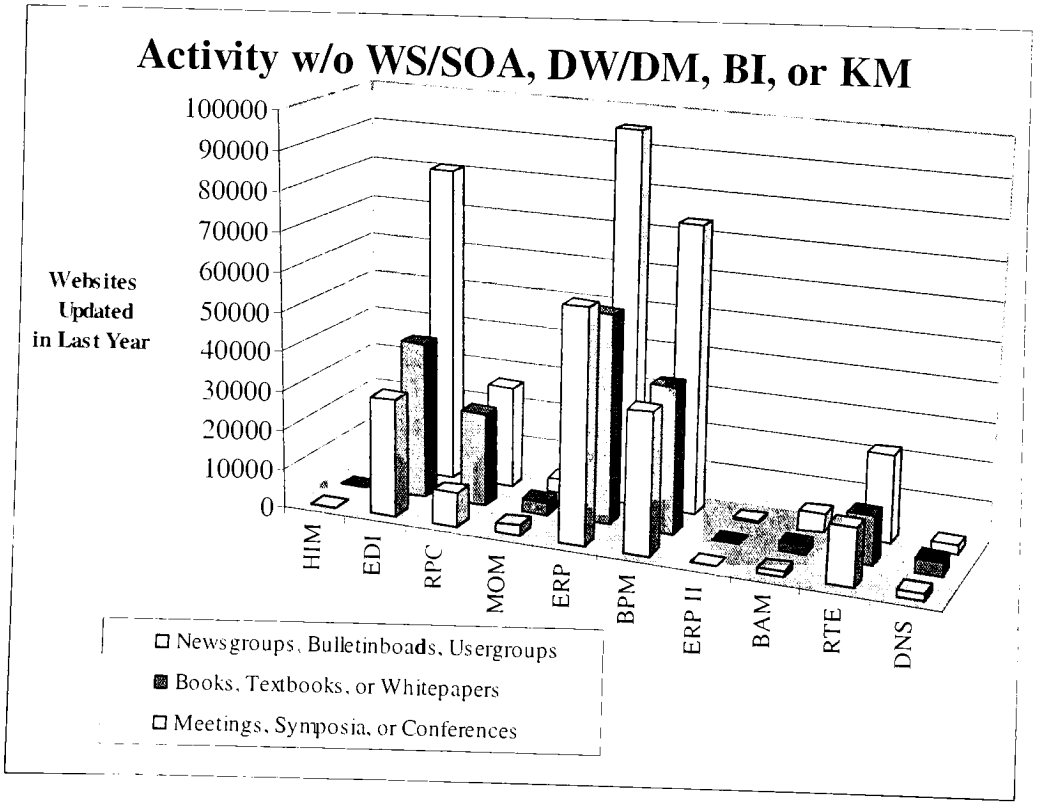
Appendix 2 – Integration Approach Activity Assessment Data





Approach	Newsgroups, Bulletinboards, or Usergroups	Books, Textbooks, or Whitepapers	Meetings, Symposia, or Conferences
DNS	1560	3580	2120
RTE	14700	12400	22100
BAM	1550	2140	4750
KM	358000	458000	958000
BI	233000	198000	453000
ERP II	181	108	344
DW/DM	125000	134000	199000
WS/SOA	1491750	2463470	2053530
BPM	35600	37200	73800
ERP	59100	53300	95500
MOM	2620	3380	3660
RPC	8480	23800	26100
EDI	30000	40000	80900
HIM	0	0	1

Appendix 3 - A Cautionary Tale of Disintegration

Among the website portals serving the florist industry, the *FlowerClub.com* exhibits a stunning example of "disintegration" from a customer perspective. The designer/operators of this site did not ensure that a customer reaching the site through differing paths is recognized as the same individual. The following "screen shots" illustrate the problem.

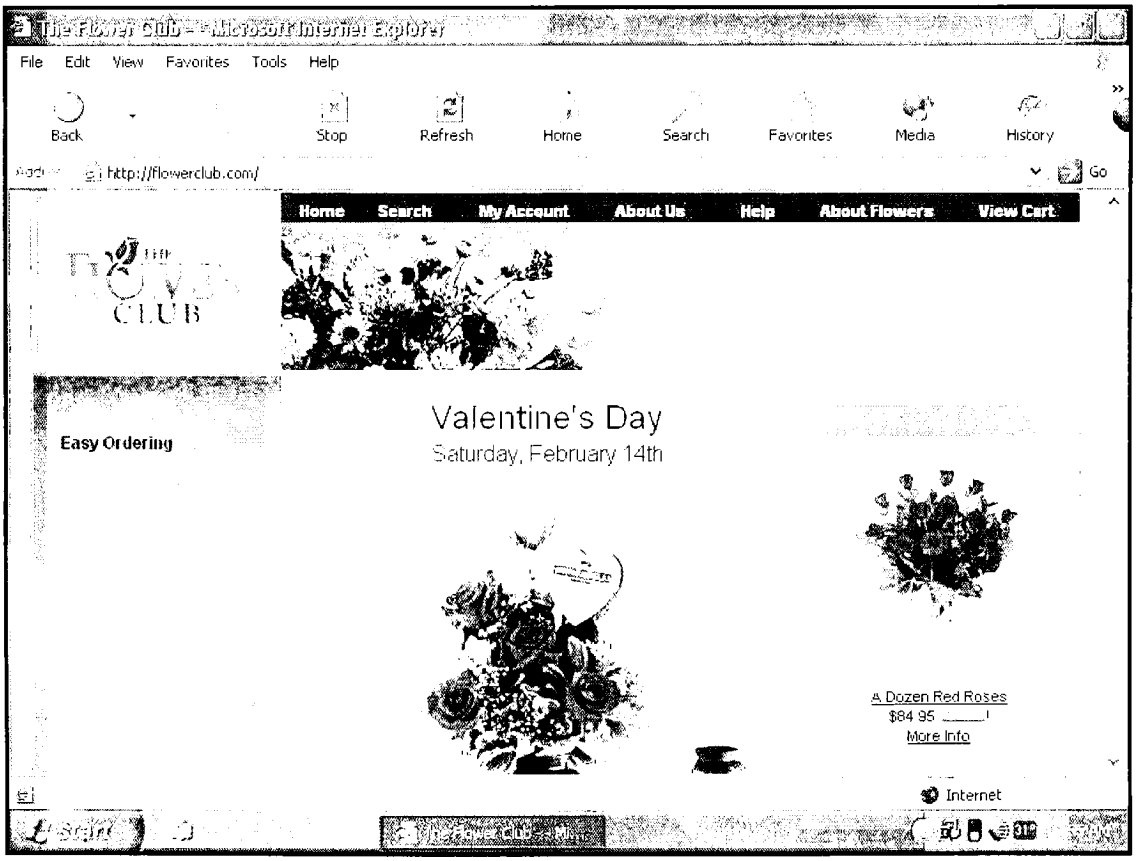


Figure A3-1

Figure A3-1 shows the *FlowerClub.com* Home page as accessed directly. The featured item for Valentine's Day 2004 is a chocolate/rose arrangement in a special vase. Although it is possible to debate the wisdom of doing so based on its relatively high price, selecting this item for addition to the standardized "Shopping Cart" applet produces a request for the potential buyer to create an account or sign

in as a "Returning Customer". In a minor violation of security best-practice, a Returning Customer is prompted to specify their E-mail address as the user ID and supply a previously designated Password. In the case of this example, providing the requested input produced the error screen shown in Figure A3-2.

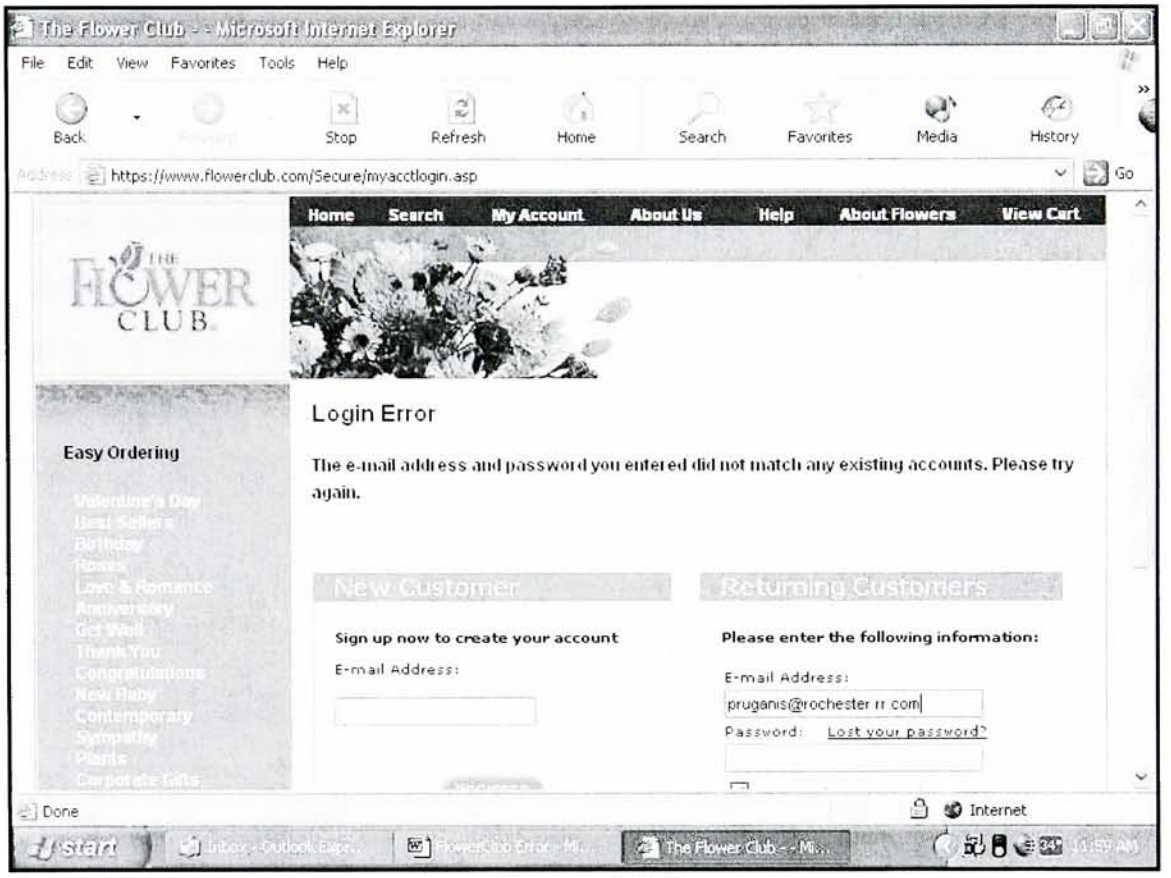


Figure A3-2

The screen shown Figure A3-2 indicates that the User ID/E-mail address and password combination provided does not match any existing accounts. In the not-uncommon situation that the potential customer may have forgotten their Password (since their E-mail address is used often enough to reduce the likelihood that it was forgotten) the site offers to provide an E-mail reminder of the appropriate input to the Returning Customer in the form of the "Lost your password?" link. The screen presented by clicking on the "Lost your password?"

link is shown in Figure A3-3 and the results of using it are shown in Figure A3-4. The potential Returning Customer is informed that his E-mail address does not exist in the FlowerClub system. The potential Returning Customer finds this quite surprising (and significantly annoying) since he had recently received an E-Mail at the address he entered from the FlowerClub advertising that same product he was trying to purchase. The E-mail is shown in Figure A3-5. In addition, a gender-based postal advertisement was sent to the potential Returning Customer at his Billing Address. It is illustrated in Figure A3-6. The potential Returning Customer was beginning to see why the flowers and chocolate were so costly – the ineffective use of multiple marketing channels had to be expensive. However the potential Returning Customer was determined to press on to see if the FlowerClub would ever acknowledge his existence.

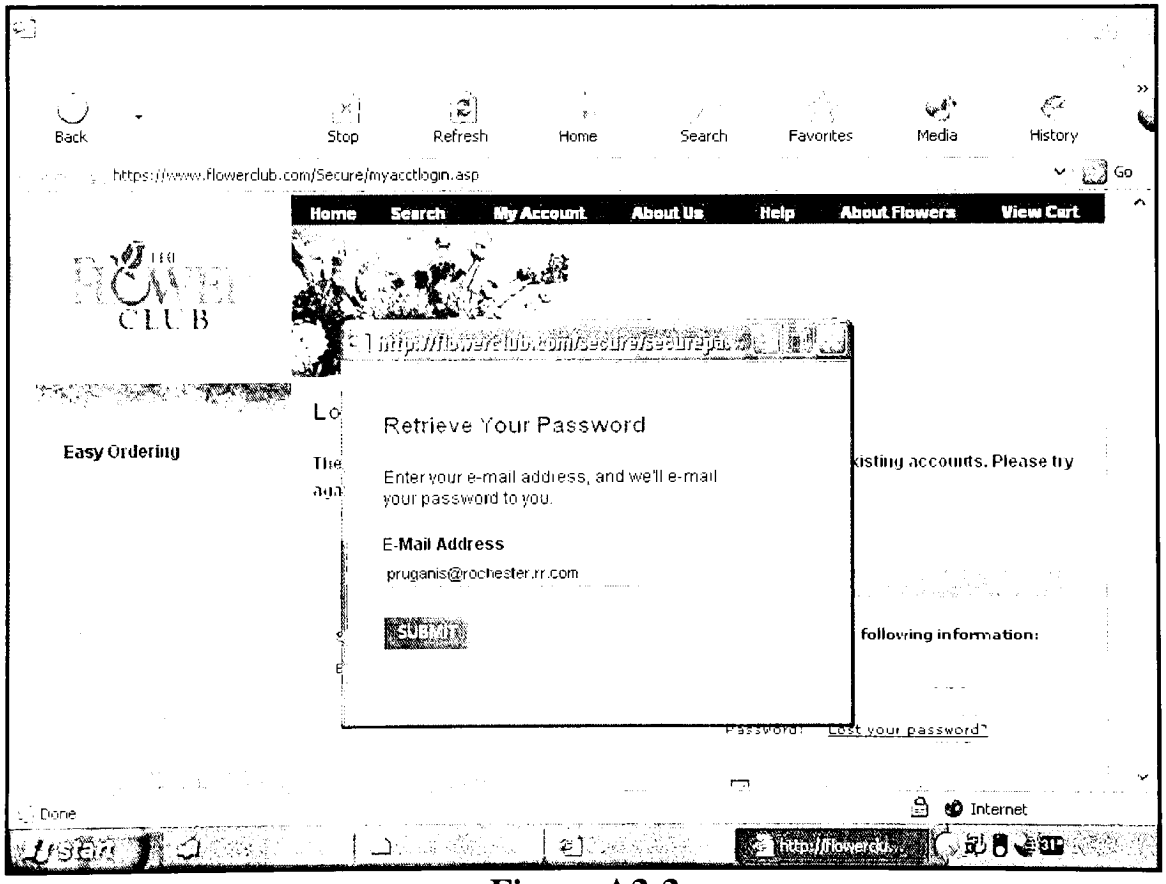


Figure A3-3

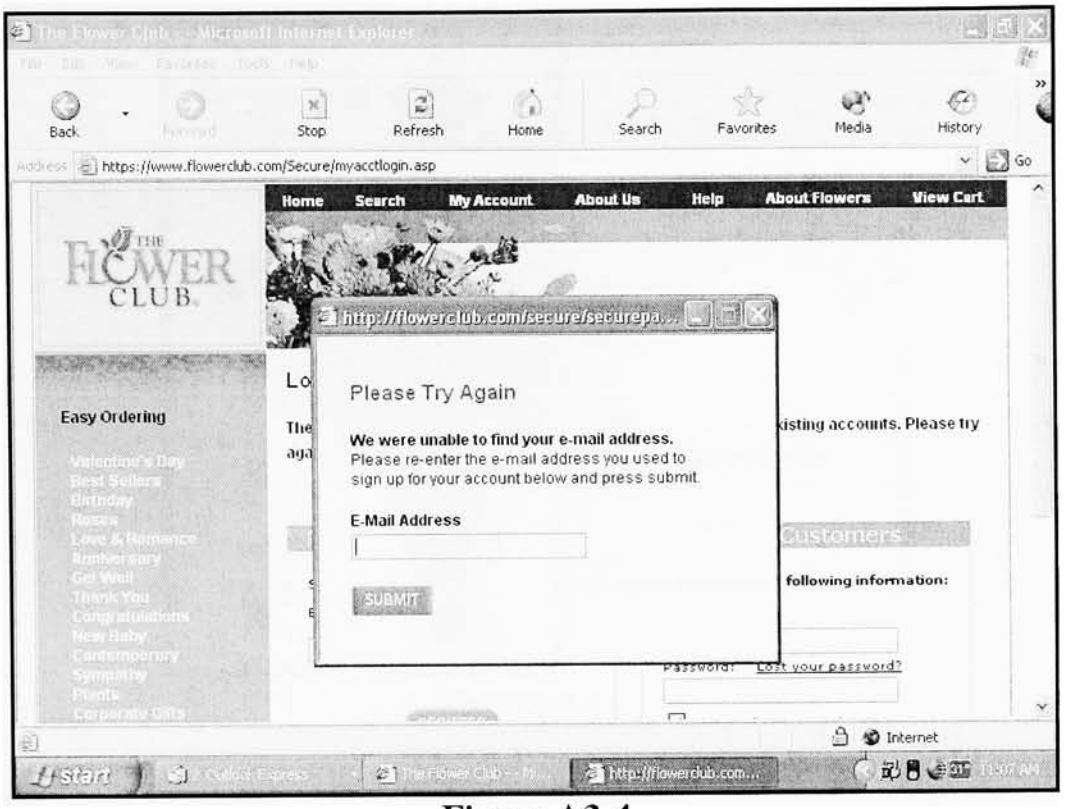


Figure A3-4

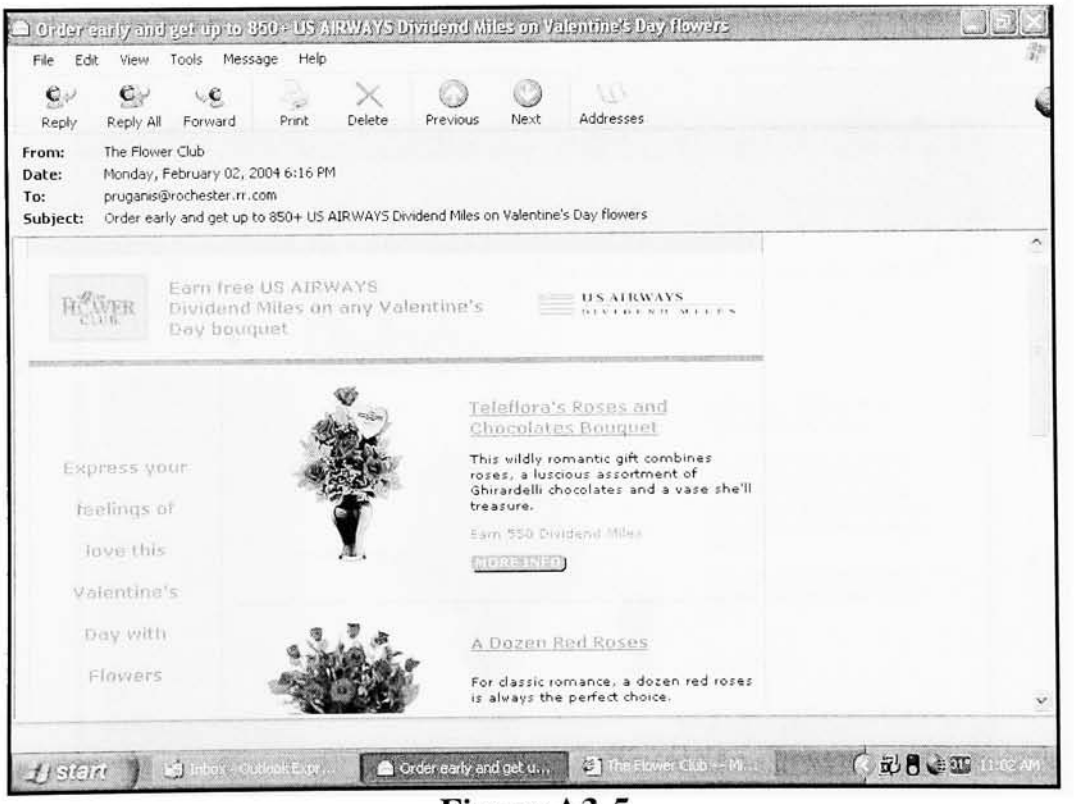


Figure A3-5

Figure A3-6

By clicking on the "More Info" button in the E-Mail sent to his allegedly non-existent address, the potential Returning Customer was presented with the new Web screen shown in Figure A3-7.

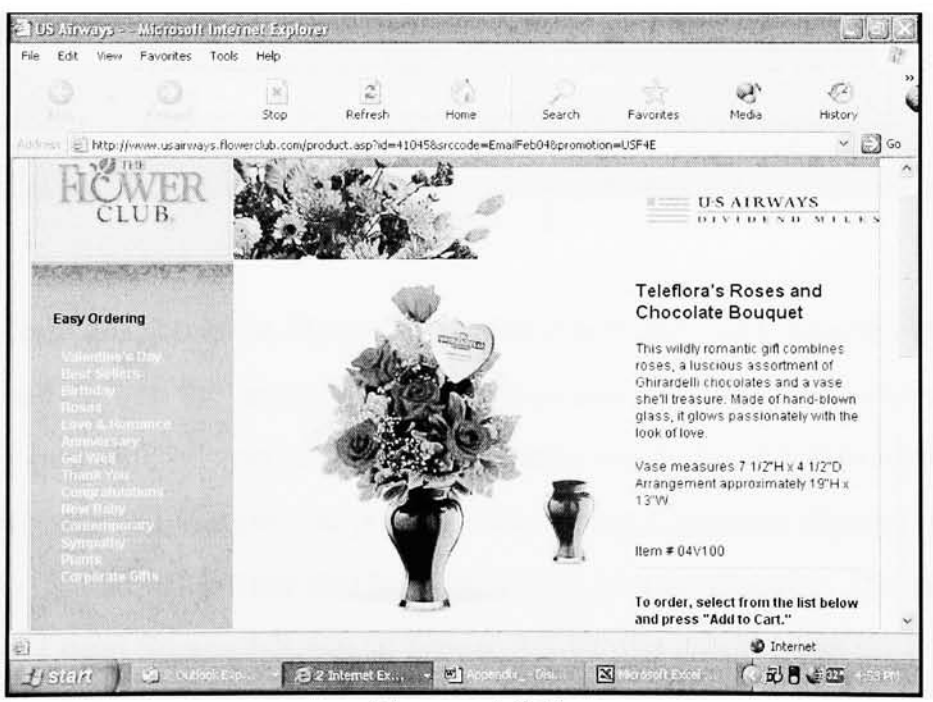


Figure A3-7

He noted that the URL used by the E-mail message was not simply "Flowerclub.com", or "www.flowerclub.com" but rather "www.usairways.flowerclub.com" with some added product and promotion information. He obediently selected the least expensive version of the product (without balloons, bears, or additional roses) and "pressed" the "Add to Cart." button, producing the screen shown in Figure A3-8.

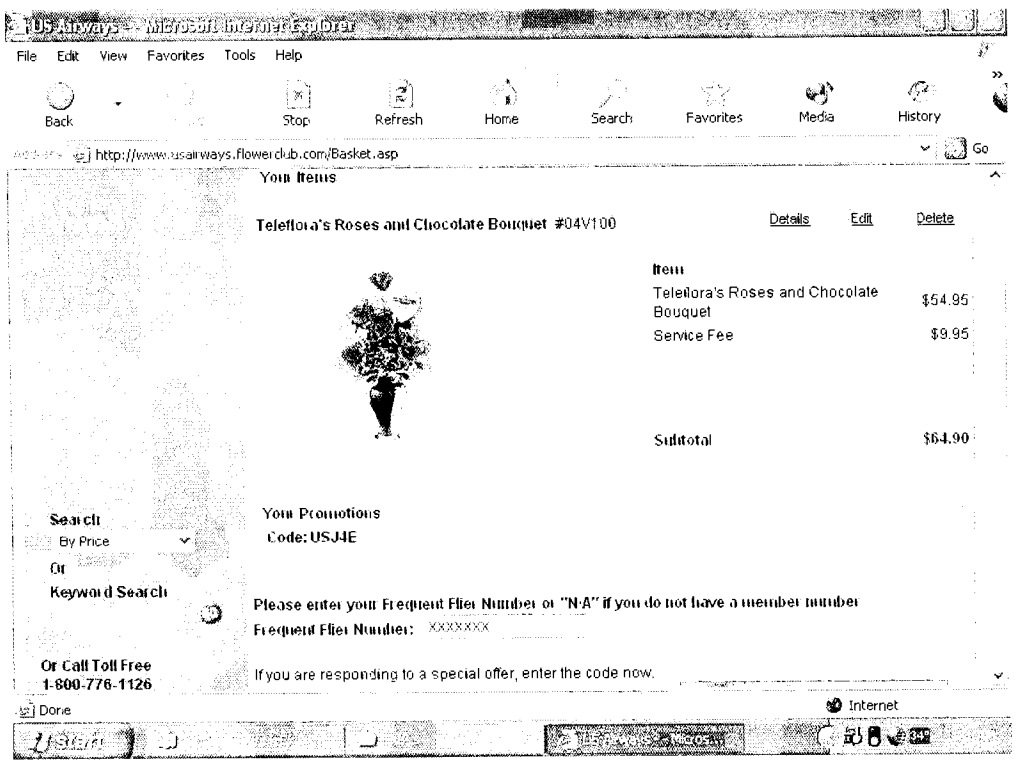


Figure A3-8

The Shopping Cart screen in Figure A3-8 confirmed that the potential Returning Customer had chosen the least expensive option and that, for the services to presumably be rendered correctly, a $9.95 charge would be added to his bill.

With some trepidation, the potential Returning Customer clicked on the "Proceed to Checkout" button that had started his initial difficulty. To his surprise, the Login Screen (shown in Figure A3-9) was much more user-friendly and actually anticipated his identity. This occurred despite the fact that the URL

involved was no longer "www.usairways.flowerclub.com" – it was "www.flowerclub.com/secure" with some added information that came from somewhere unknown.

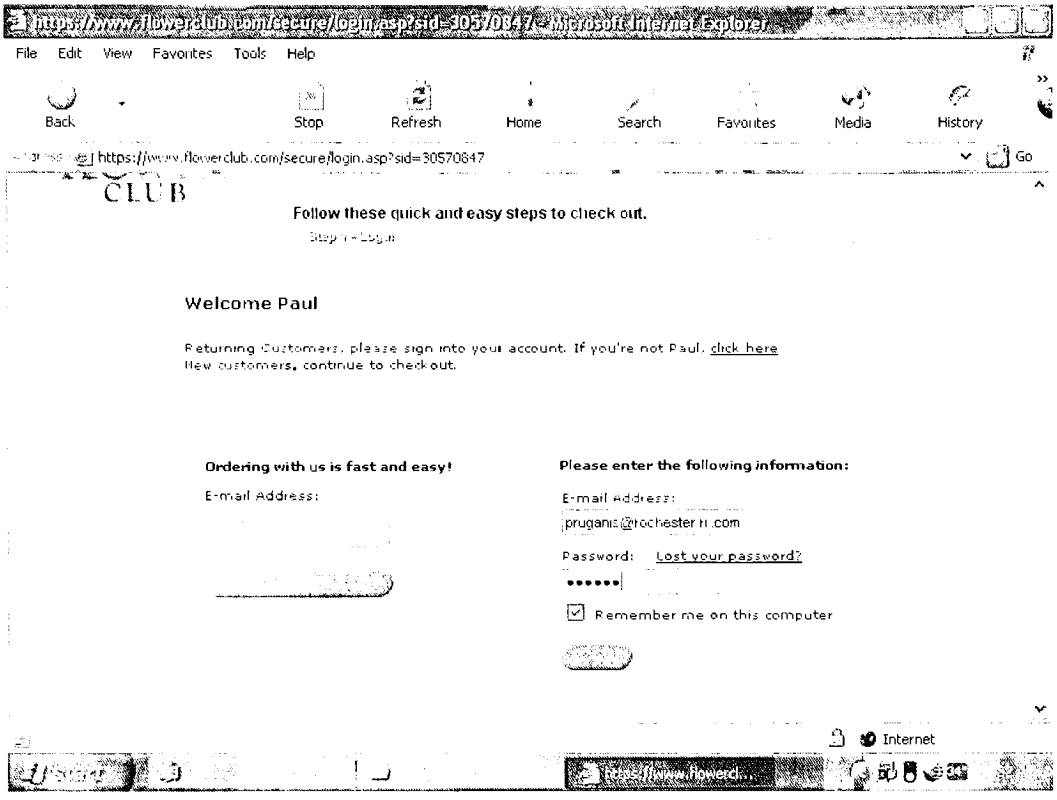


Figure A3-9

With the added information in the URL, the potential Returning Customer was this time successful in moving to "Step 2" of the process to "Add Delivery Info". However, as shown in Figure A3-10, there were still some puzzling "anomalies" in the FlowerClub system. When the potential Returning Customer tried to identify the potential Recipient of this gift, he noticed that there were apparent duplications in the list of people to whom he had sent gifts in the past. Were they duplicated because there were more than one source of data? Why was there one former recipient who was NOT duplicated?

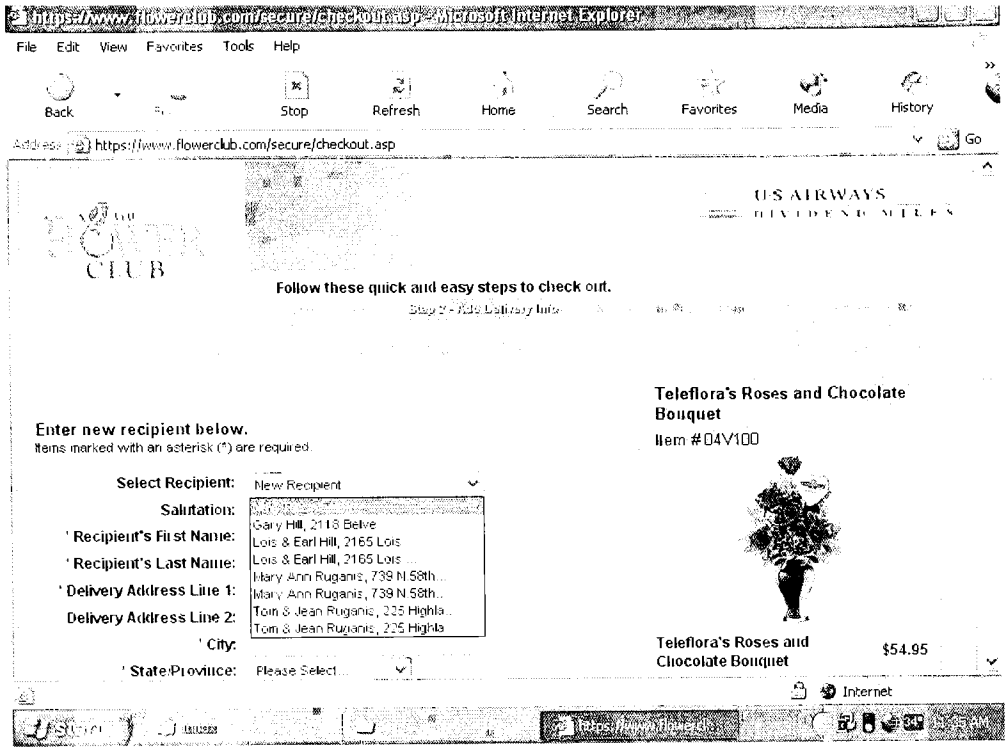


Figure A3-10

At this point, the potential Returning Customer recalled that he had experienced some additional confusion and concern with the FlowerClub organization. A couple of weeks earlier he had received a mysterious E-mail (Figure A3-11) at his supposedly non-existent address reminding him of the birthday of someone he did not know and who was not on the potential Returning Customer's previous recipient list. In light of all this confusion and misinformation, the potential Returning Customer decided that it would be easier (and perhaps safer) to deal with another business. He also sincerely hoped that someone had managed to remember Ms. Power's birthday, whoever she was.

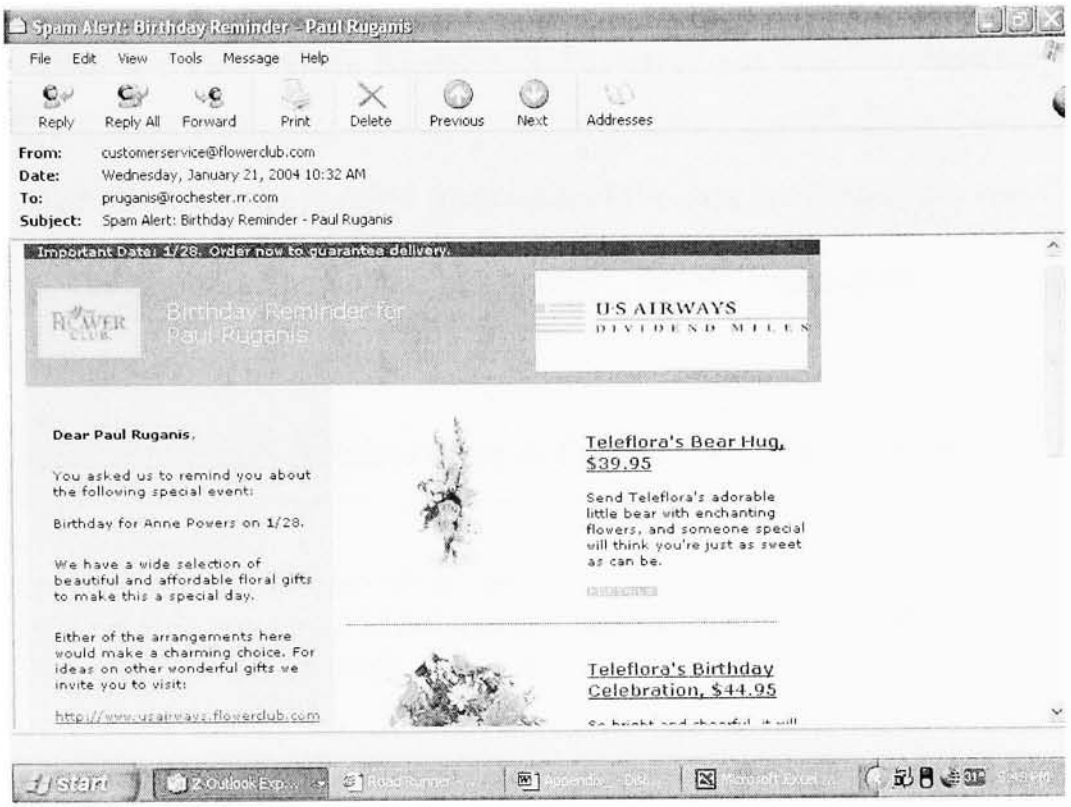

Spam Alert: Birthday Reminder - Paul Ruganis
File Edit View Tools Message Help
Reply Reply All Forward Print Delete Previous Next Addresses
From: customerservice@flowerclub.com
Date: Wednesday, January 21, 2004 10:32 AM
To: pruganis@rochester.rr.com
Subject: Spam Alert: Birthday Reminder - Paul Ruganis
Important Date: 1/28. Order now to guarantee delivery.
Birthday Reminder for Paul Ruganis
US AIRWAYS DIVIDEND MILES
Dear Paul Ruganis,
You asked us to remind you about the following special event:
Birthday for Anne Powers on 1/28.
We have a wide selection of beautiful and affordable floral gifts to make this a special day.
Either of the arrangements here would make a charming choice. For ideas on other wonderful gifts we invite you to visit:
http://www.usairways.flowerclub.com
Teleflora's Bear Hug, $39.95
Send Teleflora's adorable little bear with enchanting flowers, and someone special will think you're just as sweet as can be.
Teleflora's Birthday Celebration, $44.95
Start
Z-Outlook Exp...

Figure A3-11

Appendix 4 – Interview Results & Integration Implementation Script

The information available from each of the case study subjects varied widely. The communications, or lack thereof, can be summarized as follows:

FlowerClub

No responses to e-mail inquiries made in February and March, 2004:

From: "Paul Ruganis"
To: <customerservice@flowerclub.com>
Subject: Fw: Account Error Information 2nd Try -Does Anybody Care?
Date: Tuesday, March 16, 2004 10:43 AM

----- Original Message -----
From: Paul Ruganis
To: customerservice@flowerclub.com
Sent: Sunday, February 22, 2004 2:34 PM
Subject: Account Error Information

I have found that your site has an unusual problem in authenticating me as a returning customer. The attached file explains the particulars. I am planning to include it in a Masters Degree thesis. Is there someone with whom I can communicate to understand why this is happening and if you plan to correct the situation?

Tops Friendly Markets

Mr. David Smyers, Manager of Customer Relations Marketing, agreed to be interviewed on the specific subject of the Catalina Coupon program at Tops on May 6, 2004. The results of that interview can be summarized as follows:

The "Catalina Coupon" program was initiated by Tops in 1998. The program was started as a result of a "preferred vendor" relationship between Catalina Marketing and Tops' parent holding company, Royal Ahold.

The printed coupons can be generated in one of three ways as part of the Catalina system's programming: ValuPage "Shopping List" from the ValuPage national Website, purchase rates of specific products by individual customers, or overall purchase rates of individual customers. The local Easter and Christmas promotional campaigns were based on the "overall purchase rates of individual customers" trigger used to produce a fixed printed coupon (shown in Figure 8 in the Tops case study). The targeted product coupon (shown in Figure 13) is driven by the "purchase rates of specific products by individual customers" monitoring process.

Although one member of the Ahold group (Bi-Lo in the Southeastern US) has actively promoted the ValuPage "Shopping List" in their promotional materials, competition for advertisement space in the Tops organization has effectively eliminated the ValuPage Shopping List from local promotion. Tops

does not perceive the Internet as a productive channel for the vast majority of their customers. Local store-brand offerings were attempted but they were dropped because the "administrative burden exceeded returns" in the Tops organization.

West Marine

West Marine's CIO, Mr. David Schenk, agreed to be interviewed on June 2, 2003. The results of that scripted interview are as follows:

West Marine's Business Environment

Q.1 How is eCommerce defined at West Marine?

A.1 eCommerce is generally defined as existing in two areas at West Marine:

> "Retail" (including WM's Port Supply wholesale arm) – sales of merchandise to individuals or businesses outside WM; now includes BoatUS.com, WestMarine.com, and PortSupply.com
>
> "Supply Chain" – procurement of goods for sale from businesses (including very small businesses) outside WM. Includes hybrid EDI based on services of SPS to provide a hub for varying forms of communication vehicles vendors (Internet, fax, VAN-based traditional EDI)

Q.2 Is eCommerce viewed as important at West Marine?

A.2 Yes, very. Represents a growing channel as catalog sales decline.

Q.3 What do you see as the keys to eCommerce success?

A.3 Time-to-market for eCommerce initiatives, channel integration, ROI (low initial expenditures)

Q.4 What do you see as costs and payoffs in eCommerce implementation?

A.4 Major costs are in up-front development; WM has been focused on controlling those with use of an ISP for hosting & development on a pay-as-you-go basis. Payoffs include availability of information, consistent pricing/policies across all channels, better processes and process monitoring. Immediate availability of information is a key benefit – "yesterday's data isn't useful, we need information as it happens".

Q.5 How did you decide what marketspace(s) you would target?

A.5 [WM is targeting all of their traditional spaces + supply chain.]

Q.6 Do you specifically identify and design business processes at West Marine?

A.6 Yes – WM has established an "Efficiency Taskforce" to review process efficiency and effectiveness; they use exception reporting and executive dashboard presentation to monitor processes.

Q.7 Were there any executive level or policy changes that were needed to pursue eCommerce at West Marine?

A.7 [None identified]

West Marine's Integration Targets

Q.8 What **components/processes/activities** of West Marine did you choose to integrate with eBusiness systems? [Example: existing distribution systems]

A.8 [See A.1]

Q.9 How did you choose those components/processes/activities?

A.9 Short-duration (60 day) scope/scale, ROI w/ low upfront investments.

Q.10 Are there any components/processes/activities of West Marine that you want to integrate with eBusiness systems in the future?

A.10 Want to integrate "Special Order" process with eCommerce systems to allow on-line ordering of 300,000+ items.

Q.11 Why are you interested in integrating those components/processes/activities?

A.11 Reduced manual intervention, errors, costs.

Q.12 Were there any components/processes/activities of your existing business that you specifically choose **not** to integrate with eBusiness systems?

A.12 No. An Internet orientation is being fostered in all aspects of WM's organization and processes. An example is the use of on-line catalogs to order office supplies to encourage participation in and experience of on-line systems by everyone in the company.

West Marine's Integration Techniques and Technologies

Q.13 With which of the vendor/consultant approaches and/or technologies shown in the Integration Spectrum are you familiar?

Point-to-Point	X
Message Oriented Middleware	X
Enterprise Resource Planning	X
IDoc (Internal Document, SAP proprietary)	___
BAPI (Business API, SAP Proprietary)	___
Publish/Subscribe Middleware	X
Business Process Management	X
Data Mart	X
Data Warehouse	X
Web Services	X
Next generation Enterprise Resource Planning	X
Business Intelligence	X
Real-Time Enterprise	X
Digital Nervous System	X
Business Application Management	X
Knowledge Management	X

Q.14 Which (if any) of the vendor/consultant approaches and/or technologies shown in the Integration Spectrum have you had experience with and/or attempted to implement?

Point-to-Point	X
Message Oriented Middleware	X
Enterprise Resource Planning	X (Note 1)
IDoc (Internal Document, SAP proprietary)	___
BAPI (Business API, SAP Proprietary)	___
Publish/Subscribe Middleware	X
Business Process Management	X
Data Mart	X
Data Warehouse	X
Web Services	X (Note 2)
Next generation Enterprise Resource Planning	___
Business Intelligence	X
Real-Time Enterprise	X
Digital Nervous System	___
Business Application Management	___
Knowledge Management	X (Note 3)

Note 1 – WM uses JDA's retailing-oriented ERP software. [According to JDA's website, its applications operate in a loosely coupled, plug and play framework based on XML, Web Services, SOAP and other open standards.]
Note 2 – Websphere products

Note 3 – Focus is in Help Desk area.

Q.15 How would you characterize your experience with the vendor/consultant approaches and/or technologies shown in the Integration Spectrum?

	Good	Fair	Poor	N/A	
Point-to-Point	X				(Note 4)
Message Oriented Middleware		X			(Note 5)
Enterprise Resource Planning	X				
IDoc (SAP proprietary)					
BAPI (SAP proprietary)					
Publish/Subscribe Middleware	X				
Business Process Management		X			
Data Mart	X				(Note 6)
Data Warehouse		X			(Note 7)
Web Services	X				
Next generation Enterprise Resource Planning					
Business Intelligence		X			(Note 8)
Real-Time Enterprise					
Digital Nervous System					
Business Application Management					
Knowledge Management		X			

Note 4 – P2P still useful for small integration tasks.
Note 5 MOM has turned out to be very complex and costly.
Note 6 – Data Marts have been useful; using them in conjunction with OLAP, DB2
Note 7 – Too big and complex to be useful or easily managed.
Note 8 – Focus is in OLAP with DYNA/ARCPLAN.

Q.16 How would you characterize your experience with Data Marts and/ Data Warehousing?

A.16 Storage is very expensive. [Also see Notes 6/7]

Q.17 Have you encountered difficulties in your integration efforts as a result of data availability/quality/consistency issues?

A.17 Yes, many. Recent integration of WM and BoatUS is typical – differing product definitions despite being in basically same retail space. File layouts/SKUs differ widely. Loyalty programs using customer address information is particularly difficult.

Q.18 How did you address those issues?

A.18 "Slug-it-out" – just have to repeatedly merge, check, and consolidate data. Customer address information is professionally "cleansed" twice a year by an outside vendor using USPS and credit reporting sources.

Q.19 How have you evaluated the success of your integration efforts?

A.19 ROI, speed of information availability, consistency in channels.

"Why fumble when ChannelAdvisor had the experience to really generate results?"

Tony Gasparich
Vice President of Internet Services, West Marine

Company
West Marine, the world's largest specialty boating equipment retailer, has more than 235 stores nationwide and serves boaters in 150 nations.

Situation
Early experimentation told West Marine that eBay swarmed with visitors who were eager to scarf up their excess, refurbished and returned inventory. But they found that the time investments and overhead associated with this new channel outstripped the benefits.

Solution
ChannelAdvisor's technology and expertise gave West Marine the level of efficiency needed to maximize their yield on end-of-life products on eBay. With an average of 8,000 to 20,000 views of West Marine's eBay items each week, over time, West Marine found that the cost recovery on items sold on eBay was generally equal to or better than any of its bargain stores.

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www.channeladvisor.com

.: West Marine

Boating retailer shores up costs on refurbished inventory

Going Where the Action is

In the fall of 2000, West Marine began test-driving eBay as an avenue to accelerate the inventory velocity of its excess, refurbished and returned merchandise. The results were impressive. But they came at a price.

"We were generating good volume but the channel was difficult to manage," says Tony Gasparich, vice president of Internet services at West Marine. "It takes at least 10 to 20 minutes to post an item. Imagine posting 500 a week. And posting takes more than just throwing items on eBay. You have to categorize them, right, strategize the price points, promote the products and deal with customer support. It's a lot of overhead."

West Marine turned to ChannelAdvisor. "We realized we simply couldn't leverage the opportunity without outside help," says Gasparich. "Why fumble when ChannelAdvisor had the experience to really generate results?"

Converting Surplus into Sales

ChannelAdvisor began by posting a few new items on eBay, gradually adding more as confidence grew. West Marine found that eBay could serve as another channel to move refurbished electronics, such as GPS navigational devices. These products generated several bids per item, driving sale prices up. West Marine has experienced extremely high close rates and is very happy with the final bid prices on their refurbished electronics.

West Marine was sold. The next step was to automate information transfer by integrating its e-commerce infrastructure with the ChannelAdvisor Network. "Integration was so easy it almost scared me. I kept waiting for something bad to happen, but nothing went wrong," says Gasparich.

Since West Marine's backend now ties to ChannelAdvisor's Network, West Marine can just flag merchandise in its inventory management system to be sold on eBay. Product attributes, image paths and pricing information automatically transfer to ChannelAdvisor. ChannelAdvisor also links to West Marine's e-commerce checkout and internal fulfillment systems to offer buyers a seamless checkout through West Marine's own Web site.

Once an item is purchased, the buyer receives e-mail with a direct link to a shopping cart at West Marine's Web site. At that point, the buyer could easily add additional items to the shopping cart. Since well over half of West Marine's eBay customers are new to West Marine, this feature translates into a significant branding and customer acquisition opportunity.

Over time, West Marine found that the cost recovery on items sold on eBay was generally equal to or better than any of its four bargain stores. But while a bargain store only has a reach of about 50 miles, eBay transcends geographical boundaries to reach 6 million visitors each day. "Consumer marketplaces are a great way to move products," says Gasparich. "It's also a fun and exciting way for customers to get some fantastic deals."

customer success series

Circuit City

As a participant in Circuit City's Biz Rate follow-up survey, information about Circuit City's integration approach was requested by the author. An e-mail response was promptly provided as follows:

From: "Customer Care" <customercare@cc.Circuit City.com>
To: "Paul Ruganis"
Subject: Re: Circuit City.com BizRate comment - FF (KMM873622I9552L0KM)
Date: Saturday, March 20, 2004 4:13 AM

Dear Customer:

Thank you for writing to Circuit City.

I understand that you wish to speak to someone at Circuit City regarding the integration of stores and the web site.

I suggest that you contact your nearest Circuit City store and speak to the Store Manager. The Store Manager would be happy to help you in this regard.

Thanks again for writing to Circuit City. Your continued patronage is important to our company. We hope to have the occasion to serve your future consumer electronics, home, office and entertainment needs.

Sincerely,

Khalid S.
Customer Support Coordinator

Requests to interview local Store Mangers were unavailing. Mr. Shawn McCorry, a Customer Service Associate (CSA) Lead at the Greece, NY store

provided the following information regarding the integration approach at Circuit City:

> The Web site inventory information is updated automatically through a VPN Internet connection to each store's local inventory system. The overall inventory data is collected centrally by the corporate Web-site administrators in a database used to update the site. Inventory data at a store selected by an Internet customer is updated to place a fourteen-day hold on ordered items. The systems used to achieve this integration are extensions of systems installed by Circuit City at each store.

Additional information obtained from further research is included in the main text dealing with Circuit City case study.