Application of XML in B2B Financial Services

by

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ABSTRACT
Financial services industry is undergoing tremendous transformation due to regulatory changes and technological developments. The thesis discusses these changes including the advent of internet and how it is impacting the financial services industry. The paper provides a detailed account of XML evolution and its comparison with SGML and HTML. Several organization bodies have been formed over the past few years to define and push XML based standards for various industries. Even though XML is still in its evolving stage, there is wide consensus that it will be the enabler for disparate systems to communicate with each other. The research provides an overview of various XML standards pertaining to financial services and firms behind these standards. The author derives the conclusion that several standards with in financial services will co-exist and the industry will converge to these standards.

The thesis also provides an overview of some financial applications that are XML compliant along with examples of first mover financial services firms that have successfully applied XML to address systems issues. Based on the XML standards, changes in the industry and customer needs author predicts some future trends and milestones that will happen in the financial services industry. They include; General changes in industry Landscape, formation of Central Limit Order Book (CLOB), Emergence of HUBs and Exchanges, Global Straight Through Processing, Settlement time of T+0, Emergence of Aggregators and Enterprise Portals. The future trend section further discusses the role of XML in this changing environment and how it will help achieve some of the key break-throughs that were not possible before.

In order to fully harness the potential of XML, firms need to understand the various elements of XML. The last section of the thesis provides an overview of internal factors; issues around understanding DTD’s and other relevant factors firms need to consider for successful implementation. The factors are based on author’s own understanding of XML, issues faced by financial services industry and interviews with financial services firms.

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Section 1 Introduction

XML promises to dramatically improve the way firms exchange and present information over the internet. To help companies harness this power, influential vendors and technology players are throwing their weight behind this new language. The thesis primarily focuses on the transformation being experienced by financial services firms due to changes in regulations as well as technology and the way financial services firms can leverage XML to face the challenges of rapidly changing and demanding business environment.

Changes in financial services industry are being driven by numerous factors. These factors include; globalization, changes in regulation, strong growth in overseas markets, M&A and industry consolidation, information technology and wealth accumulation. In this paper we evaluate these factors, their business impact and how these drivers are linked to each other. One common success factor that we found which is crucial in every scenario is the need for increased system integration within a firm as well as its systems ability to communicate across multiple platforms, companies and geographical boundaries.

In this paper we also look at history of XML, compare SGML and HTML, discuss motivation and benefits for using XML and arrive at the conclusion that XML is the enabler for disparate systems to communicate with each other. Financial services firms and their vendors have realized this fact and there has been substantial adoption of XML in addressing interoperability issues. In our research we found several products from key vendors are already XML compliant and others are following fast.

In the long run success of XML and unleashing its power to the fullest will depend on established standards. Several organization bodies have been formed over the past few years to define and push XML based standards for various industries. In this paper we provide an
overview of major XML groups and discuss in detail some financial services specific XML
standards and major players behind them. It is interesting to note that several large industry
players are behind various standard bodies and standards to ensure their participation and
influence on the emerging standards.

Based on our research and understanding of XML standards, changes in the industry and
customer needs we predict some future trends and milestones for the financial services industry.
They include; General changes in industry Landscape, formation of Central Limit Order Book
(CLOB), Emergence of HUBs and Exchanges, Global Straight Through Processing, Settlement
time of T+0, Emergence of Aggregators and Enterprise Portals. The future trend section further
discusses the role of XML in this changing environment and how it will help achieve some of the
key break-throughs that were not possible before.

In order to fully harness the potential of XML, firms need to understand the various
elements of XML. The last section of the thesis provides an overview of internal factors; issues
around understanding DTD’s and other relevant factors firms need to consider for successful
implementation. The factors are based on our own understanding of XML, issues faced by
financial services industry and interviews with financial services firms.

The main contribution of this thesis is to provide a comprehensive overview of financial
services industry landscape, background of XML, it’s benefits and paint a picture of how XML
can address some of the key business issues as well as explore new opportunities to improve
service and efficiency.
Section 2 Thesis Methodology

The thesis is based on the following:

- Extensive research on the internet
- Industry research reports
- MIT course work
- Existing XML literature and books
- Vendor products and their web sites
- XML standard bodies and
- Personal interviews with financial services firms that are using XML
Section 3 Financial Services Industry Landscape

3.1 Drivers Transforming Financial Services

Financial services industry is going through tremendous transformation [32][37]. The factors driving this transformation are as follows:

- Globalization
- Strong growth in overseas markets
- Changes in regulation
- Mergers, acquisition and industry consolidation
- Information technology
- Wealth creation and accumulation

It is important to note that above mentioned factors are not independent of each other and in reality complements each other. For example changes in regulation made it possible for banks to acquire and consolidate with securities firms and success of these consolidations is based on the availability of new technology and strength of management to execute integration of these systems.

Below we discuss each of the above mentioned factors and their influence on the financial services industry:

Globalization:

The domestic competition has increased and has pushed domestic firms to expand overseas to improve their margins on services offered. Customers are willing to pay a higher price to be able to have access to

- one stop shopping
Easier management relationship with one or fewer financial services firms to manage their risk exposure

Due to increasing globalization of businesses and need for financial services firms to meet their customers growing requirements has forced financial services firms to expand their product breadth. This trend has also provided financial institutions with an opportunity to market their existing products in new locations and attract new customers base.

Globalization is now possible due to changes in governmental regulations, political climate and available technology. The availability of new technologies like XML, which facilitates data sharing and systems integration, and improvement in telecommunication infrastructure has made it easier for firms to integrate and scale their global operations and blur geographical boundaries.

Strong Growth in Overseas Markets:

Overseas markets have shown tremendous growth since the 1980's. Improvement in infrastructure, stable political environment and inexpensive labor has fueled investments and flow of capital from United States and other developed world to emerging markets. Firms from developed countries have expanded their business operations, manufacturing facilities, call centers etc, into emerging markets to lower their cost structure. This investment trend has provided financial services firms from both sides to expand their operations in each other countries to help facilitate financial transactions for their local customers.

Also, the European markets have shown strong growth ever since the collapse of Socialism. Western European countries along with US firms have made substantial investments in the eastern European block. This flow of funds again provided a potential opportunity for
financial services firms to expand their services to these new markets in order to cater their customer needs [32].

Both scenarios described above allowed financial services firms to expand their operations through either opening their own offices, establishing equity investments or mergers and acquisition.

Changes in Regulation:

The most important regulatory change that is continually transforming the financial services landscape is the repeal of Glass-Steagall act, which restricted percentage of a bank’s total revenue that could be derived through securities trading [32]. As the percentage was increased in the 1990’s the industry saw a tremendous number of mergers between retail banks and broker-dealers. Some of these include Citibank, Travelers and Salomon Smith Barney and Swiss bank with Warburg Dillon Read. The merger activity is just the beginning and there will be lot more mergers that will further consolidate the financial services industry.

The key success factor for these mergers will be the ability of the merged company to leverage off the technology integration. Firms, which will be able to successfully integrate their systems, will be the ones that will truly benefit from the repeal of the Glass-Steagall act and grow their business.

The other area within Financial services industry, which will see lot of regulatory changes in the upcoming years is the securities exchanges. In the past few years, financial service industry has witnessed a mushroom growth in Electronic Computer Networks (ECN’s). Four out of the fourteen ECN’s have already applied for an exchange status [17] [36] [37]. The way securities exchange commission iron out the governing policies for these new trading
platforms, will have a strong impact on how these trading platform will play a role in the changing landscape of financial services industry.

**Mergers, Acquisition and Industry Consolidation:**

Regulatory changes coupled with globalization and strong growth overseas have led to consolidation in the financial industry. Consolidation has also provided financial services firms with opportunities to cross-sell the broad range of product portfolio that they were able to create due to mergers and acquisitions.

As discussed in changes in regulation section, the key driver to fuel the consolidation and mergers was the repeal of Glass-Steagall act, which allowed traditional banks to have a increased portion of their earning to be driven through securities business. Also, the added benefit of economies of scale by consolidating redundant operations between banks and securities companies gave a greater incentive to firms to combine their operations. In 1990’s we not only saw increased mergers and consolidation activity among US based firms but we also saw cross border consolidation activity. Deutsche Bank and BT Alex Brown, and Credit Suisse and First Boston, are among the several cross-border mega-deals which happened recently [32].

As mentioned in the globalization section, the key factor for these consolidations to be successful will to be able to integrate their systems. IT strategy of these consolidated firms has to focus on building systems that are required to interface with a broader spectrum of applications, many of which would bridge separate line of businesses. An example of this would be a global financial firm, which deals in foreign exchange, deposits and complex instruments like swaps and derivatives. A customer would like to have its complete exposure in these products in all countries that are doing business in. For the financial services firm to pull this information on a
real-time basis could be a nightmare if all of its systems servicing different product lines and
different countries are not integrated.

**Information Technology:**

The key success criterion for all the aforementioned factors is the successful integration
of systems and technologies. The benefits of consolidation and economies of scale can be only
achieved if the systems of the merging firms as well as internal systems can be successfully
integrated. The financial services industry has been very active in testing new technologies, as
they become available, to improve their performance and services. Industry participants have
been working hard to make it products and services available on the internet and provide
customers with value added services, as this new channel becomes ubiquitous [35].

The fast growth in financial services and constant development in new technologies has
caused different departments and products to use incompatible technologies. The use of disparate
platforms has made it harder for firms to provide their customers with a consolidated view, the
very thing more and more customers are asking for. It is crucial for firms to be able to provide
their customer single comprehensive report that captures their total exposure. Firms that will be
able to provide their customers with such facility along with one-stop shopping will be the firms
that will be successful in the long run.

Technologies like XML, and other middle-ware are the enabler for financial services
firms to integrate their disparate proprietary systems.
Wealth Creation and Accumulation:

The last decade United States, European, and certain Asian and South American markets have undergone phenomenal growth. This tremendous growth has helped individuals and corporations from these markets to create large amount of wealth. As this new and increased wealth was created the corporations and individual increased their reinvestment into capital markets.

Figure 1 - Positive Feedback Loop of Wealth Creation

This cycle and the positive feedback loop as shown in figure- 1 has resulted in further growth of the markets and allowed financial services firms to ride this expansion and increase their services and product breadth to cater the growing demand. This economic expansion coupled with technological innovation posed further growth opportunities for financial services firms to offer new services domestically as well as cross-borders.

As investors earn higher rate of returns on their investments and invest more actively, they tend to make more sophisticated choices and their investing becomes more complex and their portfolios increasing include complicated strategies like Swaps and derivatives. For financial services firms, the wealthier their client base is the greater opportunity for them to cross
sell diverse financial products. As the firms strive to broaden their product portfolio to cater their client needs, the important question will be whether technology can keep up pace with the complexity of services.

3-2 Financial Services Industry Initiatives

The financial services industry collectively faces several significant initiatives in the current dynamic environment. The securities and investment sector is moving swiftly toward electronic order trading and trade execution, leading to extended trading hours and new alliances between exchanges, electronic computer networks (ECN’s) and Alternative Trading Systems (ATS’s) [17] [36] [37]. Banking and consumer credit has focused on customer acquisition. Insurance companies are emphasizing broker and client communication. Customer relationship management has become the key value proposition in all these businesses. Needless to mention that the entire financial services industry is focusing on electronic commerce to grow it’s bottom-line.

Figure 2 presented below indicates the increasing trend of internet related investments as

![Figure 2 - Technology Trends in Securities Industry](image)

Source: Tower Group/SIA Survey 1999 [32]
compared to total IT related spending in securities industries.

Repeal of Glass-Steagall act has accelerated the consolidation wave in the financial industry and internet has become an ultimate solution. Integration of various financial products is also a great influence on e-commerce. E-commerce thrives on the ability to cross-reference different but related financial products targeted to a single customer. A good example is E-citi of Citigroup. Internet has enabled Citigroup to offer its customers a one-stop shopping; full-service brokerage by Smith Barney, Travelers insurance products and traditional retail and corporate banking by Citibank.

Another area in systems growth will be Customer Relationship Management (CRM). Different segments within financial services firms have shown different level of commitments to CRM [32]. Retail and consumer banking along with securities industry has focused more on operational efficiencies and providing ubiquitous access to its customers through the internet. On the other hand, insurance companies especially Property and Casualty firms have focused on CRM technology. Figure 3 reflects the growing trend in this area.

![Figure 3 - Projected Growth in CRM Spending in P&C Insurance Industry](image)

Source: Tower Group [32]
Regardless of current level of spending on CRM's this will be a huge area of spending by financial services firms. They will need systems to increase stickiness to their sites, monitor consumer behavior, build and maintain client relationship over the internet.

The changes driven by the six factors will continue to reshape the landscape of financial services industry. Information technology management and strategy will be key for financial services firms. The success of a firm will depend upon their systems scalability, seamless integration of systems, ubiquitous information sharing and platform-independent applications.
Section 4 Introduction to XML

4.1 Introduction

What is XML?

XML (eXtensible Markup Language) is a specification developed by the W3C. XML is a pared-down version of SGML (Standard Generalized Markup Language), designed especially for Web documents [53]. XML is a meta-markup language that provides a format for describing structured data. It allows designers to create their own customized tags, enabling the definition, transmission, validation, and interpretation of data between applications and between organizations [7] [25]. In addition, XML will enable a new generation of Web-based data viewing and manipulation applications.

Figure 4 - How does XML works?

Source: Forrester Research [4]
Figure 4, presented above provides a high level overview of XML architecture and how data is exchanged between two applications using XML regardless of underlying platforms.

**Who is Behind XML?**

XML is backed by various players and standard bodies as shown in the table 1 below:

**Table 1 – Players Behind XML**

<table>
<thead>
<tr>
<th>Type</th>
<th>Function</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Bodies</td>
<td>Are responsible for facilitating and approving XML standards for industries</td>
<td>W3C, Oasis, Rosetta.net, Commerce.net</td>
</tr>
<tr>
<td>Software Vendors</td>
<td>Incorporate XML in their products</td>
<td>IBM, Microsoft, Oracle, Sun, Netscape</td>
</tr>
<tr>
<td>Industry Players</td>
<td>Using XML in their business</td>
<td>AT&amp;T, Schwab, New York Times, JP Morgan</td>
</tr>
</tbody>
</table>

We will explore this in more detail in Section 5.

**XML Documents**

XML is a text-based format, similar to HTML (Hyper Text Markup Language ) in many respects, designed specifically to store and transmit data. An XML source is made up of XML elements, each of which consists of a start tag (<title>), an end tag (<title>) and content - the information between the two tags. An XML document holds text annotated by tags. Unlike HTML, XML allows an unlimited set of tags, each indicating not how something should look, but what something means [7][11]. It is up to each document's author to determine what kind of data to use and which tag names fit best.
HTML tags are for browsing; they're meant for interactions between *humans and computers*. This limits what we can do with HTML, especially if ones need to manipulate data or for computer to computer interactions. Following example will further help us understand differences between HTML and XML.

Below is an example of HTML code (source: IBM web site) [54]:

```html
<p><b>Mrs. Mary McGoon</b></p>
<br>
1401 Main Street
<br>
Anycity, NC 34829
```

When rendered, the HTML in the above example looks like as shown below. HTML tags describe how something should look like but they don't contain any information about what the data or content.

Mrs. Mary McGoon
1401 Main Street
Anycity, NC 34829

Now let's look at some sample XML Code. With XML, you can understand the meaning of the tags. More importantly, *a computer can understand the tags as well*. It's easier for a computer to understand that the tag `<zipcode>34829</zipcode>` is a zip code.

```xml
<address>
<name>
<title> Mrs. </title>
<first-name> Mary </first-name>
<last-name> McGoon </last-name>
</name>
<street> 1401 Main Street </street>
<city> Anycity </city>
<State> NC </State>
```
By applying a different stylesheet to the same document, an XML document can be rendered in different formats as shown in figure 5. The same address can be printed on an envelope, label and a letter. The key is that with XML the information is in the document, while the rendering instructions are elsewhere. In other words, content and presentation are separate.

Motivation for Using XML

The internet has widely broadened our communication options by giving flexibility and by blurring the geographical boundaries. However, standards are crucial to exploit the full potential of the world wide web and internet. One important layer is the visual display and user interface, exemplified by current standards like HTML and GIF. These standards allow a page to be created once and be displayed at different times by many receivers.

Although visual and user interface standards are a necessary layer, they have their limitations when it comes to representing and managing data. With all the advancement in the technology arena and mushroom growth of internet, we have only scratched the surface of
internets absolute potential. Thus far, internet is merely an access medium to text and pictures. We still lag behind in performing intelligent searches, data exchanges, adaptive presentations, and personalization over the internet. In order to fully benefit from the power of internet, we have to go beyond access and display standards. We must be able to set standards regarding the information, data and content being represented on the internet. HTML only addresses the format issues on how a web page should look like; it does not represent data.

In the next two sub-sections we will look at XML from the following perspectives:

1- Value Creation

2- Value Capture

4-2 XML Value Creation

XML creates value due to the following:

Structural Representation of Data

XML provides a structural representation of data that can be implemented broadly, is

diagram

Figure 6 - S curves
Source: Author

easy to deploy and ensures that structured data will be uniform and independent of applications
or vendors. The interoperability characteristic of XML has invoked a new generation of business and electronic-commerce Web applications. XML further addresses the limitations of HTML. Figure 6 uses Forrester’s S curves [6] to reflect evolution and relationship among SGML (Standard Generalized Markup Language), HTML and XML.

XML, which provides a data standard that can encode the content, semantics, and schemata for a wide variety of cases ranging from simple to complex, can be used to mark up the following:

- An ordinary document
- A structured record
- An object with data and methods
- Result of a query
- Graphical presentation, such as an application's user interface

Once the data is extracted, it can be manipulated and presented in multiple views, without further return trips to the server. As such servers can be more scalable, due to lower computational and bandwidth loads. Also, since data is exchanged in the XML format, it can be easily merged from different sources.

XML creates value to the internet, as well as to large corporate intranet environments, because it provides interoperability using a flexible, open, standards-based format and new ways of delivering data over the Web. Applications can be built more quickly, easier to maintain, and can easily provide multiple views on the structured data.
Extensible

XML provides a robust mechanism to extend a given XML data stream. XML namespaces allow arbitrary attributes and elements to be added to an existing XML vocabulary [11]. XML provides a unique framework for tagging structured data thus allowing users to define an unlimited set of tags.

As XML tags are adopted throughout an organization and by firms across industries the true potential of internet will be unleashed. Users will be able to perform meaningful searches and communicate across multiple systems regardless of underlying architecture. Content on the internet could be presented in multiple ways and used efficiently and meaningfully by various applications. The ability of doing so creates tremendous value for businesses as well as end users.

Separation of Data from its Presentation

The power of XML lies in its ability to separate the presentation from the underlying structured data. XML allows developers to set standards defining the information that should appear in a document, and in what sequence. XML, in combination with other standards, makes it possible to define the content of a document separately from its formatting, making it easy to reuse that content in other applications or for other presentation environments. This separation of data from presentation enables the seamless integration of data from many sources [2] [7] [15] [21].
Interoperability

XML can be used on a wide variety of platforms and interpreted with a wide variety of tools. Because the document structures behave consistently, parsers that interpret them can be built at relatively low cost in any of a number of languages. XML supports a number of key standards for character encoding, allowing it to be used all over the world in a number of different computing environments. XML complements Java, another force for interoperability, very well, and a considerable amount of early XML development has been in Java. Parsers are available in C++, C, JavaScript and Python, with more on the way [11]. XML parser development so far has focused on freeware plug-ins that provide parsing capabilities to XML applications, greatly lowering the cost of building XML-enabled applications.

Making XML Data Self-Describing

Document Type Definitions (DTDs) defines rules of the document, such as which elements are present and the structural relationship between the elements. DTDs help to validate the data when the receiving application does not have a built-in description of the incoming data. With XML, however, DTDs are optional. Data sent along with a DTD is known as valid XML. In this case, an XML parser could check incoming data against the rules defined in the DTD to make sure the data was structured correctly. Data sent without a DTD is known as well formed [4] [11] [21] [38]. Here an XML-based document instance, such as the hierarchically structured address data shown above, can be used to implicitly describe itself. The open and flexible format used by XML allows it to be employed anywhere a need exists for the exchange and transfer of information. This makes it extremely powerful.
Value can be created for businesses and end-users by embedding XML data inside an HTML page; multiple views can be generated from the delivered data. XML can also be used for compelling applications like distributed printing, database searches, and others [2] [4].

**4-3 XML Value Capture**

XML brings so much power and flexibility to Web-based applications; it provides a number of compelling benefits to developers and users. Firms can capture value by leveraging off XML and can save cost of services and at the same time provide more value added, timely services to their customer by giving them powerful tools-- basically allowing the customers to be in control:

**Simple and Easy to Use**

XML is incredibly easy to use and understand. Developers who can program in HTML can learn and start programming in XML with minimal training and investment. Compared to its middle-ware predecessors like DCOM, CORBA, or Java, XML messages can be easily created using a simple text editor or scripting language [2] [11]. This accessibility has been key to XML's fast adoption.

**Focused Searches**

One major problem with today's web is that search engines can't process HTML intelligently. For example, if you search on "chip" when you're looking for someone named Chip, you might get pages on chocolate chips, computer chips, and guys named Chip. But if
there were a DTD (Document Type Definitions) for name and address records, searching for a guy named Chip could generate much more accurate and useful search results.

When using XML to exchange information between two systems, neither system needs to know other systems layout and structure. It simply requires that the interaction code between the two systems follow the document rules defined in the DTD (Document Type Definitions) [11] [38].

When writing an agent, one of the challenges is to make sense of incoming data. A good agent interprets information intelligently, then responds to it accordingly. If the data sent to an agent is structured with XML, it's much easier for the agent to understand exactly what the data means and how it relates to other pieces of data it may already know.

Open and Compatible Applications

XML allows users to architect a three-tier web application. XML provides the flexibility to manipulate the data, deliver it to other applications, objects, and middle-tier servers for further processing, or deliver it to the desktop for viewing in a browser [4] [11]. HTML, on the other side, can only be used to display the data based on the defined format.

Data Amalgamation

The most powerful value proposition of XML is its ability to integrate disparate systems. Software agents can be used to integrate data on a middle-tier server from back-end databases and other applications. This data can then be delivered to clients or other servers for further aggregation and processing.
For web-based application-to-application integration, XML is better than component systems like CORBA and DCOM as they both lacked the capability of building an application's backbone [5]. Since XML-based data is self-describing, data can be exchanged and processed without having a built-in description of the incoming data.

**Localized Manipulation**

Data in XML format can be parsed and locally edited and manipulated. Users have more control of the data as they not only represent it but can also manipulate data in multiple ways. The XML Document Object Model (DOM) also allows data to be manipulated with scripting or other programming languages. The use of XML will allow companies to develop applications that will shift the computing to the client-side and reduce network traffic and server load. This migration to ‘thick client’ and ‘thin server’ is another way to capture value by reducing server infrastructure cost and by increasing scalability of existing servers [11] [21].

**Various Ways to Render Data**

HTML defines how the data is rendered whereas XML the data itself. As we are able to separate data from its presentation, we can define multiple ways to represent the same data. Once data has been delivered to the desktop, it can be viewed in different ways. CSS and XSL provide declarative mechanisms for describing a particular view of the data [11]. This provides a true *Value capture* through customer satisfaction.

In our address example, we saw that the same address can be viewed in three different formats; 1) print it on an envelope, 2) show it on a computer screen and 3) print labels.
Partial Updates of Data Elements

Partial data fields can be updated with XML instead of sending the entire data set. This is possible because in XML user defines each data field separately using tags. If and when there is change to a particular field, only that field can be sent to make an update. In our XML example at the beginning of this section, if zip code changed from 34820 to 22222, than we can use <zipcode>22222</zipcode> to update the zipcode element without resending the unchanged portion of the data set. The other benefit is that fewer fields or data is sent from the server to the client, and the changed data can be displayed without refreshing the entire user interface, thus minimizing internet traffic [11] [21].
Section 5 Standards

5-1 Established Standards for Data Interchange

FIX (Financial Information eXchange) and S.W.I.F.T (the Society for Worldwide Interbank Financial Telecommunications) are the two oldest standards used by financial services firms to exchange financial data among themselves. There are 64,000 financial institutions in 177 countries using S.W.I.F.T.'s standards. The average daily transaction through this system is estimated to be close to 2 trillion US dollars[12]. Financial firms and personal financial management vendors have feuded for years about the standards that will let banks interact with other banks and consumers. These established standards too have realized the potential of XML and have thus embraced XML as the new emerging standard and there are efforts underway to make these standards complaint of XML [16].

Electronic Data Interchange (EDI) has been another option for firms to address automation when dealing with data exchange. The tremendous advantage XML has over EDI is that XML is both machine and human readable while EDI is only machine-readable [8] [40].

5-2 Emerging XML Based Standards

This section provides information about XML-based standards for business to business communications. Industry standards for sharing data between businesses are in their early stages. It is, therefore, unlikely that any of them could be used ‘as is’. However, standards discussed in this section offer valuable ideas for designing XML messages. At a minimum, these standards can be considered as a starting point for discussion. Firms can try to incorporate parts of the standards in their implementations.
New standards are continuously being created and this list will expand as the new standards emerge. Firms should monitor these standards and other relevant standards as they develop.

Brief descriptions are provided for the following standards:

- Financial Information eXchange (FIX/FIXML)
- Open Financial eXchange (OFX)
- BizTalk
- Simple Object Access Protocol (SOAP)
- Financial Products Markup Language (FpML)
- Electronic Data Interchange (EDI)
- Financial XML (FinXML)

**Financial Information eXchange (FIX/FIXML)**

The Financial Information eXchange (FIX) protocol is a messaging standard developed specifically for the real-time electronic exchange of securities transactions [33]. FIX is a public-domain specification owned and maintained by FIX Protocol, Ltd.

Additional information is available at [http://fixprotocol.org](http://fixprotocol.org).

FIXML is a working group sponsored by FIX to develop an XML derived grammar of the FIX protocol. A FIXML implementation will have the message format validation, cleaner, more expensive structure, and leverage of existing standards. The initial goal is to provide the ability to embed FIXML messages within traditional FIX header and trailers to minimize the impact on existing implementations.
FIX is a tag based, but non-XML, securities transactions protocol. FIX defines both the contents of the messages (application messages) as well as the means by which they are delivered (session semantics). Tags are numeric labels (like FDDA). FIX is transport-independent, but relies on a virtual circuit connection, and specifies logon and session semantics. It is currently at version 4.1.

FIXML published a number of DTD's in January 1999. Several pilots are underway. It is expected that FIX will eventually migrate to FIXML. The logon and session protocols may be a useful starting point for applications requiring this capability. The standard tags should be examined to see which ones would be useful to standardize within organizations.

**Open Financial eXchnage (OFX)**

Open Financial eXchange is a unified specification for the electronic exchange of financial data between financial institutions, businesses and consumers via the internet. Created by CheckFree, Intuit and Microsoft in early 1997. Open Financial eXchange supports a wide range of financial activities including consumer and small business banking; consumer and small business bill payment; bill presentment and investments, including stocks, bonds and mutual funds.

Additional information is available at [http://www.ofx.net](http://www.ofx.net).

OFX is an SGML and XML-like, (tag-based) framework for defining information that flows between customers and Financial Institutions. Interestingly, OFX also defines both the application message and the framework services through these tags, and standardizes the error returns from calls in a manner similar to that proposed in the XML Services Architecture document. It is currently at version 1.5.1.
OFX was modeled after a “generic” brokerage account to conform to the standard, therefore, in order to meet likely B2B requirements, the OFX responses would need to be extended (which is allowed in the specifications).

**BizTalk**

BizTalk is an industry initiative started by Microsoft and supported by a wide range of organizations, from technology vendors like SAP and CommerceOne to technology users like Boeing and BP/Amoco. BizTalk is not a standards body. Instead, it is intended to be a community of standards users, with the goal of driving the rapid, consistent adoption of XML to enable electronic commerce and application integration.

Additional information is available at [http://www.bizTalk.org](http://www.bizTalk.org).

BizTalk provides a framework for designing XML messages (currently version 0.81), some mandatory tags for identification and routing (also at version 0.81), and a place to register schemas to facilitate B2B interchange of data. Schemas participating in the BizTalk framework need to adhere to specific guidelines regarding their use of XML to represent objects, but also need to represent their XML documents using XML-Data, the Microsoft proposal for XML schemas.

**Simple Object Access Protocol (SOAP)**

SOAP is an internet Draft submitted by Microsoft as an mechanism to provide an open, extensible way for applications to communicate using XML-based messages over the web, regardless of what operating system, object model or language particular applications may use.
SOAP facilitates universal communication by defining a simple, extensible message format in standard XML and thereby providing a way to send XML message over HTTP.

Additional information is available at


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**Financial Product markup Language (FpML)**

FpML, jointly created and maintained by J.P. Morgan and Pricewaterhouse Coopers, is a new protocol for sharing information on, and dealing in, financial derivatives over the internet. It is expected to become the standard for the derivatives industry in the rapidly growing field of electronic commerce. Initially, it will handle interest rate and foreign exchange products.

Additional information is available at http://www.fpml.org.

Although FpML is XML-based, little more is known about it because the standard has not yet been published. Because of the initial focus on foreign exchange and fixed income derivatives, this may not have much relevance to B2B.

---

**Electronic Data Interchange (EDI)**

The International Organization for Standardization (ISO) has approved a new securities message standard – ISO 15022 Securities – Scheme for Messages (Data Field Dictionary). It replaces the previous International Standards for electronic messages exchanged between securities industry players. ISO 7775 – Scheme for Message Types and ISO 11521 – Scheme for Interdepository Message Types. The ISO 15022 Standard consists of a set of syntax and message design rules, a dictionary of data fields and a catalogue for present and future messages.

To address the evolving needs as they arise, the Data Field Dictionary and Catalogue of Messages have been kept outside the Standard. ISO has appointed S.W.I.F.T (the Society for Worldwide Interbank Financial Telecommunications) as the Registration Authority for ISO 15022. All new S.W.I.F.T Securities messages implemented in October 1998 are ISO 15022-compliant.

The United Nations body for Trade Facilitation and electronic Business (UN/CEFACT) and the Organization for the Advancement of Structured Information Standards (OASIS) have joined forces to initiate a worldwide project to standardize XML business specifications. UN/CEFACT and OASIS have established the Electronic Business XML Working Group to develop a technical framework that will enable XML to be used in a consistent manner for exchanging all electronic business data. Industry groups currently working on XML specifications will participate in the 18-month project. Results of the Electronic Business XML Working Group will be placed in the public domain on XML.org and UNCEFACT.org

**FinXML**

FinXML is an XML based framework developed by Integral to support a single universal standard for data interchange within Capital markets. FinXML acts as a common standard for cross application information exchange, allowing a financial institution or other organization to communicate the details of highly structured financial transaction in electronic form.

Additional information is available at [http://www.finxml.org](http://www.finxml.org).
As a vendor-initiated consortium, FinXML has been endorsed by Sun Microsystems and Chase, as well as Integral. A number of DTD’s were published in July 1999.

5-3 Convergence of Existing and Emerging Standards Via XML

Advocates of the Open Financial Exchange (OFX), Integrix’s Gold Standard, and the new Interactive Financial Exchange (IFX) specifications hope to bring the ubiquity and interoperability of HTML browsing to the financial services market. Each specification addresses a different audience. Each interface supports some form of banking, bill payment and presentment, and investing. OFX enables consumer-to-bank interactions; Gold helps financial institutions develop bank-to-bank and bank-to-service provider transactions; and the future IFX blends OFX and Gold, adds business rules, and splits technical message formats from transactional semantics.

FIX and S.W.I.F.T both have already launched an effort to migrate their systems to XML. This migration trend shows acceptance of XML in financial services industry and will force medium to small firms to migrate as well. Forrester Research projects that banks, non-banking financial firms like insurance companies, and suppliers of desktop software will embrace the XML-based IFX specification [4].

Adoption of XML will by far increase that of EDI due to its simplicity, ease of use and cost effectiveness. However, firms that are currently using EDI and have required infrastructure already in place will be slower to adopt XML [31]. Adoption rate of XML will be faster among the firms, which either did not jump on the EDI bandwagon or are among the younger firms [8] [20][40].
Competing camps will converge around XML. All the specifications build on the same three foundation stones of the Internet, client/server architecture, and request-response interactions. Software industry's massive investment in XML-enabled browsers, databases, content management systems, and application servers will push competing spec developers closer.

Early adopters will start with OFX. Financial institutions already can choose OFX servers from Corillion, Edify, Innovision, and InteliData to support their Quicken 99 and Money 99 customers. These servers filter personal financial manager (PFM) requests through a proxy server, format messages, and interact with back office mainframes -- just as an ATM or IVR system would. Many players expect to cut over to XML-based IFX in the next 12 months. Charles Schwab has already launched an effort to move from OFX to XML-based IFX.

IFX blends the best of OFX and the IFX proposal from the Banking Industry Technology Secretariat (BITS) will satisfy Gold lobbyists by addressing following aspects of OFX:

- High level of customer support
- Improved communication interfaces and consumer-focused software
- IFX will be based on EDI X.12 specification (By Data Interchange Standards Association – DISA), which is a wider group of industry members compared to OFX which is driven by Microsoft, Checkfree and Intuit driven
- Standards for interfaces in order to reduce and or eliminate time spent on interface development

For IFX to succeed they will have to:

- Help financial institutions get out of the specialized software business
- Extend IFX to non-banking institutions e.g. insurance companies and brokerages
Simply adopting XML as a component integration technology does not completely solve the interoperability problem. In particular, even though much of the industry is embracing XML as an interoperability technology, this only pushes the interoperability problem up one level of abstraction. Even if the entire industry were shift to XML overnight, this alone would not help, as different organizations are likely to use different XML vocabularies to represent the exact same information.

The success of XML is closely associated to the emergence of XML standards within each industry. Aforementioned XML standards are addressing different segments of the financial services industry, e.g. FpML is targeted towards derivatives and foreign exchange and FIXML is geared towards real-time electronic exchange of securities transactions. In the short run there will be several standards within each industry, however, in the long run these standards will converge. The success of these standards and impact of XML can be realized only if users and software vendors strictly follow these standards and not deviate to create their own modified version. Various standard bodies will also play a key role in success of these standards by ensuring these standards are convergent at some point.
## 5-4 XML Based Applications and Products in the Financial Services Industry

Table 2 – XML Vendors

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Product Name</th>
<th>Applications of product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sybase</td>
<td>Sybase Financial Server</td>
<td>Part product, part development and deployment platform. Provides transaction server capacity bundled with data transport facilities, database-independent access and connectivity access and connectivity to legacy applications</td>
</tr>
<tr>
<td>Microsoft</td>
<td>DNA F/S</td>
<td>Application architecture that uses XML as a standard interface for integrating different standards, platforms and technologies. Several pilots underway in the securities industry</td>
</tr>
<tr>
<td>Innovation Corp.</td>
<td>OFX, FIXML servers</td>
<td>OFX server used by banks/brokers to connect personal financial management applications with back-office systems. FIXML server is used by securities firms to send/receive FIX messages. American Century, T Rowe Price, Discover Brokerage, Discover Financial Services, and Dreyfus are clients of Innovation.</td>
</tr>
<tr>
<td>WebMethods</td>
<td>B2B Integration server</td>
<td>Develops tightly integrated electronic commerce systems used by some major commercial banks</td>
</tr>
<tr>
<td>Fairfax, VA</td>
<td>Ebusiness system</td>
<td>Includes modules for electronic commerce, customer service and sales automation. Over 24 clients including a few financial services firms</td>
</tr>
<tr>
<td>SilkNet</td>
<td>ReachSite</td>
<td>An XML application server that transforms text into interactive XML documents. Used by over 12 firms including some major commercial banks and securities firms</td>
</tr>
<tr>
<td>ReachCast</td>
<td>FinXML, Integral 4.0</td>
<td>Has defined an XML specification for banks and brokerages to trade various securities. Integral 4 is a browser-based risk and trading application</td>
</tr>
<tr>
<td>San Ramon, CA</td>
<td>IMatrix, FOCUS</td>
<td>IMatrix allows firms to access data residing in disparate databases. Focus provides the end-user interface for accessing and viewing JavaBean applications</td>
</tr>
</tbody>
</table>

Source: Tower Group
### 5-5 Financial Services Standards/Standard Organization

**Table 3a – XML Standards and Standard Bodies** (Source: Author)

<table>
<thead>
<tr>
<th>ABB</th>
<th>Full-name</th>
<th>Description</th>
<th>Comments</th>
<th>By</th>
<th>Directors/ owners/committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFX</td>
<td>Interactive Financial Exchange</td>
<td>The goal of the IFX Forum is to facilitate efficient and effective development of a family of global business requirements and specifications, which result in an open and interoperable foundation for online financial services</td>
<td>IFX builds on the industry experience of the Open Financial Exchange (OFX) and Integrin GOLD specifications, which are currently implemented by major financial institutions and service providers</td>
<td>Jointly developed with OFX and GOLD</td>
<td>CheckFree Corporation, Integrin Financial Network, Intuit, Inc., EDS, AT&amp;T, IBM, Wells Fargo, PaineWebber, Microsoft, Bank of America, NT&amp;SA, FleetBoston Financial, Citibank, N.A., Security First Technologies, BITS</td>
</tr>
<tr>
<td>GOLD</td>
<td>Integrin Financial Network’s GOLD</td>
<td>The GOLD Standard enables the financial institution to create network-based applications composed of best-of-breed functions supplied by the financial institution. This ensures the presentation of service preserves the relationship with consumers and small businesses the financial institution has worked so hard to create</td>
<td></td>
<td>IBM and Integrin</td>
<td>ABN AMRO, Bank of America, Bank One, Citibank, Comerica, First Union National, Fleet Financial, IBM, Mellon Bank, Michigan National, PNC Bank, US Bancorp, Visa USA, Washington Mutual, Wells Fargo</td>
</tr>
</tbody>
</table>
### 5-5 Financial Services Standards/Standard Organization (Cont’d)

#### Table 3b – XML Standards and Standard Bodies  (Source: Author)

<table>
<thead>
<tr>
<th>ABB</th>
<th>Full-name</th>
<th>Description</th>
<th>Comments</th>
<th>By</th>
<th>Directors/ owners/committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFX</td>
<td>Open Financial Exchange</td>
<td>OFX is a unified specification for the exchange of electronic financial data over the Internet. By eliminating connectivity as an issue, Open Financial Exchange enables financial services companies to make choices about the platforms, processors and systems they work with.</td>
<td>XML compliant in v 2.0</td>
<td>CheckFree, Intuit and Microsoft.</td>
<td>Bank of America, Chase Manhattan Bank, Citibank, First Technology Credit Union, KeyBank, Wells Fargo, Woodforest National Bank</td>
</tr>
<tr>
<td>FIX</td>
<td>Financial Information eXchange</td>
<td>The Financial Information eXchange (FIX) Protocol is a &quot;language&quot; which defines specific kinds of electronic messages for communicating securities transactions between two parties. FIX defines only the format of the messages and the session-level interaction between two applications -- it is not a software application in its own right. OFX is a query-response protocol much like HTTP, while FIX is a connected, session-based protocol.</td>
<td>XML compliant in v 4.2</td>
<td>FIX and OFX were designed to communicate financial information. The resemblance between the two protocols doesn't go much further than that at present. OFX is very retail-focused, while FIX targets institutional business.</td>
<td>American Century, Foreign &amp; Colonial Management Limited, Goldman Sachs, Salomon Smith Barney Inc, State Street Global Advisors, WDR</td>
</tr>
</tbody>
</table>
### 5-5 Financial Services Standards/Standard Organization (Cont'd)

**Table 3c – XML Standards and Standard Bodies** *(Source: Author)*

<table>
<thead>
<tr>
<th>ABB</th>
<th>Full-name</th>
<th>Description</th>
<th>Comments</th>
<th>By</th>
<th>Directors/ owners/committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>FpML</td>
<td></td>
<td>FpXML™ (financial product markup language) is a new protocol for sharing information on, and dealing in, financial derivatives over the Internet. It is expected to become the standard for the derivatives industry in the rapidly growing field of electronic commerce.</td>
<td>Initially, it will handle interest rate derivative products. Based on XML, FpML enables the integration of a range of services, from Internet-based electronic dealing and confirmations to the risk analysis of client portfolios.</td>
<td>J.P. Morgan PwC.</td>
<td>Bank of America Warburg Dillon Read Morgan Stanley Dean Witter Paribas J.P. Morgan Deutsche Bank Chase Fuji Capital</td>
</tr>
<tr>
<td>FinXML</td>
<td></td>
<td>FinXML™ is an XML (eXtensible Markup Language) based framework developed to support a single universal standard for data interchange. Within the Capital Markets, FinXML acts as a common standard for cross application information exchange, allowing a financial institution or other organization to communicate the details of highly structured financial Transactions in electronic form.</td>
<td>FinXML can be used as the basis for straight through processing (STP) and risk management within a financial institution as well as conducting e-commerce over the Internet. The availability of FinXML opens up a range of possibilities for the Capital Markets</td>
<td>The Consortium is funded by member organizations and is vendor neutral.</td>
<td>N/a</td>
</tr>
</tbody>
</table>
5-5 Financial Services Standards/Standard Organization (Cont'd)

Table 3d – XML Standards and Standard Bodies (Source: Author)

<table>
<thead>
<tr>
<th>ABB</th>
<th>Full-name</th>
<th>Description</th>
<th>Comments</th>
<th>By</th>
<th>Directors/ owners/committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>BITS</td>
<td>Banking Industry Technology Secretariat</td>
<td>BITS, the technology group for The Financial Services Roundtable (formerly The Bankers Roundtable), was created in the fall of 1996 to foster the growth and development of electronic banking and commerce in an open environment. Such an environment will encourage greater choice and efficiency in financial software, access devices, networks and processing capabilities for the benefit of financial institutions and their customers.</td>
<td>Formerly owned IFX requirements. Now owned by IFX. Throughout its work, BITS seeks to enhance financial institutions' roles as trusted intermediaries. BITS promotes safety and soundness in payments systems and Electronic banking products and facilitates development of superior market-driven technologies.</td>
<td>BancOne</td>
<td>BankBoston, Bank of America, Chase Manhattan, Citibank, First Security, First Union, Fleet, Huntington, KeyCorp, Mellon, Synovus Financial Corp., Wachovia Corporation, Wells Fargo &amp; Company</td>
</tr>
</tbody>
</table>
Section 6 Current XML Adoption

6-1 XML Adoption in Financial Services Industry

Financial services firms have always been aggressive in testing and adopting new leading

dge technologies. Firms like Charles Schwab, Fidelity, Citibank and Merrill spends billions of dollars every year to maintain their existing infrastructure and improve their service levels by using cutting edge technologies. Application of XML has received warm welcome from the financial services industry and has ‘crossed the chasm’ as shown in figure 7 based on Geoffrey Moore’s “chasm” model [23]. The adoption of XML has been growing faster than ever among users and vendors. Financial service giants like; Fidelity, Schwab, Merrill and JP Morgan are exploring avenues to leverage off XML to enhance their internet businesses. Major vendors to the industry like Integral, SAP, Ariba and Commerce one are also aggressively working to make their products XML compliant. The diffusion will grow even faster as some firms were holding back on new projects/technologies until after the Y2K issue, which is now over.
Examples of XML Application by Financial Services Firms and Products Available to Financial Services Industry

Append below are some examples of application of XML by a financial institution and XML based products available to financial industry. These examples further proves that adoption of XML has crossed the 'chasm' [23]. Information has been collected from respective web sites shown in each case.

1. CFOWeb

Source: www.cfoweb.com [65]

CFOWeb.com is the financial service industry's first full-service internet portal site for CFOs, fund managers, and corporate treasury operations. It represents the first single-source location for independent third-party valuations, portfolio and risk management, and trading directly with providers.

Figure 8 – CFOWeb.com Architecture (Source: CFOWeb.com)
Figure 8 above provides an overview of CFOWeb architecture. CFOWeb.com is designed to act as an intelligent financial server capable of modeling most financial instruments and events, including front to back office trading and risk management processes provided by the financial institutions. CFOWeb.com communicates data to and from financial institutions and back to the end-users' internal treasury system using FinXML, the standard capital markets XML representation. The Internet Financial Server (IFS) includes the ability to import and export any financial instrument, portfolio or market data set using FinXML

2. **Billcast**

Source: [www.justintime.com](http://www.justintime.com) [64]

BillCast from JUST IN TIME is the premier enterprise application platform for internet billing and interactive customer care in the electronic channel. Using BillCast, service companies can deliver superior billing and customer care conveniences through the internet, increasing customer satisfaction and reducing churn.

BillCast provides all the functionality and flexibility necessary in a complete internet billing application. Along with the BillCast suite of application modules, BillCast includes bill presentment, payment, distribution of electronic bills to consolidators, such as home banking Web sites and portals, and integration with existing billing and enterprise systems. Right out of the box, BillCast includes a complete, brandable application with support for all the business processes needed to help billers get up and running quickly. All capabilities of BillCast are completely customizable and extensible to meet billers’ exact requirements.

BillCast seamlessly integrates with Just in Time’s suite of internet billing and interactive customer care applications, providing a complete platform for managing customer relationships
through the electronic channel. All BillCast applications share the capabilities of the core BillCast platform, including:

- Enterprise-class scalable application platform
- Flexible application definition via business rules
- Personalized billing and service delivery
- Modular applications that can be added as needed
- Support for direct and consolidator distribution model

![BillCast Architecture](image)

**Figure 9 — BillCast Architecture (Source: Justintime)**

The BillCast is a modular system as shown in figure 9, and allows billers to purchase capabilities they need and purchase separate add-ons as they deem appropriate. BillCast’s XML-based definitions of back-end systems make it easy to map integration to existing billing and
customer care systems. Additional enterprise software systems—data warehousing, accounting, and provisioning—can be easily integrated using XML.

3. **Integral Internet Financial Server**

Source: [www.integral.com](http://www.integral.com)[62]

Integral is a leading provider of e-commerce infrastructure for capital markets. Central to this infrastructure is a scalable, extensible platform built using leading edge technology. Integral platform can immediately deliver proven trading and risk management functionality to internal users, and can seamlessly extend these capabilities to your worldwide customer base as an e-commerce offering.

At the core of the Integral platform is the Integral Internet Financial Server (IFS), an intelligent financial application server designed to support a broad range of financial products as well as front to back office trade processing as shown in figure 10. Integral IFS leverages Enterprise JavaBeans technologies to provide a scalable, extensible, and flexible platform for hosting enterprise financial applications. It provides a complete set of applications services for capital markets transactions and offers a rich set of reusable financial application components that can be easily customized or extended using the Integral IFS Software Development Kit (SDK). Integral IFS supports modern high-throughput architectures including web server clusters and symmetric multi-processor machines (SMP), ensuring enterprise levels of scalability and performance. It also features comprehensive front-to-back office security. Integral IFS uses Financial Extensible Markup Language, (FinXML), the first XML mark-up language designed specifically for capital markets, to easily integrate information from a wide array of proprietary systems, providing a single clearinghouse for all enterprise information.
4. **Wells Fargo Cashes in on XML Technology for its Foreign Exchange**

**Marketing and Dealing System with Help From OOP.COM and IBM**


Foreign Exchange System

Wells Fargo has recently developed a 100% pure Java system that allows its Foreign Exchange (FX) advisors to conduct the business of foreign exchange at multiple geographic sites across the country. Wells Fargo was in need of a new system to be available to multiple geographic offices with increased stability to minimize downtime.

Wells Fargo has more than 9 different locations with 70+ concurrent users on this system. The solution also had to be flexible and stable enough to allow the system to keep up with the changing needs of the extremely competitive financial services environment.

Object technology, specifically Java, was investigated for its platform neutrality and industry support. All the reports are generated in XML. The data and format aspects of the reporting system are separated so that multiple presentations can be made based on the XML
report data (HTML is currently supported; Excel and PDF support is being added in version 2). This allows the end users to receive the data in the format they are most comfortable with. The internet-based presentation of the data reduces paper consumption and delivers the data directly to the end user. The reports are easily customizable and managed centrally, and provide real-time access to data.

Wells Fargo needed to have a vast array reporting technologies that would allow for flexible delivery options, and support rapid changes to report criteria. When the decision was made to use XML technology for the basis of the reporting system, an extensive evaluation of the XML products available in the market was done. In multiple benchmark tests, IBM's XML technology (parsers) was consistently on top in performance and reliability. The IBM XML technology emerged as the standard for all XML-based operations in the application.

XML was used for its portability. It offers the ability to export reports to any XML-aware software available. When designing the reporting module, the concept of "criteria objects" was created. Criteria objects were objects that contained attributes that pertained to each report (things such as filter data, sorting orders, etc.) Because these objects were very different in their attributes, mapping presented a problem. It was important not to have to modify tables and adjust mappings each time a new report was created or modify the criteria attributes for an existing one. A mechanism that would persist for our criteria object in XML was created.

5. **First Union Bank on Java and XML**


The First Union environment is heterogeneous, consisting of OS/390, AIX, Solaris, HP/9000, and Windows NT servers with Windows NT, Windows 98, Solaris, and AIX clients.
To cost effectively build applications that will run in this environment, First Union turned to Java for platform run-time independence and to XML for platform-independent data.

The bank's distributed applications are built on a messaging infrastructure. Application logic running on distributed Web and application servers initiates data requests and transactions to the OS/390 server via an IBM MQSeries message block. The message content is based on a First Union proprietary specification called Common Interface Message (CIM). Back on the OS/390 system, a message broker interrogates the message header and routes the request to the appropriate subsystem such as CICS or DB2 IMS for processing.

Before the application sends the message across the LAN to the OS/390 message broker, the message content is converted to an XML-tagged data stream using a service built by First Union's Distributed Object Integration Team. Another service, which utilizes the IBM XML for Java (XML4J) parser, parses the request for backend server processing.

First Union has also written a third service to convert COBOL copy books to DTDs. This allows them to use the XML4J parser to validate that the data block portion of the request matches the COBOL data structure that the OS/390 application expects. The use of Java and XML has been proved to be successful to date and will soon be incorporated into several systems company-wide. The first deployment usage of XML was in the bank's call center application, E2. XML is also being used in the next version of First Union's commercial Cyberbanking application. The first deployment usage of XML has been in several internet-channel applications, for server-to-server messaging. It is currently being used in development in many other projects as well.
6. mySAP.com Provides Collaboration and Interoperability Through Internet-Business Framework

Source: http://www.sap.com/solutions/technology/index.htm [57]

The leading provider of inter-enterprise software solutions, unveiled new XML-based technologies for Web collaboration within the Internet-Business Framework. On the basis of this flexible and open infrastructure, mySAP.com provides an open collaborative business environment of personalized solutions on demand. The new mySAP.com Workplace lets users enjoy easy, uniform and personalized Web access to both intranet and internet applications and information from any place at any time. XML-based Web messaging and WebFlow empower companies to implement dynamic, collaborative solutions with their employees, customers and partners and to facilitate change at internet speed.

The Internet-Business Framework targets a new model of business software that demands ease of change, ease of access, ease of collaboration and interoperability. Driven by new internet-enabled opportunities, this model features dynamic collaboration among users, business partners and customers throughout a trading community or market. By engaging in collaborative business activities, companies will be able to move beyond traditional boundaries and quickly find different and innovative ways to solve business problems and build new customer relationships.

SAP technology strengths that facilitate inter-enterprise collaboration and interoperability include an inherently thin-client three-tier internet architecture as shown in figure 11, more than 1,500 XML-compliant open interface definitions openly published on the Web, and an open and flexible component-based architecture. The SAP platform also delivers
excellent scalability through support for parallel application and database servers along with world-class reliability and security.

![MySAP.com Architecture](image)

Figure 11 - MySAP.com Architecture (Source: MySAP.com)

*Following products (item 7~10) are FIX compliant. FIX v 4.2 will be XML ready.*

7. **NyFix Systems –Product Desktop Systems**

Source: [http://www.nyfix.com](http://www.nyfix.com) [59]

Nyfix Systems offers integrated system solutions for the Trader Desktop. Windows-based applications and state-of-the art network enable traders to electronically enter and route orders to different locations, manage workflow by keeping track of individual order status and average pricing, and improve the flow of information among parties, resulting in greater efficiency and reduced errors. Nyfix's Trader Desktop Systems are fully FIX (Financial Information eXchange)
compliant, offering traders the greatest level of electronic connectivity available today through Nyfix's combined FIX and Exchange Access Network, NYFIX.

8. **NyFix Systems – Centralized Electronic Access**

Source: [http://www.nyfix.com](http://www.nyfix.com) [59]


Trinitech's Electronic Connectivity Services include:

Buy-side to Sell-side Connections and Order Routing Access

Independent Broker Order Routing Access

Market Maker Access

Electronic Crossing Network Access

Regional Exchange Access

Clearing and Back-office Links

OCS Online Comparison SystemLink

9. **NyFix Systems – Exchange Floor Systems**

Source: [http://www.nyfix.com](http://www.nyfix.com) [59]

Nyfix offers integrated system solutions for exchange floor booths on all major Regional and Foreign Exchanges. FIX compliant order management and routing system enables clerks and
floor brokers to receive orders electronically from upstairs traders and enter and route execution information back to traders in real time.

**Figure 12 – FIX Messaging Through AutEx/TradeRoute**

Architecture overview is shown in figure 12. Real time quotes from the exchange floor can also be sent to traders in several locations simultaneously. Nyfix's wireless systems enable floor brokers to communicate directly with their booths and upstairs traders from a handheld "wearable" computer. Nyfix's exchange floor systems help improve the flow of information, reduce errors and increase the efficiency of trading floor operations.

10. **Bank Internet Payment System**


Based on XML, Bank Internet Payment System (BIPS) was developed by the Financial Services Technology Consortium or FSTC. BIPS covers payments to and from banks and has
several working prototypes ongoing or planned to test basic BIPS functions Glenview Bank in Illinois), consumer utility payments (Mellon Bank), and higher volume business payments (Citibank). FSTC designed BIPS to work with current electronic bank messaging and settlement systems including the FedWire, Society for Worldwide Interbank Financial Transfers (S.W.I.F.T), and automated clearinghouse standards.
Section 7 Future of Financial Services

Dramatic advances in information technology in recent years have enabled the development and implementation of electronic data networks that can link computer systems (and the people who use them) around the world. This kind of global linkage was inconceivable a decade ago, however, now not only it is possible but it is also efficient and affordable. The internet and the World Wide Web have evolutionized basic system-to-system data communications, and they can revolutionize any and all business processes and functions that involve transmitting and sharing information between organizations [27]. Electronic data networking offers exciting new options to both individuals and organizations, not just for communications and customer service, but as a transaction channel as well.

As technology development lead to redesign of fundamental business processes enterprise-wide, organizations must cope with entirely new ways of conducting business and commerce. And as completely new business models and entities emerge and prosper, older methods of doing business—and the companies that continue to rely on them—can suddenly become uncompetitive, and hence, obsolete.

The challenges to financial service firms in the new economy of electronic information and electronic commerce (e-commerce) are substantial, but so are the benefits to be gained by addressing them. Corporations that have highly automated treasury and financial management applications have seen the potential for automating information delivery and transaction initiation, thus facilitating business-to-business trade. This potential has been seen as well by the financial service institutions that serves those corporations.

Business to Business electronic commerce is already a $43 billion industry and is estimated to grow between $1.4 trillion and $3.2 trillion by 2003, according to Forrester
Research [34]. The increased B2B e-commerce will require new and improved way of doing business. Technology, regulation and creativeness will play an integral role in shaping up of this new channel. Following are some key phenomenon that will take place in the financial services industry in the next few years:

- General Changes in Industry Landscape
- Central Limit Order Book (CLOB)
- Emergence of HUBs and Exchanges
- Global Straight Through Processing
- T+0
- Aggregators
- Enterprise Portal

Some of the processes and changes have already started. The winners in these scenarios will be the firms that are nimble to radical changes, open to new ways of doing business, exploring new channels, and are first mover in that space.
General Changes in Industry Landscape:

Internet has impacted all industries and businesses and has forced the brick and mortar incumbents to think of new ways of doing business and to interact more closely with their partners in the value chain [39]. The financial services industry has been impacted by the internet as well and will have to undergo significant restructuring to survive current and future waves of global information technology changes.

The most agile organizations in the financial industry will enjoy extraordinary opportunities for growth and expansion over the next few years, while those resisting changes will either cease to exist or be forced to merge. Technology has transformed the financial industry into an emerging market and only those companies that embrace technological change and restructure their business in this new market environment will survive [1].

Major forces, which are driving changes in the financial services industry, include technology, economic/social, globalization and regulatory forces. Financial services firms will have to position themselves to meet head-on the challenges posed by internet inspired electronic commerce and online services; tightening of regulations issued by the Securities and Exchange Commission governing such operations as licensing requirements for off-floor traders; internet fraud; and regulations such as T+1 processing.

Financial service organizations are beginning to recognize these changes in the industry and are seeking new growth opportunities by paying greater attention to the following six business imperatives:

1. Global and local linkage of customers, partners and suppliers
2. Pursue alliances, partnerships, mergers and acquisitions
3. Strengthen customer relationships and cross-sell customer services through
development and enhancement of existing products and services portfolio

4. Create and foster information management, particularly in the area of intellectual
property

5. Reduce costs and improve speed of products and services to market

6. Align business and technology strategy

All of these will collectively help position companies to succeed in what promises to be
an increasingly volatile market.

We have already seen due to the repeal of Glass-Steagel act there has been an increase in
number of mergers across the industry. This trend will continue and we will see even more
mergers and acquisition where firms will acquire niche players in different market segments to
build a comprehensive product portfolio [10]. Some of the mergers and acquisition that will
happen will include incumbent financial services firms taking over newer players that have built
their business models around internet. Firms like Ameritrade whose business model is a 100%
internet play, low cost and narrow product breadth would not be able to survive on its own as
trading will become a commodity and trading commissions will reduce to zero. Such firms will
be acquired by stronger and larger firms with existing product breadth and who are looking to
add or further enhance their internet channel along with existing distribution channels.

As the customers gets more demanding and business environment more complex,
technology and first to market will become the key factor for success. We will see an increase
trend for financial services firms to look for alliances and partners to reduce systems
development costs, share risk and push new standards developed by them. This is very different
from the past where financial services firms have been notorious in trying to reinvent the wheel and create proprietary systems.

Looking at the ECN market we found an interesting phenomenon where investments and alliance were across the board, see table 4. Investment banks and broker-dealers are investing in several ECN’s simultaneously as well as Investment banks and broker-dealers are jointly investing along with their key competitors in ECN’s [17] [36]. Fidelity and Schwab, two major rivals in the on-line brokerage arena, jointly invested in RediBook, last year. This kind of

<table>
<thead>
<tr>
<th>Table 4 – ECN Ownership</th>
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<tbody>
<tr>
<td>Ownership Stakes in Referenced ECN</td>
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</table>

<table>
<thead>
<tr>
<th>ECN</th>
<th>Goldman Sachs</th>
<th>Merrill Lynch</th>
<th>MSNW</th>
<th>CITI-SSB</th>
<th>JP Morgan</th>
<th>DLJ</th>
<th>E-Trade</th>
<th>CSFB</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instinet</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Reuters, DTK Holdings, Europe@web 7.5 percent, TA Associates</td>
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<tr>
<td>Island</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
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<td></td>
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<td></td>
<td>Knight/Trimark, ACS, Sunguard</td>
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<tr>
<td>Brut</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Townsend Analytics, G. Putnam, Southwest, CNBC, Instinet, American Century</td>
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<tr>
<td>ARCHIPELAGO</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>Redibook</td>
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<td>X</td>
<td>X</td>
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<td>Lehmen, Waterman, SLK, Fidelity, Schwab, NDB</td>
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<tr>
<td>Tradebook</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Bloomberg, Bank of New York</td>
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<td>Strike</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td></td>
<td>Prudential, Hull, 24 frims in group</td>
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<td>Optimark</td>
<td>X</td>
<td>X</td>
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<td>X</td>
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<td>Dow Jones, Softbank, PCX, NASDAQ, Knight-Trimark</td>
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<td>Primex</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>Bernard L. Madoff Investment Securities</td>
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<td>Tradepoint</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>UBS, DKM Warburg, American Century</td>
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<tr>
<td>MarketXT</td>
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<td>X</td>
<td>X</td>
<td>X</td>
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<td>Herzog, Polaris</td>
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<td>NexTrade</td>
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<td>X</td>
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<td>Privately Held</td>
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<td></td>
<td>All-Tech Direct</td>
</tr>
</tbody>
</table>

Sources: TowerGroup, Traders Magazine, Securities Industry News, Author, J Galper, D Berray, February 2
behavior is due to the changing and uncertain business environment and firms are trying to hedge their bets. This kind of co-opetition will be a strong and growing factor over the next few years.

Another good example is of Chase Manhattan, First Union Bank, and Wells Fargo Bank. They recently joined forces to create a new for-profit company, named Spectrum, that would develop electronic bill presentment and payment capabilities. All three banks have prior experience in this area. Wells Fargo has already piloted bill presentment with TransPoint, while First Union has had limited programs with CheckFree. Chase, meanwhile, has already struck a deal with CheckFree to test electronic bill presentment. With increasing internet traffic and realizing potential of bill presentment and payment related to that, the three banks have decided to set-up their own venture. It is interesting to note that before them, there was no banking institution in this business and all players were hi-tech and or internet startups dominating the market.

As mentioned throughout this paper, technology will play a key role in shaping the future of financial services firms. Financial services firms have spent a great deal of money and effort to build proprietary systems. A recent study done by Rubin Systems Inc., showed that financial services firms spent nearly $39,000 per employee on information technology in 1998 [29]. Study also mentioned that hefty tech spending doesn’t necessarily drive increased business performance.

The increased cut throat competition and shrinking margins has put lot more pressure on financial services firms to improve their technology investment related ROI without cutting back on new initiatives. This has spurred the shift firms from building proprietary systems to building and promoting open systems. Another trend we will see is the increased use of off-the-shelf packages rather than in-house development as well as outsourcing of non-critical systems.
Due to the ubiquity of internet and technologies like XML, financial services industry has been drifting from building proprietary software and standards to more open systems and standards to allow them to easily communicate and exchanges information with their partners to better serve their end customers. We have seen this in the area of XML standards. Financial firms have formed groups and consortiums to promote open standards and are building systems across these standards. FpML, FinXML, cXML, and IFX just to name a few. Even though there is lot more work to be done in order to achieve total agreement and harmony among the players but it sure indicates the future direction.
Central Limit Order Book (CLOB)

Formation of a Central Limit Order Book (CLOB) has been a hot topic in United States. The CLOB is defined as a central repository where the bid-ask prices for all financial products will be available to all traders from all trading platforms. The need for a CLOB arises from the fact that as a security could be traded over various platforms and for a split second the prices of the security at different platforms could be different by a fraction. This difference may result in an unfair pricing of the security to the traders trading through that platform [22]. Even though the price differential would be only for a split second and as the arbitrageurs move in the price differential will disappear, the fact that there is a possibility of mispricing remains an issue to be addressed. Part of the value proposition that Electronic Communication Networks (ECN’s) are marketing is that they can offer fair pricing to their customers [17] [37].

Increased fragmentation and globalization are the two key factors that are forcing the need of CLOB and fair pricing [22]. Fragmentation of securities market happens when orders for a security are being executed over various platforms resulting in its limited liquidity at each platform. This illiquidity impacts the price discovery process for the given security. Fragmentation not only threatens the health of stock exchanges; it also undermines public confidence in the broader capital markets system.

Financial markets are experiencing increased globalization. The globalization on one hand is creating new and extended markets for securities and allowing companies to raise money across geographical boundaries but on the other hand is also making the price discovery an issue for traders. The impact of both increased fragmentation and globalization has made it even more important to have a CLOB.
There are several ways that a CLOB could emerge as reflected in the figure 13 below. Formation of a CLOB may be either through government regulators, broker/dealer consortium, extension of NASDAQ “supermontage” or major banks. Currently, market users and service providers are in an iterative process about how many markets are to be included in the CLOB and what additional services will be offered, if any. The CLOB may significantly change the way that established firms manage and route orders to financial markets. It may also alter the business models of firms that benefit from a segmentation of information between market users.

The mushrooming of ECN’s is the first and interim step towards formation of CLOB. If and when it happens, ECN’s will be eliminated from the market, as they will be unable to sell their current value proposition of fair pricing. Regardless of who are the players that make the idea of CLOB a reality, technology will be a key role in its strategy and execution. The most like scenario of establishing a CLOB will be a “tech-driven CLOB” which will create a virtual
repository of real-time bid-ask price of all securities by connecting systems of all established platforms in the market.

As mentioned in XML advantages section, XML tags offer easy, readable forms for passing data, minimal maintenance and XML data is far quicker to integrate into the existing systems across companies because people can understand the structure in electronic data interchange. It is the only technology available today that can be utilized in formation of a virtual

**Figure 14 - Emergence of a Tech-Driven Virtual CLOB**

Bid-Ask price for all securities is available from all trading platforms (LOCALLY & GLOBALLY) through a virtual central repository. Traders can view the information through a single site and route their trade through the platform based on their preference.

CLOB. Architectural overview of a virtual CLOB leveraging XML is shown in figure 14.

Because information tends to be stored in proprietary data formats, systems can vary between companies, and there are even compatibility issues within a single corporation. XML promises to open up those bottlenecks and let companies and broader communities speak a standardized language. XML tagging mechanism that can define what the information is the key
factor that can link several proprietary systems based on different platforms and architecture. The key factor of XML application will be organization and agreement of common DTD's that can be used across exchanges and firms to send and receive information, as well as query to view data. These strengths of XML will help link various trading platforms and facilitate information flow among them and make CLOB a reality.
Emergence of HUBs and Exchanges

In order to provide its customers one-stop shopping, financial services firms will form business hubs and exchanges. Market leaders will use electronic commerce to extend their service and brand name as well as to defend their market share against new entrants [35]. This will allow them to profitably integrate electronic commerce into their existing business and offer their products and services through this new distribution network. One area of future growth will be development of unique "Hub" solutions for segments of financial industry. These Hubs will provide business customers better, faster and easier access to products and information.

Hub solutions often have a number of characteristics in common, including a focus on proprietary content, commingling industry content through an independent entity, and leveraging and protecting the strengths of the Hub participants. As a trusted third party, the provider of hub helps insure these market leaders maintain, and often regain control of their content, brand name and distribution franchise.

One of the first hub providers to financial services industry is Communicator Inc. Its first venture is in conjunction with major Wall Street firms to create Bond.Hub, which will serve as the industry portal for Fixed Income Institutional Investors. Bond.Hub allows the participating dealers' customers to easily navigate between the dealers' proprietary web sites and commingle the content, creating a vertical portal with a critical mass of users thereby increasing the impact and value to all participants.

Six major securities firms have joined the new e-commerce company to link their Web sites featuring bond research and price quotations, the latest effort by traditional Wall Street firms to make inroads on the internet. The system soon will be expanded to include new bond issues as well. Wall Street has been left reeling as upstart, technology-savvy competitors have
gotten the upper hand in many internet-related financial businesses, including online stock trading. The largest traditional firms have been aggressively backing new ventures lately, often in collaborative efforts.

This particular new venture, Securities.Hub, marks an expansion of a portal called Bond.Hub, launched in December with the participation of Goldman Sachs Group Inc., Morgan Stanley Dean Witter & Co., and the Salomon Smith Barney unit of Citigroup Inc. Bond.Hub, whose population of 3,000 users is growing by 30% a month, will continue to operate as part of Securities.Hub [79].

Figure 15 reflects an overview of Financial Services Hub Model. The idea of Bond.Hub can be further expanded to other markets, possibly forming a hub for equity research and price quotes. Although other Web sites already offer trading in government bonds, the main feature of Securities.Hub is its ability to allow institutional investors to shuttle among the six major dealers'
Web sites with a single log-on and password. At the central Bond.Hub, buyers can see listings of new research and price quotes by all the member firms, and than decide to move to a dealer's Web site if they want to see more or negotiate a transaction. Such services will enable clients to reach the content of the Street without having to log on to each Web site separately. This will help the participants draw clients' eyeballs to one site in a very efficient fashion as none of the firms individually has enough content to maintain their clients' interest all day long.

As all the member firms will have proprietary systems, the challenge will be to collect the data from these disparate systems and show in real time to the users. XML can play a key role in this regard as its strength lies in linking and allowing real time communication among multi-platform systems.

Another area that will mushroom due to the availability of internet is the emergence of exchanges. These exchanges will allow financial services firms as well as firms that deal in commodity to partner and trade in commodities like energy, metals over-the-counter. The buyer as well as provider will be able to trade across national borders and the limitation of geographical boundaries will blur.

The value proposition of these exchanges for their participants will be increased market transparency, liquidity and efficiency, while preserving the anonymity most market participants requires. In 1999, the notional value of OTC commodity contracts was estimated to be more than $1.8 trillion and is growing rapidly [79]. In a market of such size, implementation of electronic systems will also help improve market quality and significantly reduce operational costs for customers.

In order for such exchanges to be successful, they will need strong technology backbone infrastructure, a robust and scalable trading system with sophisticated support tools for strategies
such as synthetic spread trading, and interoperability of participant systems. The exchanges will provide market participants with global trading support around the clock and throughout the business week. Users will also have a real-time, reliable and secure system for the rapid trading of complex OTC products and should be able to dynamically change their trading strategy based on either internal, market conditions or reassessment of credit and other counterpart issues.

The establishment of such electronic markets will create the opportunity for the "paperless back office" through straight-through processing of trade information for OTC products and will provide its participants as end-to-end execution including clearing and settlement of OTC products.

Last month, Morgan Stanley Dean Witter along with a group of leading U.S. and European financial institutions and some of the world's largest diversified energy and natural resource firms launched such an exchange -- the IntercontinentalExchange [74]. The exchange will provide trading in a variety of petroleum and precious metals-based OTC products later this year, with plans to develop additional markets for other commodity products — including global natural gas, electrical power and a variety of base metals in due course. There will be no "memberships" in the Exchange and no dues or fees beyond those incurred in the process of trading. Participation will be open to all commercial market participants. The important factor to note in this venture is that all the founding firms, which are to provide the initial market liquidity to IntercontinentalExchange, are among the largest players in a broad array of OTC commodity products. The member firms include BP Amoco, Deutsche Bank, Goldman Sachs, Royal Dutch/Shell Group, Société Générale, and the Totalfina Elf Group. These companies represent the top two or three spots in league tables for principals in nearly every category of OTC energy
derivative products, and their participation will offer market users unmatched access to liquidity in these markets.

Citigroup and Commerce One announced in February 2000 that they are joining forces to create an Internet portal that would enable companies to do business with each other online [61]. The e-Citi unit and Commerce One's B2B exchange would have the usual functionalities of most electronic markets such as e-catalogs and procurement services but would also include payment and financing services. The portal called Citibank Procurement Connection will offer immediate online executable currency exchange rates, financing, procurement capabilities, digital certificates, electronic business-to-business bill payment and presentment, and electronic payments linked to a company's accounts payable processing. Citigroup said it expected to launch Citibank Procurement Connection mid 2000 although competitors estimate it will not be operational until late 2001.

Not surprisingly, in April 2000, Bank of America (BoA) and Ariba launched a similar competitive response to Citi-Commerce One and would create their own digital market [60]. Bank of America has more than 2 million business customers over the world and Ariba is a leading B2B software developer. The two companies will be able to achieve synergies in the following areas:

➢ BoA will use Ariba commerce platform to deliver B2B financial services such as electronic invoicing, electronic payments, information integration, and secured data interchange.

➢ BoA and Ariba will form a new company, Banc of America Marketplace LLC, to create and operate a B2B marketplace.
BoA will use Ariba procurement solution in its worldwide operations to cut costs and enhance information flows.

According to the terms of alliance, the two companies will share transaction-based revenue streams from these services and the rolling-out of whole services will be completed before 2002.

All of the examples mentioned above show the increasing trend towards formation of Hubs and exchanges. XML, XML related standards and XML based servers would play an integral role in making such exchanges successful. Power of XML will allow the exchange to communicate and transfer data among the member firms and institutional users. XML based products will also key in executing global straight through processing, clearing and settlement. Role of XML in this area is discussed in more detail in global straight through processing section.
Global Straight Through Processing (GSTP)

Straight Through Processing (STP) in financial services refers to the automated seamless processing of securities trades and payments processing together with their associated transactions, such as corporate actions, product/security master file set-up, and customer account information. As enterprises determine the level of STP they want to achieve, it is critical that they measure themselves against three benchmarks - cost, accuracy of data, and speed.

Global Straight Through Processing (GSTP) is the extension of STP to payment, processing and settlement at a global level. GSTP is a way of responding to the intense and sustained competitive pressure that is forcing every player in the securities business to try to do things quicker, better and cheaper. Needless to say that GSTP is lot more complex than STP as it deals with much larger audience, cross-border regulations and much more disparate systems and practices. As US securities firms are major players in the global market and cross-border trades are growing tremendously, it is imperative for them to work towards GSTP. There are efforts already underway to address GSTP related issues.

The rapid development of Electronic Communications Networks, such as Instinet, Archipelago, Brut and Island ECN, is reducing spreads, cutting dealing costs and turning post-trade and settlement services into a commodity [37]. Right now, these alternative trading systems are competing mostly against stock exchanges. But as they begin to offer more added value features they will encroach on the secondary market business of investment banks. With such new market entrants undermining their core competencies, incumbents are completely rethinking their business offering. Traditionally, GSTP has been seen as a back office issue, but primary market and front office pressures are forcing firms to tighten up on more than their back office operations.
The Securities industry is not only changing but is changing faster than anyone could have predicted and even faster than anyone can react. These changes are shaking the basic building blocks of the industry and changing its underlying value propositions. Online brokerage firms that did not exist five years ago are now generating more transactions than many large 100-year-old firms are. Trading spreads and commissions, across all products, are at historic lows, and transaction volumes are at record highs.

In the next few years, trading spreads would reduce to zero and firms will offer free trading to attract customers, they will offer other value-added services and products to generate revenues. Once this happens the next item that securities firms will offer free to retain its customers will be free clearing and settlement of trades. As a result, the firms need to think how to re-engineer the way they process trades. The firms, which will be able to execute trade processing and settlement more efficiently, will stay competitive. To address this issue, firms need to focus on their core competencies and have a clear understanding of their future value-propositions. Radical change is difficult, particularly in the area of operations where control is synonymous with do it yourself attitude. In the meantime, a focus on reducing costs is a worthy interim solution for most. This changing landscape emphasizes the need of industry-wide GSTP standard.

The securities industry has managed to build up a very high cost infrastructure over the years. In Europe alone, there is a glut of exchanges, clearing corporations and depositories. Some firms still use creaking back office systems that struggle to deal with simple trades. As per S.W.I.F.T (the Society for Worldwide Interbank Financial Telecommunications) estimates, only about 30% of all payments are processed automatically, with the vast majority requiring some manual intervention, 15% of all cross-border trades and 33% of all emerging market trades fail.
[68]. In a recent Global Straight Through Processing Association (GSTPA) conference following data was presented (Table 5 and 6) to reflect cost savings associated with successful implementation of GSTP:

<table>
<thead>
<tr>
<th>Table 5 – Industry Statistics of Failed Trades and Associated Costs</th>
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<tbody>
<tr>
<td><strong>Average number of trades per day (present)</strong></td>
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<tr>
<td><strong>Average number of trades by 2003</strong></td>
</tr>
<tr>
<td><strong>Average dollar amount per trade</strong></td>
</tr>
<tr>
<td><strong>Average failure rate</strong></td>
</tr>
<tr>
<td><strong>Average duration of fail</strong></td>
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<tr>
<td><strong>Conservative Impact Analysis</strong></td>
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</tbody>
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*Source S.W.I.F.T and GSTPA [68]*

<table>
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<tr>
<th>Table 6 – Potential Savings Associated With Efficient GSTP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Opportunity Cost</strong></td>
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<td></td>
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</tr>
</tbody>
</table>

*Source S.W.I.F.T and GSTPA [68]*

The root of the inefficient trade processing and settlement systems is due to the fact that the securities industry has over the year built a complicated infrastructure that has grown in to a
complicated web that no one really understands, is hard to change and is based on proprietary technology.

Securities industry needs to take a step back and should try to simplify the whole process for automating the post-trade, pre-settlement process for cross-border equities that links broker dealers, investment managers and custodians worldwide. The GSTPA (Global Straight-Through Processing Association), a group that represents US and European financial institutions engaged in cross-border trades, is presently working on this aspect. It is currently in the process of selecting a consortium to build a Transaction Flow Monitor (TFM), a post-trade, pre-settlement matching tool. The parties to a trade exchange information with the TFM, which will act like a back office intranet. Figure 16 reflects a blueprint of simplified architecture for GSTP.

![Diagram](image)

**Figure – 16 Proposed GSTP Architecture by GSTPA**

*Source: GSTPA [68]*
The GSTPA initiative represents the first industry-wide attempt to glue GSTP together. It only covers cross-border equity transactions, which in the short term is a sensible approach. The cost of cross-border settlement is very high, and the volume of deals is soaring. It needs to be developed as soon as possible to cover all products and all geographies and more of the trade processing lifecycle.

The key success factors for GSTP are as follows:

1. Establish and conform to industry standards
2. Create interoperability and cross-connectivity between and within participant infrastructures
3. Share of common transaction data without compromising competitive edge

All these factors can be addressed by leveraging on XML strengths. XML is vendor-independent and can facilitate rendering and storing data from increasingly diverse and disparate computing infrastructures. XML fits in well with the current paradigm of message-oriented middle-ware, allowing clients and servers to evolve separately but inter-work together. XML is fast becoming the de facto method of enabling Electronic Data Interchange (EDI) over internet technology based networks, i.e. the internet, intranets and extranets [8] [40].

XML document /files consist of elements (each having attributes) that can be grouped into entities which are then grouped into documents. The Document Type Definition (DTD) defines these and the relationship between them. XML will become the native language for the next generation of internet (www) browsers and part of the Applications Programming Interface (API) definition [15]. This allows disparate applications to communicate over an internet
technology based network. XML also provides a powerful set of tools for developing internet
technology based applications: Database exchange, distribution of processing to clients, multiple
views of data on the client, intelligent agents, management of document collections and so on.
As GSTP will need to link and communicate with disparate and proprietary global systems,
application of XML for this project even becomes more imperative [9]. Even though, currently
GSTPA is working with XML related industry standard bodies it needs to work even closer and
take a leadership role in identifying certain standards.

Some added benefit of using XML for this project includes:

1. XML provides a non-revolutionary migration path; it interfaces with legacy and
current traditional EDI methods. On extraction prior to transmission the agent will
use a description (within the DTD) to simply describe the content of a field (without
concern at extraction time for its internal structure). The DTD will also provide the
means to describe this internal structure within the document itself – therefore the
receiving process will work to these rules. Effectively any translations can be
performed within the DTD itself.

2. XML reduces implementation costs and thus increases acceptance from broader
market participants. Small / Medium-sized firms who previously could not afford to
join the ‘EDI’ community will be open to less expensive XML solutions.

3. XML allows leveraging off existing legacy systems and still allows firms to leverage
from "interactive" transactions enabled by the web. This means that firms supporting
GSTP could use XML to move information to and from TFM and any other systems
but still use its existing systems to meet local needs, regulations and preferences.
One of a major financial services firms mentioned during their interview that among all the XML related initiative currently underway, achieving STP is the most critical effort they are working on. They are member of GSTPA and are working actively to push GSTP across industry and set the required standards by getting buy-in from other major players. The reason for importance is based on the cost benefit associated with STP and believes that XML is the technology, which can help achieve STP.
XML Would Help Achieve T+0

Last five years securities industry has been witnessing another change – reduce time to process and settlement of trades. Figure 17 provides the US trade settlement trend. Firms spent millions of dollars to achieve T+3 from T+5. United States is by far ahead in this arena and the firms are already working towards T+1 settlement. Securities and Exchange Commission has mandated for a T+1 settlement cycle as of mid-2002 [21]. There are similar efforts underway in Great Britain and Japan to achieve T+3 and T+1 by 2002 respectively.

The notion of T+0 complements the global straight through processing (GSTP) effort. Regardless which one happens first the second one will follow. They both can act as a common motivator for firms to reduce the inefficiencies in the current settlement system. United States will remain the leader to offer T+0 settlement, however, due to the effort of GSTPA; non-US firms can embrace the same sooner than anticipated.
Figure 18 provides a high-level model of interactions among various constituencies involved in the end-to-end process of order generation, execution and settlement. It is important to note that this model only shows interaction among single constituencies, in reality a single investment manager may be dealing with multiple broker/dealers and custodians and vice versa, this is what makes the management of communication among these constituencies extremely complex.

Presently, custodian banks systems and processes are designed to handle transactions on an item by item basis. This is a double edged sword, on one hand it gives custodian enough
information and time to check, verify and correct instructions and prepare for settlement, including dealing with securities lending, however it is a time consuming effort and becomes the biggest bottle-neck to T+0 implementation. One way to tackle the issue is to minimize handling actual number of settlement by netting out certain trades. Agreement and implementation of aggregated settlement will be a stepping stone towards achieving T+0.

The first step would be the matching of execution details between the fund manager and the broker-dealer and matching of the execution notice to the trade allocations. This would allow the fund manager and broker-dealer to agree on how the entire block of shares should be divided among the fund manager's clients. This information would then be sent to a matching facility, which would compare the execution instructions (NOE- Notice of Execution) sent by the broker-dealer to the allocations sent by the investment manager. The comparison will take place according to a predefined set of data fields and send a matched status report to the broker-dealer and the investment manager so that the parties can immediately identify and resolve any problems. The matching facility would then send the final matched trade instructions for settlement to the custodian of the investment manager as well as the clearing agent of the broker. Such instructions could be trade for trade today-or in aggregate-allocated within the original block trade execution-which have a common custodian.

Under this scenario, the cumbersome and redundant communication exchanges between broker-dealer sending confirmations to the investment manager and custodian bank via mail, is eliminated. Only an affirmed client confirmation is sent by the matching utility to the investment manager for each beneficial owner of securities.

In the proposed facility, the central repository will need to interface with multiple disparate systems and will need to exchange data/messages. XML fits in well with the current
paradigm of message-oriented middleware, allowing clients and servers to evolve separately but inter-work together. Application of XML will enable implementation of such facility over internet technology based networks, i.e. the internet, intranets and extranets. This will allow disparate applications to communicate over an internet technology based network. XML provides a powerful set of tools for developing internet technology based applications: Database exchange, distribution of processing to clients, multiple views of data on the client, intelligent agents, management of document collections and so on.

The proposed matching facility and the messaging among constituencies can be implemented through application of XML features as follows:

1. Identification (role and syntax) of each piece of interchanged data between various constituencies.

2. Identification of the source of each shared structure, whether the data is from an investment manager to execute a trade or from a broker/dealer to confirm the execution of the trade or a settlement notification from the custodian.

3. Identification of which pieces of information should occur in each interchanged set of data, and where relevant, the order in which individual fields should occur. The aggregation of settlement (netting), execution and settlement can be identified based on predefined criteria.

4. Provision of meta data fields that can be used to identify who is responsible for creating, transmitting, receiving and processing each message and can have built-in facilities for identifying the storage points of programs that should be used to control process. Responsibilities and sequence for each constituency can be defined and maintained here.
5. Provision of facilities that can identify when a message should be moved from one stage to another and to check relevant forms of interchange have taken place. Checking and verification process can be defined to ensure settlement was netted and settled as defined.

The described model reduces the number of institutional settlements and brings securities firms closer to T+0 settlement but it would face acceptance problems from custodians. The reason is that custodians do not want to receive instructions on aggregated settlement at one time of the day and may not wish to aggregate settlement for all of their clients. Aggregated settlement would also mean that contract between custodian banks and their clients would have to be rewritten. Most of such contracts are designed for settlement on a beneficial level basis and may have to be renegotiated under this settlement structure.
Aggregators:

"An aggregator is an entity that *transparently* collects and *analyzes* information from different data sources" [13]. In the process, the aggregator resolves the semantic and contextual differences in the information. The aggregator may also at times provide the user with value added services through use of smart agents. Aggregators existence is only made possible due to internet, its explosive growth and technologies that has enabled aggregators to be able to query databases of incumbent manufacturers with or without their knowledge.

Forrester Research founder and CEO George Colony at a recent electronic commerce conference mentioned that financial services companies that become information aggregators from many sources would thrive online challenges [41]. Financial services firms that want to leverage the internet and want to grow in the digital economy should prepare to become aggregators of information from multiple providers.

This means that financial services firms need to develop an online package that would offer their clients access to banking, mortgage, insurance, mutual funds, and financial information, regardless of who the sponsors of these services are. This additional service along with the old channels that the firm uses to deliver it services will help spur future growth. All the channels, new and old, should carry the same information and lend support to each other.

Large and brand established firms could still survive in this business environment due to their strong brand name, loyal customer base and specialty product offering. However, mid-tier firms will face the greatest challenges for survival in the internet age. Specialists will be successful online if they become the recognized number one provider of a particular service or product via the internet such as mortgage or insurance. However, egos may prevent some
financial services firms from embracing this "open finance" internet business model that would have them funneling competitors' data to clients.

We are already seeing this phenomena taking place, Netbank, a leading internet bank with more than $1.3 billion in assets, recently announced that its customers will soon have free one-click access to their financial portfolios, regardless of the owning institution [72]. After a single log-in to their account at http://www.netbank.com, Net.B@nk customers will be able to conveniently view all of their personal and business account information from multiple banks, brokers, credit card companies, mortgage companies, and more, all from their personalized page on the Net.B@nk Web site.

To achieve this functionality, Net.B@nk is integrating with its online banking platform Teknowledge Corporation's TekPortal(TM) solution, a multi-bank account aggregation system. A consolidated financial statement is an incredibly attractive and innovative offering, particularly when presented by an institution the consumer trusts -- their bank. This new service will provide Net.B@nk customers an improved way to manage their entire financial portfolio, making Net.B@nk the one-stop shop for all their financial services and account access. Through TekPortal's, Net.B@nk will offer its customers attractive features like Web-based funds transfer and sweep capabilities, intuitive notification and alert services, stop payment functionality, as well as advanced one-to-one marketing capabilities. In addition to providing customers their top-level account summary data, Net.B@nk will also offer statement and transaction detail from multiple institutions.

Another example of a major bank to become a aggregator is Chase Manhattan [73]. It has upgraded its banking Web site with an eye toward becoming a consolidator of financial services from many providers. The redesign has created a more consistent look and feel throughout the
site's 2,200 pages, as well as improved navigation and ways for customers to manage information. James Springer, senior vice president for Chase's channel management in a recent interview mentioned that "Chase's aim is "to be an aggregator" by letting customers build personalized Web pages using content provided by the bank". He also mentioned that Chase is following the model of "open finance," a term promulgated by Forrester Research Inc. of Cambridge, Mass., to describe a Web site's ability to combine account information and access to products of multiple providers, along with comprehensive advice. Chase customers could gain access to their accounts and do transactions with partners of Chase that use the Interactive Financial Exchange, or IFX, protocol for secure communication. Chase plans that its web site, which serves 550,000 internet banking customers, eventually would expand beyond banking as we know it today. It would include all possible extensions of finance.

The above two examples of NetBank and Chase are the ones where financial institutions are transforming themselves into an aggregator. There are other examples where firms are collaborating with pure aggregators and defining rules for aggregation from their sites. Recently, First Union Corporation, with assets of $235 billion, issued guidelines for aggregators of financial information will have to follow if they want to get customer data from their Web site [81]. The move is the first by a major financial institution to fortify itself against companies seeking to gather all of a consumer's account-related data at one on-line location using a controversial practice known as screen scraping. First Union officials say the decree is prompted as much by a realization that such aggregators will continue to seek to grab customer data directly from its Web pages, as it is by a hope to ensure the privacy and security of its customers' account information.
Companies like Yodlee.com and VerticalOne Corp. act as virtual secretaries, gathering on-line information from the Web sites of other companies at consumers' request. Consumers give the aggregators permission as well as their log-in information so the companies can "scrape" the information directly from the Web. Yodlee.com, for example, gathers consumers' bank and brokerage account information, frequent flier miles, and recent e-mails. First Union will soon require aggregators to sign binding contractual agreements and to consolidate the information in a way that protects its confidential nature, by providing end-to-end audit trails at both the system and transactional levels and agreeing to adhere to privacy standards. Other guidelines stipulate that customers' log-in and authentication information be protected, that aggregators agree to limits on sharing information with other parties, and that the customer authorize the service only after receiving full disclosure about it.

Whether financial institutions take the role of aggregator or collaborate with existing aggregators, the aggregator business will grow rapidly over the next five years. Technologies like Web wrapper and XML has made it easier for firms to collect data over the internet and provide post-aggregation value added services to their customers [30] [14].
Enterprise Information Portals (EIP)

Enterprise Information Portals (EIP) are also known as corporate portal (CP) or Enterprise Portals (EP). EIP’s will enable firms to unlock internally and externally stored information and provide users a single gateway to required information to make informed business decisions. EIP’s can be viewed as browser based system providing ubiquitous access to business related information the same way that internet content portals are the gateway to the wealth of web content.

During the last decade firms have spent millions of dollars and resources to build data warehouses. The key hurdle in establishing data warehouses has been the way same data elements were defined in disparate systems. Lot of energy has been spent just to standardize the data definition across systems within a firm [3]. However, with the ubiquity of internet and the need to share the data not only within firms but also with suppliers, vendors and partners has created a need for data standardization across firms. EIP’s would enable firms to keep pace with the changing business environment and allow sharing information within their own firms but also with their partners, suppliers and customers.

With the growth of internet and technologies available, EIP will witness a tremendous growth. Merrill Lynch projects that the EIP market will grow to $14.8 billion by 2002 [18]. The value proposition of EIP is as follows:

1. Competitive advantage: EIP applications will provide users with access to internal and external data and to use this information effectively. Users will be able to standardize, analyze, and distribute the information with ease and without accessing multiple systems separately and than patching the information to do a meaningful analysis.
2. High Return on Investment: Software providers have noticed the demand for such packaged applications and several products are available in the market. The availability of off-the-shelf packages will reduce the cost of implementing EIP and encourage corporations to opt for a packaged solution rather than building an in-house system.

3. Reduce cost and generate revenues: The information available on customers, suppliers, and partners will help make smart and quick decisions thus reducing costs and increase revenues.

4. Increased access: Firms once have the right information available in the right format can use it to their advantage by distributing the data through either "push" or "pull" technologies in a timely fashion.

XML will play an integral role in firms implementing EIP solutions. XML makes use of metadata to integrate structured data in legacy files or databases with data in relational databases. This integration is realized easily with XML offering an open architecture interface, and in the process eliminating the need for the complete redevelopment of the legacy systems. XML can be used to integrate unstructured data resource with the structured data resource in relational and legacy database, and in the process, make all enterprise knowledge accessible [3].

Structured data is the focus of information systems and data warehouses, but it typically represents only 10 percent of the knowledge resource in most enterprises. The other 90 percent exist as unstructured data in text documents, reports, e-mail, graphics, images, audio and video resources [18]. This knowledge has been largely inaccessible to information systems and data warehouses. Decisions have had to be taken by management without easy access to this
unstructured knowledge. XML can be used to integrate this unstructured data resource with the structured data resource in relational and legacy databases -- making all enterprise knowledge potentially accessible through EIP.

Access to this integrated knowledge resource via the internet (either through the corporate intranet or extranets) to customers, suppliers and business partners will unleash new business opportunities. This is one of the reasons that there is lot of interest in developing enterprise portals.

![Figure 19 - Enterprise Information Portal (EIP)](image)

Source: Adapted and Modified from Merrill Lynch [18]

Enterprise portals can be built from the ground up using XML or can evolve progressively from existing data warehouses. Figure 19 reflects a XML based EIP systems overview. Many data warehouse and DBMS vendors have already seen the potential of enterprise portals and strengths of XML in this regard. They are extending their products to provide needed support in these areas. Other vendors are providing a capability to deliver
information from data warehouses and enterprise portals by innovative ways -- not just to client workstations, but also by using browsers via the intranet and internet. One can also register to receive information to be sent to them automatically -- via printers, fax, pagers, PDAs, voice or voice mail. This can provide information on a regular basis, such as top-selling items for the day. Or it may notify them on an exception basis of certain events that require a decision to be made.

Sequoia Software Corporation, the leading provider of interactive enterprise information portals (EIPs) early this year announced that it would provide integrated desktop connectivity for its XML Portal Server (XPS) customers with real-time investment information from Zacks Investment Research, and Web-based financial calculators from FinanCenter. Zacks Investment Research will bring up-to-the-minute feeds of equity earnings estimates, analyst recommendations and company research through the internet directly to an XPS user's desktop. These feeds allow users to see at a glance, how their individual or client portfolios are faring, so that they can make fast and effective investment decisions.

These partnerships will enable Sequoia's to deliver an industry-specific interactive EIP solution to financial services industry. Use of such EIP solutions will enable financial services firms deliver the information and service their customers to gain and sustain a competitive advantage.

The Sequoia and Zack partnership is only one mentioned. There are other players like webmethods, iQ4, Hummingbird, On-Display, InfoGlide and S2 who are working to offer EIP packaged solutions for targeted industries [51] [66] [67] [59] [70].
Section 8 XML Success Factors

8-1 Potential Issues with XML and its Implementation

Press hype and the explosion of XML-based standards would lead the casual internet observer to think that XML is a panacea. It's not. Although XML can deliver real benefits, it is an immature technology that faces the following issues:

- XML makes it easier for firms to build a common language for data interchange. However, if the parties don't agree on the definitions than XML's value will be compromised.

- Once data has been converted to XML, it can be freely exchanged among applications that recognize the data elements. However, before mapping an application's native data formats into XML, developers must consider how different applications and business processes will use this data. Bad formatting decisions will m benefits of XML.

- Even though XML has a better content format than HTML for browsing and searching internet content, but HTML still is entrenched among developers of internet applications.

- XML will work its way into content formats over the next three years as authoring tool, notably Microsoft Office 2000, use XML to tag documents.

- As XML is an extensible technology that can be used in many different ways, there is a clear danger that competing groups will define incompatible formats and limit XML's true potential.

- XML allows common method of representing data that enables firms to share data and create an effective environment for firms to share information effectively. Wider
adoption of XML as a base language for industry standards like FIX, S.W.I.F.T., and OFX would make it easier to achieve interoperability between standards, and enhance the integration of different systems, technologies and practices without an extensive use of middle-ware technology or without incurring significant additional cost.

8-2 Definitional Issues in XML Implementation

META group makes some key points related to the implementation of XML in enterprise architectures [19]. There are four stages of creating XML document:

- **Content**: Document components (elements, entities, attributes)
- **Document**: Document Type Definition (DTD) expresses which and where document components can exist and detail business rules
- **Relationships**: XLL expresses relationships between components within and external to the document
- **Presentation**: Expresses the layout convention given the specific circumstances and policy of the document/content.

Firms implementing XML need to take a look at the above mentioned steps and understand what each step means and their relationships. The most important of all is defining and using of DTD’s, as they are the set of rules for using XML to represent documents of specific type. They are a “big part” of the power of XML. Like SQL databases, poorly designed DTD’s will cause problems. The true value of XML for data interchange is in using the industry DTD’s. These carry the promise of being able to exchange data between system that you have purchased, between suppliers, with a minimal amount of integration effort. Firms should work
together to iron out industry standards for DTD's so that they can harness and unleash the full power of XML.

Application of XML will grow substantially in the areas of 1) application development, 2) application infrastructure platform (middle-ware), and 3) application integration. XML will become the business-to-business enabler and the interface and message-definition language of the future [16] [19]. Firms will use XML to support application development/integration, content management and complex publishing, corporate portals, web architectures, data interchange, workgroup efficiency, etc.

8-3 Internal Success Factors for XML Implementation

Some other internal factors for firms to successfully migrate to XML for their e-commerce business are:

Organizational structure and talent: It will be hard to find and retain qualified professionals that understand the business, legacy systems and XML. However, cross-functional teams can help leverage across wide range of firms absorptive knowledge [39].

One of the firms that we interviewed is trying to build XML capabilities within each of their business unit's systems group. There is a centralized group, which is coordinating the effort, but each business group is responsible for their own XML related projects. There are several reasons for that; 1) each group understands their systems better than anyone else and thus can truly exploit XML to their benefit, 2) they feel XML is not being pushed on to them and thus are looking at XML with an open mind and 3) integrates application of XML as part of their existing projects. So far the effort is paying off well for the company. The central group sets the high level direction and gets involved when there are any cross-departmental issues.
Leadership: Clear direction and commitment from senior management to move to XML. As XML is still in its evolutionary stages, there are no guarantees that it will succeed, and there is not much history to learn from. Also, in order to launch any XML project will need lot of effort to evaluate the current data structure and define new standard formats. This need time resources and money. Until there is a strong commitment from management to implement XML, any half-hearted efforts will not succeed or at least will not be able to unleash full strength of XML.

Incentives: Like any other software project proper incentives (professional growth and monetary) should be set and communicated up front. These incentives should be based on pre-defined deliverables and milestones [39]. In today’s job market where dot com companies are attracting talent, large financial services firms have to be creative in offering incentives to their key development people.

Culture/mental models: Firms through involvement of various levels of management should develop culture and mental models that migration to XML is imperative for the firm long-term profitability to be successful in E-commerce business.

Project selection: As firms get involved with XML, which is constantly evolving, the best way to approach is to start with transformation of a relatively non-critical business application. Upon successful transition of this effort, firms can than use it’s learning and expand its XML efforts to critical business areas of the firm. XML can be applied to internal as well as external systems. Another way to build XML learning curve is to apply XML in an internal environment and understand its potential before using it in an external environment.

One of the large financial services firms that we interviewed mentioned that they are applying XML to tackle internal communication and data transfer among various departments.
This will help them explore the strengths and weaknesses of XML in their environment before they apply XML to a system that interfaces with outside world.

Another Boston based firm that we interviewed is using XML on a limited basis for internal systems as well before they lay out a detail strategy of deploying XML. However, both these firms are very active with the various XML standard bodies and are playing an active role in shaping the various standards.
Section 9 Conclusion

Financial services industry will continue to experience tremendous change. The key drivers of this transformation are changes in regulation, availability of innovative technologies and new medium for delivering services like internet. These changes have forced financial services firms to reinvent themselves and reconstruct their value chain. Changing environment and customers need for one-stop shopping has further spurred globalization and consolidation activity in the industry. Firms that are nimble enough to respond quickly and creatively to these changes will be the ones that will survive in the long run.

Globalization and consolidation activity has opened new avenues, markets and allowed firms to have a comprehensive product portfolio for their customers. The key success factor for these activities will be the ability of the merged company to leverage off the technology integration. Firms, which will be able to successfully integrate their systems, will be the ones that will be successful in meeting their customer needs and grow their business.

In order to link disparate systems of these newly acquired products and to be able to deliver information over the internet, firms are looking for new middleware technologies and architectures. XML is the upcoming technology, which can help firms achieve the interoperability issues among disparate systems and B2B e-commerce.

Even though XML is still in its evolving stage, there is wide consensus that it will allow disparate systems to communicate with each other. There is lot of industry support to define XML standards for financial services. In the short run, several XML standards with in financial services will co-exist but the industry will converge to these standards. We believe that multiple XML standards are just an interim step towards industry-wide consensus and are necessary to speed up the process.
Simply adopting XML as a component integration technology does not completely solve the interoperability problem. In particular, even though much of the industry is embracing XML as an interoperability technology, this only pushes the interoperability problem up one level of abstraction. Even if the entire industry were to shift to XML overnight, this alone would not help, as different organizations are likely to use different XML vocabularies to represent the exact same information and vice versa. Granted, there are currently industry-wide initiatives to standardize domain-specific XML vocabularies (for example, BizTalk, FinXML, and OASIS); however, it is not known whether any of these efforts will achieve 100 percent penetration in a particular application domain.

Fortunately, the lack of standardized vocabularies can be solved using XML technology. In particular, in the presence of two competing vocabularies, it is likely that application-level gateways will transform requests from vocabulary "A" into requests in vocabulary "B." An even more promising solution lies in XML transforms. XML transforms allow one XML vocabulary to be transformed into another by specifying the transformation rules (in XML of course). XML transforms were originally devised to map XML to HTML, but are currently being applied in a variety of much more interesting scenarios.

Despite the hype, XML will not solve all of problems. XML will never replace programming languages such as C++ or Java. XML will probably never replace programming technologies such as COM or Java either. XML will, however, become widely used as a way for software components to interoperate, in essence acting as a gateway between autonomous, heterogeneous systems. It is in this role that XML really excels.

We strongly believe that XML is here to stay. The real impact of a rational approach to XML is the kick it gives internet initiatives of all kinds. By knocking down both technical and
organizational barriers to sharing information, XML will dramatically improve collaboration and communication. The adoption of XML will also fuel network externalities which will further accelerate the internet's impact on businesses and the first mover will reap the benefits, as they will be able to have a lock-in on their customer base.
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